THE

ENGLISH ENCYCLOPÆDIA.

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THE

ENGISH ENCYCLOPÆDIA:

BEING

A COLLECTION OF TREATISES,

AND

A DICTIONARY OF TERMS,

ILLUSTRATIVE OF THE

ARTS AND SCIENCES.

COMPILED FM MODERN AUTHORS OF THE FIRST EMINENCE IN THE DIFFERENT BRANCHES OF SCIENCE.

IN TEN VOLUMES.

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RELIGION (Religio), is a Latin word derived, according to Cicero, from *relegere*, "to re-conſider;" but, according to Servius and moſt modern grammarians, from *religare*, "to bind faſt." The reaſon aſſigned by the Roman orator for deducing *religio* from *relego*, is in theſe words, "qui autem omnia, quæ ad cultum deorum pertinerent, diligenter retractarent, et tanquam relegerent, ſunt dicti *religioſi* ex relegendo." The reaſon given by Servius for his derivation of the word is, "quod mentem religio religet." If the Ciceronian etymology be the true one, the word *religion* will denote the diligent ſtudy of whatever pertains to the worſhip of the gods; but according to the other derivation, which we are inclined to prefer, it denotes that obligation which we feel on our minds from the relation in which we ſtand to ſome ſuperior power. In either caſe, the import of the word *religion* is different from that of *theology*, as the former ſignifies a number of practical duties, and the latter a ſyſtem of ſpeculative truths. *Theology* is therefore the foundation of *religion*, or the ſcience from which it ſprings; for no man can ſtudy what pertains to the worſhip of ſuperior powers till he believe that ſuch powers exiſt, or feel any obligation on his mind from a relation of which he knows nothing.

This idea of religion, as diſtinguiſhed from theology, comprehends the duties not only of thoſe more refined and complicated ſyſtems of theiſm or polytheiſm which have prevailed among civilized and enlightened nations, ſuch as the polytheiſm of the Greeks and Romans, and the theiſm of the Jews, the Mahometans, and the Chriſtians; it comprehends every ſentiment of obligation which human beings have ever conceived themſelves under to ſuperior powers, as well as all the forms of worſhip which have ever been practiſed through the world, however fantaſtic, immoral, or abſurd.

When we turn our eyes to this feature of the human character, we find it peculiarly intereſting. Mankind are diſtinguiſhed from the brutal tribes, and elevated to a higher rank, by the rational and moral faculties with which they are endowed; but they are ſtill more widely diſtinguiſhed from the inferior creation, and more highly exalted above them, by being made capable of religious notions and religious ſentiments. The ſlighteſt knowledge of hiſtory is ſufficient to inform us, that religion has ever had a powerful influence in moulding the ſentiments and manners of men. It has ſometimes dignified, and ſometimes degraded, the human character. In one region or age it has been favourable to civilization and refinement; in another, it has occaſionally cramped the genius, depraved the morals, and deformed the manners of men. The varieties of religion are innumerable; and the members of every diſtinct ſect muſt view all who differ from them as more or leſs miſtaken with reſpect to the moſt important concerns of man. Religion ſeems to be congenial to the heart of man; for, wherever human ſociety ſubſiſts, there we are certain of finding religious opinions and ſentiments.

It muſt, therefore, be an important ſubject of ſpeculation to the man and the philoſopher to conſider the origin of religion; to inquire, How far religion in general has a tendency to promote or to injure the order and happineſs of ſociety? and, above all, to examine, What particular religion is beſt calculated to produce a happy influence on human life?

We ſhall endeavour to give a ſatiſfactory anſwer to each of theſe queſtions, reſerving to the article Theology the conſideration of the dogmas of that particular religion which, from our preſent inquiries, ſhall appear to be true, and to have the happieſt influence on human life and manners.

I. The foundation of all religion reſts on the belief of the exiſtence of one or more ſuperior beings, who govern the world, and upon whom the happineſs or miſery of mankind ultimately depends. Of this belief, as it may be ſaid to have been univerſal, there ſeem to be but three ſources that can be conceived. Either the image of Deity muſt be ſtamped on the mind of every human being, the ſavage as well as the ſage; or the founders of ſocieties, and other eminent perſons, tracing by the efforts of their own reaſon viſible effects to inviſible cauſes, muſt have diſcovered the exiſtence of ſuperior powers, and communicated the diſcovery to their aſſociates and followers; or, laſtly, the univerſal belief in ſuch powers muſt have been derived by tradition from a primæval revelation, communicated to the progenitors of the human race.

One or other of theſe hypotheſes muſt be true, becauſe a fourth cannot be framed. But we have elſewhere (ſee Polytheism) examined the reaſoning which has been employed to eſtabliſh the firſt, and ſhown that it proceeds upon falſe notions of human nature. We ſhould likewiſe pronounce it contrary to fact, could we believe, on the authority of ſome of its patrons, who are not aſhamed to contradict one another, that the Kamtſchatkans, and other tribes, in the loweſt ſtate of reaſoning and morals, have no ideas whatever of Deity. We proceed, therefore, to conſider the ſecond hypotheſis, which is much more plauſible, and will bear a ſtricter ſcrutiny.

That the exiſtence and many of the attributes of the Deity are capable of rigid demonſtration, is a truth which cannot be controverted either by the philoſopher or the Chriſtian; for "the inviſible things of Him from the creation of the world are clearly ſeen, being underſtood by the things that are made, even His eternal power and Godhead." See Metaphysics and Theology. But ſurely it would be raſh to infer, either that every truth for which, when it is known, the ingenuity of man

can frame a demonstration, is therefore *discoverable* by human sagacity, or that all the truths which have been discovered by a *Newton* or a *Locke* might therefore have been discovered by untaught barbarians. In mathematical science, there are few demonstrations of easier comprehension than that given by Euclid, of the theorem of which Pythagoras is the reputed author; yet no man ever dreamed that a boy capable of being made to understand that theorem, must therefore have sagacity equal to the sage of Samos; or that such a boy, having never heard of the relation between the hypothenuse and other two sides of a right-angled triangle, would be likely to *discover* that the square of the former is precisely equal to the sum of the squares of the latter. Just so it seems to be with the fundamental truths of theology. There can hardly be conceived a demonstration less intricate, or more conclusive, than that which the man of science employs to prove the existence of at least one God, possessed of boundless power and perfect wisdom. And could we suppose that the human race had remained without any knowledge of God in the world, till certain lucky individuals had by some means or other made themselves masters of the rules of logic, and the philosophy of causes, there can be no doubt but that these individuals might have discovered the existence of superior powers, and communicated their discovery to their associates and followers. But this supposition cannot be admitted, as it is contradicted by the evidence of all history. No nation or tribe has ever been found, in which there is not reason to believe that some notions were entertained of superior and invisible powers, upon which depends the happiness or misery of mankind: and from the most authentic records of antiquity, it is apparent that very pure principles of theism prevailed in some nations long before the rules of logic, and the philosophy of causes, were thought of by any people under heaven.

The supposition before us is inadmissible upon other accounts. Some modern philosophers have fancied that the original progenitors of mankind were left entirely to themselves from the moment of their creation; that they wandered about for ages without the use of speech and in the lowest state of savagism; but that they gradually civilized themselves, and at last stumbled upon the contrivance of making articulate sounds significant of ideas; which was followed by the invention of arts and sciences, with all the blessings of religion and legislation in their train. But this is a wild reverie, inconsistent with the phenomena of human nature.

It is a well known fact, that a man blind from his birth, and suddenly made to see, would not by means of his newly-acquired sense discern either the magnitude or figure or distance of objects, but would conceive every thing which communicated to him visible sensations as inseparably united to his eye or his mind (see Metaphysics). How long his sense of sight would remain in such an imperfect state, we cannot positively say; but, from attending to the visible sensations of infants, we are confident that weeks, if not months, elapse before they can distinguish one thing from another. We have indeed been told, that Chefelden's famous patient, though he was at first in the state which we have described, learned to distinguish objects by sight in the course of a few hours, or at the most of a few days: but, admitting this to a certain extent to be true, it may easily be accounted for. The disease called a *cataract* seldom occasions total blindness; but let us suppose the eyes of this man to have been so completely dimmed as to communicate no sensation whatever upon being exposed to the rays of light; still we must remember that he had long possessed the power of loco-motion and all his other senses in perfection. He was therefore well acquainted with the real, *i. e.* the tangible magnitude, figure, and distance of many objects; and having been often told that the things which he touched would, upon his acquisition of sight, communicate new sensations to his mind, differing from each other according to the distance, figure, and magnitude of the objects by which they were occasioned, he would soon learn to infer the one from the other, and to distinguish near objects by means of his sight.

The progenitors of the human race, however, if left to themselves from the moment of their creation, had not the same advantages. When they first opened their eyes, they had neither moved, nor handled, nor heard, nor smelled, nor tasted, nor had a single idea or notion treasured up in their memories; but were in all these respects in the state of new-born infants. Now we should be glad to be informed by those sages who have conducted mankind through many generations in which they were *mutum et turpe pecus* to that happy period when they invented language, how the first men were taught to distinguish objects by their sense of sight, and how they contrived to *live* till this most necessary faculty was acquired? It does not appear that men are, like brutes, provided with a number of instincts which guide them blindfold and without experience to whatever is necessary for their own preservation (see Instinct): On the contrary, all voyagers tell us that, in strange and uninhabited countries, they dare not venture to taste unknown fruits unless they perceive that these fruits are eaten by the fowls of the air. But without the aid of instinct, or of some other guide equally to be depended upon, it is not in our power to conceive how men dropt from the hands of their Creator, and left from that instant wholly to themselves, could move a single step without the most imminent danger, or even stretch out their hands to lay hold of that food which we may suppose to have been placed within their reach. They could not, for many days, distinguish a precipice from a plane, a rock from a pit, or a river from the meadows through which it rolled. And in such circumstances, how could they possibly exist, till their sense of sight had acquired such perfection as to be a sufficient guide to all their necessary motions? Can any consistent theist suppose that the God whose goodness is so conspicuously displayed in all his works, would leave his noblest creature on earth, a creature for whose comfort alone many other creatures seem to have been formed, in a situation so forlorn as this, where his immediate destruction appears to be inevitable? No! This supposition cannot be formed, because mankind still exist.

Will it then be said, that, when God formed the first men, he not only gave them organs of sensation, and souls capable of arriving by discipline at the exercise of reason, but that he also impressed upon their minds adequate ideas and notions of every object in which they were interested; brought all their organs, external and internal, at once to their utmost possible state of perfection; taught them instantaneously the laws of reasoning; and, in one word, stored their minds with every branch of useful knowledge? This is indeed our own opinion; and it is perfectly agreeable to what we are taught by the Hebrew lawgiver. When God had formed Adam and Eve, Moses does not say that he left them to acquire by slow degrees the use of their senses and reasoning powers, and to distinguish as they could fruits that were salutary from those that were poisonous. No: he placed them in a garden where every tree but one bore fruit fit for food; he warned them particularly against the fruit of that tree; he brought before them the various animals which roamed through the garden; he arranged these animals into their proper genera and species; and by teaching Adam to give them names, he communicated to the first pair the elements of language. This condescension appears in every respect worthy of perfect benevolence; and indeed without it the helpless man and woman could not have lived one whole week.

But it cannot be ſuppoſed, that amidſt ſo much uſeful inſtruction the gracious Creator would neglect to communicate to his rational creatures the knowledge of himſelf; to inform them of their own origin, and the relation in which they ſtood to him; and to ſtate in the plaineſt terms the duties incumbent on them in return for ſo much goodneſs.

In what manner all this knowledge was communicated, cannot be certainly known. It may have been in either of the following ways conceivable by us, or in others of which we can form no conception. God may have miraculouſly ſtored the minds of the firſt pair with adequate ideas and notions of ſenſible and intellectual objects; and then by an internal operation of his own Spirit have enabled them to exert at once their rational faculties ſo as to diſcover his exiſtence and attributes, together with the relation in which as creatures they ſtood to him their Almighty Creator. Or, after rendering them capable of diſtinguiſhing objects by means of their ſenſes, of comparing their ideas, and underſtanding a language, he may have exhibited himſelf under ſome ſenſible emblem, and conducted them by degrees from one branch of knowledge to another, as a ſchoolmaſter conducts his pupils, till they were ſufficiently acquainted with every thing relating to their own happineſs and duty as rational, moral, and religious creatures. In determining the queſtion before us, it is of no importance whether infinite wiſdom adopted either of theſe methods, or ſome other different from them both which we cannot conceive. The ordinary proceſs in which men acquire knowledge is, by the laws of their nature, extremely tedious. They cannot reaſon before their minds be ſtored with ideas and notions; and they cannot acquire theſe but through the medium of their ſenſes long exerciſed on external objects.

The progenitors of the human race, left to inform themſelves by this proceſs, muſt have inevitably periſhed before they had acquired one diſtinct notion; and it is the ſame thing with reſpect to the origin of religion, whether God preſerved them from deſtruction by an *internal* or *external* revelation. If he ſtored their minds at once with the rudiments of all uſeful knowledge, and rendered them capable of exerting their rational faculties, ſo as, by tracing effects to their cauſes, to diſcover his being and attributes, he *revealed* himſelf to them as certainly as he did afterwards to Moſes, when to him he condeſcended to ſpeak face to face.

If this reaſoning be admitted as fair and concluſive, and we apprehend that the principles on which it proceeds cannot be conſidered as ill-founded, we have advanced ſo far as to prove that mankind muſt have been originally enlightened by a revelation. But it is ſcarce neceſſary to obſerve, that this revelation muſt have been handed down through ſucceeding generations. It could not fail to reach the era of the deluge. It is not abſurd to ſuppoſe, that he who ſpake from heaven to Adam ſpake alſo to Noah. And both the revelation which had been handed down to the poſtdiluvian patriarch by tradition, and that which was communicated immediately to himſelf, would be by him made known to his deſcendants. Thus, it appears almoſt impoſſible that ſome part of the religious ſentiments of mankind ſhould not have been derived from revelation; and that not of the religious ſentiments of one particular family or tribe, but of almoſt all the nations of the earth.

This concluſion, which we have deduced by fair reaſoning from the benevolence of God and the nature of man, is confirmed by the authority of the Jewiſh and Chriſtian Scriptures, which are entitled to more implicit credit than all the other records of ancient hiſtory.

When we review the internal and external evidence of the authenticity of theſe ſacred books, we cannot for a moment heſitate to receive them as the genuine *word of God*. If we examine their internal character, they everywhere appear to be indeed the voice of Heaven. The creation of the world—the manner in which this globe was firſt peopled—the deluge which ſwept away its inhabitants—the ſucceeding views of the ſtate of mankind in the next ages after the deluge—the calling of Abraham—the legiſlation of Moſes—the whole ſeries of events which befel the Jewiſh nation—the prophecies—the appearance of Jeſus Chriſt, and the promulgation of his goſpel, as explained to us in the Scriptures—form one ſeries, which is, in the higheſt degree, illuſtrative of the power, wiſdom, and goodneſs of the Supreme Being.

While it muſt be allowed that the human mind is ever prone to debaſe the ſublime principles of true religion by enthuſiaſm and ſuperſtition, reaſon and candour will not for a moment heſitate to acknowledge, that the whole ſyſtem of revelation repreſents the Supreme Being in the moſt ſublime and amiable light: that, in it, religion appears eſſentially connected with morality: that the legiſlative code of Moſes was ſuch as no legiſlator ever formed and eſtabliſhed among a people equally rude and uncultivated: that the manners and morals of the Jews, vicious and ſavage as they may in ſome inſtances appear, yet merit a much higher character than thoſe either of their neighbours, or of almoſt any other nation whoſe circumſtances and character were in other reſpects ſimilar to theirs: that there is an infinite difference between the Scripture prophecies and the oracles and predictions which prevailed among heathen nations: and that the miracles recorded in thoſe writings which we eſteem ſacred were attended with circumſtances which entitle them to be ranked in a very different claſs from thoſe which enthuſiaſm and impoſture have fabricated among other nations. See MIRACLE and PROPHECY.

But as the evidence of the divine origin of the primæval religion reſts particularly on the authority of the firſt five books of the Old Teſtament, it may be thought incumbent on us to ſupport our reaſoning on this ſubject, by proving, that the author of thoſe books was indeed inſpired by God. This we ſhall endeavour to do by one deciſive argument; for the nature of the article, and the limits preſcribed us, admit not of our entering into a minute detail of all that has been written on the divine legation of Moſes.

If the miracles recorded in the book of Exodus, and the other writings of the Hebrew lawgiver, were really performed; if the firſt-born of the Egyptians were all cut off in one night, as is there related; and if the children of Iſrael paſſed through the Red ſea, the waters being divided, and forming a wall on their right hand and on their left—it muſt neceſſarily be granted, that Moſes was ſent by God; becauſe nothing leſs than a divine power was ſufficient to perform ſuch wonderful works. But he who ſuppoſes that thoſe works were never performed, muſt affirm that the books recording them were *forged*, either at the era in which the miracles are ſaid to have been wrought, or at ſome ſubſequent era: There is no other alternative.

That they could not be *forged* at the era in which they affirm the miracles to have been wrought, a very few reflections will make incontrovertibly evident. Theſe books inform the people for whoſe uſe they were written, that their author, after having inflicted various plagues upon Pharaoh and his ſubjects, brought them, to the number of 600,000, out of Egypt with a high hand; that they were led by a pillar of cloud through the day, and by a pillar of fire through the night, to the brink of the Red ſea, where they were almoſt overtaken by the Egyptians, who had purſued them with chariots and horſes; that, to make a way for their eſcape, Moſes ſtretched out his rod over the ſea, which was immediately divided, and permitted them to paſs through on dry ground, between two walls of water; and that the Egyptians, purſuing and going in after them to the midſt of the ſea, were all drowned by the return of the waters to their uſual ſtate, as ſoon as the

Hebrews arrived at the further ſhore. Is it poſſible now that Moſes or any other man could have perſuaded 600,000 perſons, however barbarous and illiterate we ſuppoſe them, that they had been witneſſes of all theſe wonderful works, if no ſuch works had been performed? Could any art or eloquence perſuade all the inhabitants of Edinburgh and Leith, that they had yeſterday walked on dry ground through the Frith to Kinghorn, the waters being divided and forming a wall on their right hand and on their left? If this queſtion muſt be anſwered in the negative, it is abſolutely impoſſible that the books of Moſes, ſuppoſing them to have been forged, could have been received by the people who were alive when thoſe wonders are ſaid to have been wrought.

Let us now inquire, whether, if they be forgeries, they could have been received as authentic at any ſubſequent period: and we ſhall ſoon find this ſuppoſition as impoſſible as the former. The books claiming Moſes for their author ſpeak of themſelves as delivered by him, and from his days kept in the ark of the covenant; an ark, which, upon this ſuppoſition, had no exiſtence prior to the forgery. They ſpeak of themſelves likewiſe, not only as a hiſtory of miracles wrought by their author, but as the ſtatutes or municipal law of the nation, of which a copy was to be always in the poſſeſſion of the prieſts, and another in that of the ſupreme magiſtrate. Now, in whatever age we ſuppoſe theſe books to have been forged, they could not poſſibly be received as authentic; becauſe no copy of them could then be found either with the king, with the prieſts, or in the ark, though, as they contain the ſtatute law of the land, it is not conceivable that, if they had exiſted, they could have been kept ſecret. Could any man, at this day, forge a book of ſtatutes for England or Scotland, and make it paſs upon theſe nations for the only book of ſtatutes which they had ever known? Was there ever ſince the world began a book of ſham ſtatutes, and theſe, too, multifarious and burdenſome, impoſed upon any people as the only ſtatutes by which they and their fathers had been governed for ages? Such a forgery is evidently impoſſible.

But the books of Moſes have internal proofs of authenticity, which no other books of ancient ſtatutes ever had. They not only contain the laws, but alſo give an hiſtorical account of their enactment, and the reaſons upon which they were founded. Thus they tell us, that the rite of circumciſion was inſtituted as a mark of the covenant between God and the founder of the Jewiſh nation, and that the practice of it was enforced by the declaration of the Almighty, that every uncircumciſed man-child ſhould be cut off from his people. They inform us that the annual ſolemnity of the paſſover was inſtituted in commemoration of their deliverance, when God ſlew, in one night, all the firſt-born of the Egyptians: that the firſt-born of Iſrael, both of men and beaſt, were on the ſame occaſion dedicated for ever to God, who took the Levites inſtead of the firſt-born of the men; that this tribe was conſecrated as prieſts, by whoſe hands alone the ſacrifices of the people were to be offered; that it was death for any perſon of a different tribe to approach the altar, or even to touch the ark of the covenant; and that Aaron's budding rod was kept in the ark in memory of the wonderful deſtruction of Korah, Dathan, and Abiram, for their rebellion againſt the prieſthood.

Is it poſſible now, if all theſe things had not been practiſed among the Hebrews from the era of Moſes, with a retroſpect to the ſignal mercies which they are ſaid to commemorate, that any man or body of men could have perſuaded a whole nation, by means of forged books, that they had always religiouſly obſerved ſuch inſtitutions? Could it have been poſſible, at any period poſterior to the Exodus, to perſuade the Iſraelites that they and their fathers had all been circumciſed on the eighth day from their birth, if they had been conſcious themſelves that they had never been circumciſed at all? or that the paſſover was kept in memory of their deliverance from Egyptian bondage, if no ſuch feſtival was known among them?

But let us ſuppoſe that circumciſion had been practiſed, and all their other rites and ceremonies obſerved from time immemorial, without their knowing any reaſon of ſuch inſtitutions; ſtill it muſt be confeſſed that the forger of theſe books, if they *were* forged, conſtructed his narrative in ſuch a manner as that no man of common ſenſe could receive it as authentic. He ſays it was death to touch the ark! As ſuch an aſſertion was never heard of before, and as the ritual he was endeavouring to make them eſteem ſacred was oppreſſively multifarious; ſurely ſome daring ſpirit would have ventured to put his veracity to the teſt by moving the ark and even offering ſacrifices; and ſuch a teſt would at once have expoſed the impoſture. The budding rod, too, and the pot of manna, which, though long preſerved, were never before heard of, muſt have produced inquiries that could not fail to end in detection. Theſe books ſpeak likewiſe of weekly ſabbaths, daily ſacrifices, a yearly expiation, and monthly feſtivals, all to be kept in remembrance of great things particularly ſpecified as done for the nation at an early period of its exiſtence. If this was not the caſe, could the forger of the books have perſuaded the people that it really was ſo? The enlightened reaſoners of this nation would be offended were we to compare them with the ancient Iſraelites; but ſurely they will not ſay that we are partial to that people, if we bring them to a level with the moſt ſavage tribes of the Ruſſian empire, who profeſs Chriſtianity! Now, were a book to be forged containing an account of many ſtrange things done a thouſand years ago in Siberia by an *Apollonius*, or any other philoſopher or hero, numbers of the barbarians inhabiting that country would, we doubt not, give implicit credit to the *legend*: But were the author, in confirmation of his narrative, to affirm, that all the Siberians had from that day to this kept ſacred the firſt day of the week in memory of this hero; that they had all been baptized or circumciſed in his name; that in their public judicatories they had ſworn by his name, and upon that very book which they had never ſeen before; and that the very ſame book was their law and their goſpel, by which for a thouſand years back the actions of the whole people had been regulated—ſurely the groſſeſt ſavage among them would reject with contempt and indignation a forgery ſo palpable.

If this reaſoning be concluſive, the books of Moſes muſt indubitably be authentic, and he himſelf muſt have been inſpired by the ſpirit of God. But this point being eſtabliſhed, the queſtion reſpecting the origin of the primæval religion is completely anſwered. The writer of the book of Geneſis informs us, that Adam and Noah received many revelations from the Author of their being, and that their religion was founded on the principles of the pureſt theiſm. How it degenerated among the greater part of their deſcendants into the groſſeſt idolatry, has been ſhown at large in another place. See POLYTHEISM.

II. Having thus anſwered the firſt queſtion propoſed for diſcuſſion in the preſent article, we now proceed to conſider the ſecond, and to inquire whether and how far religious ſentiments have a tendency to injure or to promote the welfare of ſociety? This is a ſubject of the utmoſt importance; and if we prove ſucceſsful in our inquiries, we ſhall be enabled to determine whether the governors of mankind ought carefully to ſupport religious eſtabliſhments, or whether the philoſopher, who calls himſelf a citizen of the world, and profeſſes to feel the moſt eager deſire to promote the intereſts of his ſpecies, acts conſiſtently when he labours to exterminate religion from among men.

A celebrated French financier (M. Necker), a man of abilities and virtue, who has publifhed a book on the importance of religious opinions, labours to fhow that religious eftablifhments are indifpenfably neceffary for the maintenance of civil order, and demonftrates how weak the influence of political inftitutions is on the morals of mankind; but he refufes to review the hiftory of paft ages in order to difcover how far religious opinions have actually been injurious or beneficial to the welfare of fociety; choofing rather to content himfelf with the refult of a feries of metaphyfical difquifitions.

We admire the fpirit which induced a man who had fpent a confiderable part of his life amid the hurry of public bufinefs, to become the ftrenuous advocate of religion; but we cannot help thinking that, notwithftanding the eloquence, the acutenefs, and the knowledge of mankind which he has difplayed, his refufing to admit the evidence of facts concerning the influence of religion on fociety may poffibly be regarded by its enemies as a tacit acknowledgment that the evidence of facts would be unfavourable to the caufe which he wifhes to defend. The fallacy of general reafonings, and the inutility of metaphyfics for the purpofes of life, are fo univerfally acknowledged, that they have long been the theme of declamation. Though the abufes of religion, as well as the abufes of reafon, the perverfion of any of the principles of the human mind, and the mifapplication of the gifts of Providence, may have often produced effects hurtful to the virtue and the happinefs of mankind; yet, after tracing religion to a divine origin, we cannot, for a moment, allow ourfelves to think that the primary tendency of religion muft be hoftile to the interefts of fociety, or that it is neceffary to view it abftractedly in order that we may not behold it in an odious light. Often has the fceptic attacked religion with artful malice; but perhaps none of his attacks has been fo fkilfully directed as that which has firft ridiculed the abfurdity of the moft abfurd fuperftitions, and afterwards laboured to prove that the moft abfurd fyftem of polytheifm is more favourable to the interefts of fociety than the pureft and moft fublime theifm. Inftances in which the abufe of religion had tended to deprave the human heart, and had led to the moft fhocking crimes, have been affiduoufly collected, and difplayed in all the aggravating colours in which eloquence could array them, till at length even the friends of true religion have been abafhed; and it has become a fafhionable opinion, that nothing but felf-intereft or bigotry can prompt men to reprefent religion as the friend of civil order. But let us try if, by a candid confideration of what effects have refulted to fociety from religious principles, in general, without comparing thefe with regard to truth or falfehood, we can advance any thing to vindicate the character of religion.

Notions of Deity in general, of various orders of divinities, of their moral character, of their influence on human life, of a future ftate, and of the immortality of the human foul, conftitute the leading articles of religion. Let us view thefe together with the rites to which they have given rife, and we may perhaps be enabled to form fome well-grounded notions on this important point.

1. Having proved that the firft religious principles entertained by men were derived from revelation, it is impoffible to fuppofe that they could produce effects injurious to fociety. If religion of any kind has ever leffened the virtue or difturbed the peace of men, it muft have been that religion which fprings from a belief in a multitude of fuperior powers actuated by paffions, and of whom fome were conceived as benevolent and others as malicious beings. That fuch fentiments fhould have produced vices unknown in focieties where pure theifm is profeffed, will be readily admitted. Even the few *atheifts* who live in Chriftian or Mahometan countries are reftrained by the laws, by a defire to promote the honour of the fect, and by many other confiderations, from indulging in practices which the example of the falfe gods of antiquity fanctioned in their votaries. But, in determining the prefent queftion, we muft not compare the virtues of the pagan world with thofe of individual atheifts in modern Europe, but with thofe of *nations* profeffing atheifm; and fuch nations are no where to be found. We can however eafily conceive, that, in a fociety unawed by any notions of God or a future ftate, no fuch laws would be enacted as thofe which reftrain the fenfual appetites; of which the criminal indulgence was one of the greateft ftigmas on the pagan worfhip of antiquity. In fuch focieties, therefore, thofe vices would be practifed conftantly to which paganifm gave only an occafional fanction; and many others, in fpite of the utmoft vigilance of human laws, would be perpetrated in fecret, which the moft profligate pagans viewed with horror. Confcience, though acting with all her energy, would not be able to command any regard to the laws of morality. No virtue would be known; focial order would be no where obferved; the midnight affaffin would every where be found; and in the general fcramble mankind would be exterminated from the face of the earth.

The worft fpecies of paganifm, even that which prevails among favages who worfhip evil fpirits, affords greater fecurity than this. It is indeed fhocking to think that demons fhould be worfhipped, while deities, who are regarded as being all benevolence, are treated with contempt: And it has been afked, If the influence of fuch religious fentiments on the moral practice of the idolators muft not naturally be, to caufe them to treat their friends and benefactors with ingratitude, and to humble themfelves with mean fubmiffion before a powerful enemy?

They do not appear to have produced fuch effects on the morality of the favages by whom they were entertained. The benevolent deities were neglected, only becaufe their benevolence was neceffary. A voluntary favour merits a grateful return: a defigned injury provokes refentment. But when you become, by accident, the inftrument of any man's good fortune, the world will fcarce confider him as owing you any obligation: the ftone which bruifes your foot excites only a momentary emotion of refentment. Thofe gods who could not avoid doing good to men might not receive a profufion of thanks for their fervices; and yet a favour conferred by a human benefactor commands the warmeft gratitude. But thofe rude tribes appear to have had fo much wifdom as to confer a lefs abfolute malice on their malevolent deities, than the benevolence which they attributed to their more amiable order of fuperior beings: though the latter could not poffibly do them any thing but good, and that conftantly; yet the former were not under an equally indifpenfable neceffity of perfevering in depreffing them under calamities. On their malevolent deities they conferred a freedom of agency which they denied to the benevolent. No wonder, then, that they were more affiduous in paying their court to the one than to the other. They might with as much propriety have thought of being grateful to the boar or ftag whofe flefh fupported them, as to deities who were always benevolent, becaufe they could not poffibly be otherwife. Though negligent of fuch deities, this can fcarce be thought to have had any tendency to render them ungrateful to benefactors like themfelves. And yet it muft not be diffembled, that the American Indians, among whom fuch religious fentiments have been found to prevail, are faid to be very little fenfible to the emotions of gratitude. An Indian receives a prefent without thinking of making any grateful acknowledgments to the beftower. He pleafes his fancy or gratifies his appetite with what you have given, without feeming to confider himfelf as under the fmalleft obligation to you for the gift.

It may be doubted, however, whether this ſpirit of ingratitude originates from, or is only collateral with, that indifference which refuſes adoration and worſhip to the benevolent divinities. If the former be actually the caſe, we muſt acknowledge that thoſe religious notions which we now conſider, though preferable to general atheiſm, are in this reſpect unfriendly to virtue. But if the Indians may be thought to owe the ingratitude for which they are diſtinguiſhed to the opinion which they entertain of the exiſtence of a benevolent order of deities, whoſe benevolence is neceſſary and involuntary, their ideas of the nature of their malevolent demons do not appear to have produced equal effects on their moral ſentiments. However ſubmiſſive to thoſe dreaded beings, they are far from ſhowing the ſame tame and cowardly ſubmiſſion to their human enemies: towards them they ſeem rather to adopt the ſentiments of their demons. Inveterate rancour and brutal fury, inhuman cruelty and inconceivable cunning, are diſplayed in the hoſtilities of tribes at war; and we know not, after all, if even theſe ſentiments do not owe ſomewhat of their force to the influence of religion.

Yet let us remember that theſe ſame Indians have not been always repreſented in ſo unamiable a light; or, at leaſt, other qualities have been aſcribed to them which ſeem to be inconſiſtent with thoſe barbarous diſpoſitions. They have been deſcribed as peculiarly ſuſceptible of conjugal and parental love; and he who is ſo cannot be deſtitute of virtue.

2. But, leaving the religion of ſavages, of which very little is known with certainty, let us proceed to examine what is the natural influence of that mixed ſyſtem of theology which repreſents to the imagination of men a number of ſuperior and inferior divinities, actuated by the ſame paſſions and feelings with themſelves, and often making uſe of their ſuperior power and knowledge for no other purpoſe but to enable them to violate the laws of moral order with impunity. This is the celebrated polytheiſm of the Greeks and Romans, and moſt other nations of antiquity (ſee POLYTHEISM). Could its influence be favourable to virtue?

At a firſt view every perſon will readily declare, that ſuch a ſyſtem muſt have been friendly to profligacy. If you commit the government of the univerſe, and the inſpection of human ſociety, to a ſet of beings who are often diſpoſed to regard vice with a no leſs favourable eye than virtue, and who, though there be an eſtabliſhed order by which virtue is diſcriminated from vice, and right from wrong, yet ſcruple not to violate that order in their own conduct; you cannot expect them to require in you a degree of rectitude of which they themſelves appear incapable. A Mercury will not diſcourage the thieviſh arts of the trader; a Bacchus and a Venus cannot frown upon debauchery; Mars will behold with ſavage delight all the cruelties of war. The Thracians indeed, one of the moſt barbarous nations of antiquity, whoſe ferocity was little if at all inferior to that of the Indians, who have been diſtinguiſhed as cannibals, was the favourite nation of Mars; among whom ſtood his palace, to which he repaired when about to mount his chariot, and arm himſelf for battle. Even Jupiter, who had been guilty of ſo many acts of tyrannical caprice, had been engaged in ſuch a multitude of amorous intrigues, and ſeemed to owe his elevated ſtation as monarch of the ſky, not to ſuperior goodneſs or wiſdom, but merely to a ſuperior degree of brutal force, could not be feared as the avenger of crimes, or revered as the impartial rewarder of virtues.

That this ſyſtem had a pernicious effect on morals, and that, as compared with pure theiſm, it was injurious to ſociety, cannot be denied; but yet, when contraſted with atheiſm, it was not without its favourable effects. It was ſo connected with the order of ſociety, that, without its ſupport, that order could ſcarce have been maintained. The young rake might perhaps juſtify himſelf by the example of Jupiter or Apollo, or ſome other amorous divinity; the frail virgin or matron might complain of Cupid, or boaſt of imitating Venus; and the thief might practiſe his craft under the patronage of Mercury: But if we take the whole ſyſtem together, if we conſider with what views thoſe deities were publicly worſhipped, what temples were raiſed, what rites inſtituted, what ſacrifices offered, and what *feriæ* conſecrated; we ſhall perhaps find it neceſſary to acknowledge, that the general effects even of that mixed and incoherent ſyſtem of polytheiſm which prevailed among the Greeks and Romans were favourable to ſociety. To ſtate a particular inſtance; the *ancilia* of Mars and the fire of Veſta were thought to ſecure the perpetuity of the Roman empire. As long as the ſacred *ancile*, which had been dropped from heaven for that benevolent purpoſe, was ſafely preſerved in thoſe holy archives in which it had been depoſited; and as long as the ſacred fire of Veſta was kept burning, without being once extinguiſhed, or at leaſt ſuffered to remain for an inſtant in that ſtate; ſo long was Rome to ſubſiſt and flouriſh. And, however ſimple and abſurd the idea which connected the proſperity of a nation with the preſervation of a piece of wood in a certain place, or with the conſtant blazing of a flame upon a hearth; yet no fact can be more certain, than that the patriotiſm and enthuſiaſtic valour of the Romans, which we ſo much extol and admire, were, in many inſtances, owing in no inconſiderable degree to the veneration which they entertained for the *ancilia* and the veſtal fire.

A numerous ſeries of facts occur in the Roman hiſtory, which ſhow the happy effects of their religious opinions and ceremonies on their ſentiments concerning ſocial order and the public welfare. How powerful was the influence of the *ſacramentum* adminiſtered to the ſoldiers when they enliſted in the ſervice of their country! The promiſes made, the idea of the powers invoked, and the rites performed on that occaſion, produced ſo deep and ſo awful an impreſſion on their minds, that no danger, nor diſtreſs, nor diſcontent, could prompt them to violate their engagements. The reſponſes of the oracles, too, though the dictates of deceit and impoſture, were often of ſingular ſervice to thoſe to whom they were uttered: when they inſpired the warrior, as he marched out to battle, with the confidence of ſucceſs, they communicated to him new vigour, and more heroic valour, by which he was actually enabled to gain, or at leaſt to deſerve, the ſucceſs which they promiſed. Again: when, in times of public diſtreſs, the augur and the prieſt directed ſome games to be celebrated, certain ſacrifices to be offered, or ſome other ſolemnities to be performed, in order to appeaſe the wrath of the offended deities; it is plain that the means were not at all ſuited to accompliſh the end propoſed by them; yet ſtill they were highly beneficial. When the attention of the whole people was turned entirely to thoſe ſolemnities by which the wrath of heaven was to be averted, they were rouſed from that deſpondency under which the ſenſe of the public diſtreſs or danger might have otherwiſe cauſed them to ſink: the public union was at the ſame time more cloſely cemented, and the hearts of the people knit together; and, when perſuaded that by propitiating the gods they had removed the cauſe of their diſtreſs, they acquired ſuch calmneſs and ſtrength of mind as enabled them to take more direct and proper meaſures for the ſafety of the ſtate.

Could we view the ancient Greeks and Romans acting in public or in private life under the influence of that ſyſtem of ſuperſtition which prevailed among them; could we perceive how much it contributed to the maintenance of civil order; could we behold Numa and Lycurgus eſtabliſhing their laws, which would otherwiſe have met with a very different reception under the

fanction of divinities; could we obferve all the beneficial effects which arofe to communities from the celebration of religious ceremonies; we fhould no longer hefitate to acknowledge, that thofe principles in the human heart by which we are fufceptible of religious fentiments, are fo eminently calculated to promote the happinefs of mankind, that, even when perverted and abufed, their influence is ftill favourable.

The ideas which prevailed among the nations of the heathen world concerning a future ftate of retribution were, it muft be confeffed, not very correct. Some of the poets, we believe, have reprefented them in no unfair light: both Homer and Virgil have conducted their heroes through the realms of Pluto, and have taken occafion to unfold to us the fecrets of thofe dreary abodes. The fcenes are wild and fanciful; the rewards of the juft and virtuous are of no very refined or dignified nature: and of the punifhments inflicted on the guilty, it is often hard to fay for what ends they could be inflicted; whether to correct and improve, or for the gratification of revenge or whim: they are often fo whimfical and unfuitable, that they cannot with any degree of propriety be afcribed to any caufe but blind chance or wanton caprice. A great dog with three tongues, a peevifh old boat-man with a leaky ferry-boat, demanding his freight in a furly tone, and an uxorious monarch, are objects too familar and ludicrous not to degrade the dignity of thofe awful fcenes which are reprefented as the manfions of the dead, and to prevent them from making a deep enough impreffion on the imagination. The actions and qualities, too, for which departed fpirits were admitted into Elyfium, or doomed to the regions of fuffering, were not always of fuch a nature as, under a well-regulated government on earth, would have been thought to merit reward or to be worthy of punifhment. It was not always virtue or wifdom which conducted to the Elyfian fields, or gained admiffion into the fociety of the immortal gods. Ganymede was for a different reafon promoted to be the cup-bearer of Jove; and Hercules and Bacchus could not furely plead that any merits of that kind entitled them to feats in the council, and at the banquets of the immortals. That doctrine, likewife, which reprefented mortals as hurried by fate to the commiffion of crimes, which they could no more abftain from committing than the fword can avoid to obey the impulfe of a powerful and furious arm plunging it into the breaft of an unrefifting antagonift, could not but produce effects unfavourable to virtue; and it afforded a ready excufe for the moft extravagant crimes.

Yet, after all, he who attentively confiders the ideas of the Greeks and Romans concerning the moral government of the world and a future ftate of rewards and punifhments, will probably acknowledge, that their general influence muft have been favourable to virtue and moral order. Allow them to have been incorrect, and dafhed with abfurdity; ftill they reprefent punifhments prepared for fuch qualities and actions as were injurious to the welfare of fociety; whilft, for thofe qualities which rendered men eminently ufeful in the world, they hold forth a reward. Though incorrect, their ideas concerning a future ftate were exceedingly diftinct; they were not vague or general, but fuch as might be readily conceived by the imagination, in all their circumftances, as really exifting. When a man is told that for fuch a deed he will be put to death, he may fhudder and be alarmed, and think of the deed as what he muft by no means commit; but place before him the fcene and the apparatus for his execution, call him to behold fome other criminal mounting the fcaffold, addreffing his laft words in a wild fcream of defpair to the furrounding fpectators, and then launching into eternity—his horror of the crime, and his dread of the punifhment, will now be much more powerfully excited. In the fame manner, to encourage the foldier marching out to battle, or the mariner fetting fail under the profpect of a ftorm, promife not, merely in general terms, a liberal reward; be fure to fpecify the nature of the reward which you mean to beftow; defcribe it fo as that it may take hold on the imagination, and may rife in oppofition to the images of death and danger with which his courage is to be affailed.

If thefe phenomena of the human mind are fairly ftated; if it be true that general ideas produce no very powerful effects on the fentiments and difpofitions of the human heart; it muft then be granted, that though the fcenes of future reward and punifhment, which the heathens confidered as prepared for the righteous and the wicked, were of a fomewhat motley complexion: yet ftill, as they were diftinct and even minute draughts, they muft have been favourable to virtue, and contributed in no inconfiderable degree to the fupport of civil order.

Another thing of which we may take notice under this head, is the vaft multiplicity of deities with which the Greek and Roman mythology peopled all the regions of nature. Flocks and fields, and woods and oaks, and flowers, and many much more minute objects, had all their guardian deities. Thefe were fomewhat capricious at times, it is true, and expected to have attention paid them. But yet the faithful fhepherd, and the induftrious farmer, knew generally how to acquire their friendfhip; and in the idea of deities enjoying the fame fimple pleafures, partaking in the fame labours, protecting their poffeffions, and bringing forward the fruits of the year, there could not but be fomething of a very pleafing nature, highly favourable to induftry, which would animate the labours, and cheer the feftivals, of the good people who entertained fuch a notion; nay, would diffufe a new charm over all the fcenes of the country, even in the gayeft months of the year.

From all of thefe particular obfervations, we think ourfelves warranted to conclude, that notwithftanding the mixed characters of the deities who were adored by the celebrated nations of antiquity; though they are in many inftances reprefented as confpicuous for vices and frolics; however vain, abfurd, and morally criminal, fome of the rites by which they were worfhipped may have been, and however incorrect the notions of the heathens concerning the moral government of the univerfe and a future ftate of retribution; yet ftill, after making a juft allowance for all thefe imperfections, the general influence of their religious fyftem was rather favourable than unfavourable to virtue and to the order and happinefs of fociety.

It was not without good reafon that the earlieft legiflators generally endeavoured to eftablifh their laws and conftitutions on the bafis of religion; government needs the fupport of opinion; the governed muft be impreffed with a belief that the particular eftablifhment to which they are required to fubmit, is the beft calculated for their fecurity and happinefs, or is fupported on fome fuch folid foundation, that it muft prove impoffible for them to overturn it, or is connected with fome awful fanction, which it would be the moft heinous impiety to oppofe. Of thefe feveral notions, the laft will ever operate on moft men with the moft fteady influence. We are frequently blind to our own intereft; even when eager for the attainment of happinefs, we often refufe to take the wifeft meafures for that end. The great bulk of the people in every community are fo little capable of reafoning and forefight, that the public minifter who fhall moft fteadily direct his views to the public good will often be the moft unpopular. Thofe laws, and that fyftem of government, which are the moft beneficial, will often excite the ftrongeft popular difcontents. Again: it is not always eafy to perfuade people that your power is fuperior to theirs, when it is not really fo. No one man will ever be able to perfuade a thoufand that he is ftronger than they all toge-

ther: and therefore, in order to perfuade one part of his fubjects or army that it is abfolutely neceffary for them to fubmit to him, becaufe any attempts to refift his power would prove ineffectual, a monarch or general muft take care firft to perfuade another part that it is for their intereft to fubmit to him; or to imprefs the whole with a belief that, weak and pitiful as he himfelf may appear, when viewed fingly in oppofition to them all, yet by the affiftance of fome awful invifible beings, his friends and protectors, he is fo powerful, that any attempts to refift his authority muft prove prefumptuous folly. Here, then, the aid of religion becomes requifite. Religious fentiments are the moft happily calculated to ferve this purpofe. Scarce ever was there a fociety formed, a mode of government eftablifhed, or a code of laws framed and enacted, without having the religious fentiments of mankind, their notions of the exiftence of fuperior invifible beings, and their hopes and fears from thofe beings, as its fundamental principle. Now, we believe, it is almoft univerfally agreed, that even the rudeft form of fociety is more favourable to the happinefs of mankind, and the dignity of the human character, than a folitary and favage ftate. And if this, with what we have afferted concerning religion as the bafis of civil government, be both granted, it will follow, that even the moft imperfect religious notions, the moft foolifh and abfurd rites, and the wildeft ideas that have been entertained concerning the moral government of the univerfe by fuperior beings, and a future ftate of retribution, have been more advantageous than atheifm to the happinefs and virtue of human life. We have already granted, nor can it be denied, indeed, that many of the religious opinions which prevailed among the ancient heathens, did contribute, in fome degree, to the depravation of their morals: and all that we argue for is, that, on a comparative view of the evil and the good which refulted from them, the latter muft appear more than adequate to counterbalance the effects of the former.

But if fuch be the natural tendency of thofe principles by which the human heart is made fufceptible of religious fentiments, that even enthufiafm and abfurd fuperftition are productive of beneficial effects more than fufficient to counterbalance whatever is malignant in their influence on fociety—furely a pure rational religion, the doctrines of which are founded in undeniable truth, and all the obfervances which it enjoins calculated to promote by their direct and immediate effects fome ufeful purpofes, muft be in a very high degree conducive to the dignity and the happinefs of human nature. Indeed, one collateral proof of the truth of any religion, which muft have very confiderable weight with all who are not of opinion that the fyftem of the univerfe has been produced and hitherto maintained in order and exiftence by blind chance, will be, its having a ftronger and more direct tendency than others to promote the interefts of moral virtue and the happinefs of mankind in the prefent life. Even the teftimony of thoufands, even miracles, prophecies, and the fanction of remote antiquity, will fcarce have fufficient weight to perfuade us, that a religion is of divine origin, if its general tendency appear to be rather unfavourable than advantageous to the promotion of moral virtue.

III. We fhall therefore, in the next place, endeavour to determine, from a comparative view of the effects produced on the character and circumftances of fociety by the moft eminent of thefe various fyftems of religion which have been in different ages or in different countries eftablifhed in the world, how far any one of them has in this refpect the advantage over the reft; and, if the utility of a fyftem of religion were to be received as a teft of its truth, what particular fyftem might, with the beft reafon, be received as true, while the reft were rejected.

1ft, The principle upon which we here fet out is, that all, or almoft all, fyftems of religion with which we are acquainted, whether true or falfe, contribute more or lefs to the welfare of fociety. But as one field is more fruitful, and one garden lefs overgrown with weeds than another; fo, in the fame manner, one fyftem of religious opinions and ceremonies may be more happily calculated than others to promote the trueft interefts of mankind. In oppofition to thofe philofophers who are fo vehement in their declamations againft the inequality of ranks, we have ever been of opinion, that refinement and civilization contribute to the happinefs of human life. The character of the folitary favage is, we are told, more dignified and refpectable than that of the philofopher and the hero, in proportion as he is more independent. He is indeed more independent; but his independence is that of a ftone, which receives no nourifhment from the earth or air, and communicates none to animals or vegetables around it. In point of happinefs, and in point of refpectability, we cannot hefitate a moment, let philofophers fay what they will, to prefer a virtuous, enlightened, and polifhed Briton to any of the rudeft favages, the leaft acquainted with the reftraints and the fympathies of focial life, that wander through the wild forefts of the weftern world. But if we prefer civilization to barbarifm, we muft admit, that in this view Chriftianity has the advantage over every other religious fyftem which has in any age or country prevailed among men; for nowhere have civilization and ufeful fcience been carried to fuch a height as among Chriftians.

It is not, indeed, in any confiderable degree that the abfurd fuperftitions of thofe rude tribes, who can fcarce be faid to be formed into any regular fociety, can contribute to their happinefs. Among them the faculty of reafon is but in a very low ftate; and the moral principle ufually follows the improvement or the depreffion of the reafoning faculty. Their appetites and merely animal paffions are almoft their only principles of action: their firft religious notions, if we fuppofe them not to be derived from revelation or tradition, are produced by the operation of gratitude, or grief, or hope, or fear, upon their imaginations. And to thefe, however wild and fanciful, it is not improbable that they may owe fome of their earlieft moral notions. The idea of fuperior powers naturally leads to the thought that thofe powers have fome influence on human life. From this they will moft probably proceed to fancy one fet of actions agreeable, another offenfive, to thofe beings to whom they believe themfelves fubject. And this, perhaps, is the firft diftinction that favages can be fuppofed to form between actions, as right or wrong, to be performed or to be avoided. But if this be the cafe, we muft acknowledge that the religious notions of the favage, however abfurd, contribute to elevate his character, and to improve his happinefs, when they call forth the moral principle implanted in his breaft.

But if the focial ftate be preferable to a ftate of wild and folitary independence, even the rude fuperftitions of unenlightened tribes of favages are in another refpect beneficial to thofe among whom they prevail. They ufually form, as has been already obferved under this article, the bafis of civil order. Religious opinions may lead the great body of the community to reverence fome particular fet of inftitutions, fome individual, or fome family, which are reprefented to them as peculiarly connected with the gods whom they adore. Under this fanction fome form of government is eftablifhed; they are taught to perform focial duties, and rendered capable of focial enjoyments. Not only Numa and Lycurgus, but almoft every legiflator who has fought to civilize a rude people, and reduce them under the reftraints of legal government, have endeavoured to imprefs their people with an idea that they acted with the approbation, and under the immediate direction, of fuperior

powers. We cannot but allow that the rude ſuperſtitions of early ages are productive of theſe advantages to ſociety; but we have already acknowledged, and it cannot be denied, that they are alſo attended with many unhappy effects. When we view the abſurdities intermixed with the ſyſtems of religion which prevailed among moſt of the nations of antiquity, we cannot help lamenting that ſo noble a principle of human nature as our religious ſentiments ſhould be liable to ſuch groſs perverſion; and when we view the effects which they produce on the morals of mankind, and the forms of ſociety, though we allow them to have been upon the whole rather beneficial than hurtful, yet we cannot but obſerve, that their unfavourable effects are by far more numerous than if they had been better directed. What unhappy effects, for inſtance, have been produced by falſe notions concerning the condition of human ſouls in a future ſtate! Various nations have imagined that the ſcenes and objects of the world of ſpirits are only a ſhadowy repreſentation of the things of the preſent world. Not only the ſouls of men, according to them, inhabit thoſe regions; all the inferior animals and vegetables, and even inanimate bodies that are killed or deſtroyed here, are ſuppoſed to paſs into that viſionary world; and, exiſting there in unſubſtantial forms, to execute the ſame functions, or ſerve the ſame purpoſes, as on earth. Such are the ideas of futurity that were entertained by the inhabitants of Guinea. And by theſe ideas they were induced, when a king or great man died among them, to provide for his comfortable accommodation in the world of ſpirits, by burying with him meat and drink for his ſubſiſtence, ſlaves to attend and ſerve him, and wives with whom he might ſtill enjoy the pleaſures of love. His faithful ſubjects vied with each other in offering, one a ſervant, another a wife, a third a ſon or daughter, to be ſent to the other world in company with the monarch, that they might there be employed in his ſervice. In New Spain, in the iſland of Java, in the kingdom of Benin, and among the inhabitants of Indoſtan, ſimilar practices on the ſame occaſion, owing no doubt to ſimilar notions of futurity, have been prevalent. But ſuch practices as theſe cannot be viewed with greater contempt on account of the opinions which have given riſe to them, than horror on account of their unhappy effects on the condition of thoſe among whom they prevail. A lively impreſſion of the enjoyments to be obtained in a future ſtate, together with ſome very falſe or incorrect notions concerning the qualities or actions which were to entitle the departing ſoul to admiſſion into the ſcene of thoſe enjoyments, is ſaid to have produced equally unhappy effects among the Japaneſe. They not only bribed their prieſts to ſolicit for them; but, looking upon the enjoyments of the preſent life with diſguſt or contempt, they uſed to daſh themſelves from precipices, or cut their throats, in order to get to paradiſe as ſoon as poſſible. Various other ſuperſtitions ſubſiſting among rude nations might here be enumerated, as inſtances of the perverſion of the religious principles of the human heart, which render them injurious to virtue and happineſs. The auſterities which have been practiſed, chiefly among rude nations, as means of propitiating ſuperior powers, are eſpecially worthy of notice.—When the favourite idol of the Banians is carried in ſolemn proceſſion, ſome devotees proſtrate themſelves on the ground, that the chariot in which the idol is carried may run over them; others, with equal enthuſiaſm, daſh themſelves on ſpikes faſtened on purpoſe to the car. Innumerable are the ways of torture which have been invented and practiſed on themſelves by men ignorantly ſtriving to recommend themſelves to the favour of heaven. Theſe we lament as inſtances in which religious ſentiments have been ſo ill directed by the influence of imagination, and unenlightened erring reaſon, as to produce unfavourable effects on the human character, and oppoſe the happineſs of ſocial life.—Though we have argued, that even the moſt abſurd ſyſtems of religion that have prevailed in the world, have been upon the whole rather beneficial than injurious to the dignity and happineſs of human nature; yet if it ſhall not appear, as we proceed further in our comparative view of the effects of religion on ſociety, that others have been attended with happier effects than theſe ſuperſtitions which belong to the rude ages of ſociety, we may ſcarce venture to brand the infidel with the appellation of *fool*, for refuſing to give his aſſent to religious doctrines, or to act under their influence.

2d, The polytheiſm of the Greeks and Romans, and other heathen nations in a ſimilar ſtate of civilization, we have already conſidered as being, upon the whole, rather favourable than unfavourable to virtue; but we muſt not partially conceal its defects. The vicious characters of the deities which they worſhipped, the incorrect notions which they entertained concerning the moral government of the univerſe and a future retribution, the abſurdity of their rites and ceremonies, and the criminal practices which were intermixed with them, muſt have altogether had a tendency to pervert both the reaſoning and the moral principles of the human mind. The debaucheries of the monarch of the gods, and the fidelity with which his example in that reſpect was followed by the whole crowd of the inferior deities, did, we know, diſpoſe the devout heathen, when he felt the ſame paſſions which had aſſerted their power over the gods, to gratify them without ſcruple. It is a truth, however, and we will not attempt to deny or conceal it, that the genius of the polytheiſm of the Greeks and Romans was friendly to the arts; to ſuch of them eſpecially as are raiſed to excellence by the vigorous exertion of a fine imagination; muſic, poetry, ſculpture, architecture, and painting, all of theſe arts appear to have been conſiderably indebted for that perfection to which they attained, eſpecially among the Greeks, to the ſplendid and fanciful ſyſtem of mythology which was received among that ingenious people.—But we cannot give an equally favourable account of its influence on the ſciences. There was little in that ſyſtem that could contribute to call forth reaſon. We may grant indeed, that if reaſon can be ſo ſhocked with abſurdity as to be rouſed to a more vigorous exertion of her powers, and a more determined aſſertion of her rights in conſequence of ſurveying it; in that caſe this ſyſtem of mythology might be favourable to the exerciſe and improvement of reaſon; not otherwiſe.

The connection of paganiſm with morality was too imperfect for it to produce any very important effects on the morals of its votaries. Sacrifices and prayers, and temples and feſtivals, not purity of heart and integrity of life, were the means preſcribed for propitiating the favour of the deities adored by the Pagans. There were other means, too, beſides true heroiſm and patriotiſm, of gaining admiſſion into the Elyſian fields, or obtaining a ſeat in the council of the gods. Xenophon, in one of the moſt beautiful parts of his Memoirs of Socrates, repreſents Hercules wooed by Virtue and Pleaſure in two fair female forms, and deliberating with much anxiety which of the two he ſhould prefer. But this is the fiction of a philoſopher deſirous to improve the fables of antiquity in ſuch a way as to render them truly uſeful. Hercules does not appear, from the tales which are told us of his adventures, to have been at any ſuch pains in chooſing his way of life. He was received into the palace of Jove, without having occaſion to plead that he had through life been the faithful follower of that goddeſs to whom the philoſopher makes him give the preference; his being the ſon of Jove, and his wild adventures, were ſufficient without any other merits to gain him that honour. The ſame may be ſaid concerning many of the other demi-gods and heroes who were advanced to heaven, or conveyed to the bliſsful fields of Elyſium. And whatever might be the good effects

of the religion of Greece and Rome in general upon the civil and political eſtabliſhments, and in ſome few inſtances on the manners of the people; yet ſtill it muſt be acknowledged to have been but ill calculated to impreſs the heart with ſuch principles as might in all circumſtances direct to a firm, uniform tenor of virtuous conduct.

But, after what has been ſaid on the character of this religion elſewhere (ſee POLYTHEISM), and in the ſecond part of this article, we cannot without repetition enlarge further on it here. Of the Jewiſh religion, however, we have as yet ſaid little, having on purpoſe reſerved to this place whatever we mean to introduce under the article, concerning its influence on ſociety.

3d, When we take a general view of the circumſtances in which the Jewiſh religion was eſtabliſhed, the effects which it produced on the character and fortune of the nation, the rites and ceremonies which it enjoined, and the ſingular political inſtitutions to which it gave a ſanction, it may perhaps appear hard to determine, whether it were upon the whole more or leſs beneficial to ſociety than the polytheiſm of the Egyptians, Greeks, and Romans. But if ſuch be the judgement which preconceived prejudices, or a haſty and careleſs view, have induced ſome to form of this celebrated ſyſtem; there are others who, with equal keenneſs, and ſounder reaſoning, maintain, that it was happily calculated, not only to accompliſh the great deſign of preparing the way for the promulgation of the Goſpel, but likewiſe to render the Jews a more refined and virtuous people, and a better regulated community, than any neighbouring nation. In the firſt place, the attributes of the Deity were very clearly exhibited to the Jews in the eſtabliſhment of their religion. The miracles by which he delivered them from ſervitude, and conducted them out of Egypt, were ſtriking demonſtrations of his power; that condeſcenſion with which he forgave their repeated acts of perverſeneſs and rebellion, was a moſt convincing proof of his benevolence; and the impartiality with which the obſervance and the violation of his laws were rewarded and puniſhed, even in the preſent life, might well convince them of his juſtice. A part of the laws which he dictated to Moſes are of eternal and univerſal obligation; others of them were local and particular, ſuited to the character of the Jews, and their circumſtances in the land of Canaan. The Jewiſh code, taken altogether, is not to be conſidered as a complete ſyſtem of religion, or laws calculated for all countries, and all ages of ſociety. When we conſider the expediency of this ſyſtem, we muſt take care not to overlook the deſign for which the Jews are ſaid to have been ſeparated from other nations, the circumſtances in which they had lived in Egypt, the cuſtoms and manners which they had contracted by their intercourſe with the natives of that country, the manner in which they were to acquire to themſelves ſettlements by extirpating the nations of Canaan, the rank which they were to hold among the nations of Syria and the adjacent countries, together with the difficulty of reſtraining a people ſo little civilized and enlightened from the idolatrous worſhip which prevailed among their neighbours: All theſe circumſtances were certainly to be taken into account; and had the legiſlator of the Jews not attended to them, his inſtitutions muſt have remained in force only for a ſhort period; nor could they have produced any laſting effects on the character of the nation. With a due attention to theſe circumſtances, let us deſcend to an examination of particulars.

Although, in every religion or ſuperſtition that has prevailed through the world, we find one part of its inſtitutions to conſiſt in the enjoining of certain feſtivals to be celebrated by relaxation from labour, and the performance of certain ceremonies in honour of the gods; yet in none, or almoſt none beſides the Jewiſh, do we find every ſeventh day ordained to be regularly kept holy. One great end which the legiſlator of the Jews had in view in the inſtitution of the Sabbath was, to impreſs them with a belief that God was the maker of the univerſe. In the early ages of the world a great part of mankind imagined the ſtars, the ſun, the moon, and the other planets, to be eternal, and conſequently objects highly worthy of adoration. To convince the Iſraelites of the abſurdity of this belief, and prevent them from adopting that idolatry, Moſes taught them, that thoſe conſpicuous objects which the Gentile nations regarded as eternal, and endowed with divine power and intelligence, were created by the hand of God; who, after bringing all things out of nothing, and giving them form, order, and harmony, in the ſpace of ſix days, reſted on the ſeventh from all his works. Various paſſages in the Old Teſtament concur to ſhow that this was one great end of the inſtitution of the Sabbath. The obſervance of the Sabbath, and deteſtation of idolatrous worſhip, are frequently inculcated together; and again, the breach of the Sabbath, and the worſhip of idols, are uſually reprobated at the ſame time. Another good reaſon for the inſtitution of a Sabbath might be to remind the Jews of their deliverance from bondage, to inſpire them with humanity to ſtrangers and domeſtics, and to mitigate the rigours of ſervitude.

The purpoſes for which the other feſtivals of the Jewiſh religion were inſtituted appear alſo of ſufficient importance. The great miracle, which, after a ſeries of other miracles, all directed to the ſame end, finally effected the deliverance of the Jews out of Egypt; and their actual departure from that land of ſervitude, might well be commemorated in the feaſt of the Paſſover. To recall to the minds of poſterity the hiſtory of their anceſtors, to impreſs them with an awful and grateful ſenſe of the goodneſs and greatneſs of God, and to make them think of the purpoſes for which his almighty power had been ſo ſignally exerted, were ſurely good reaſons for the inſtitution of ſuch a feſtival. The feaſt of Pentecoſt celebrated the firſt declaration of the law by Moſes, in the ſpace of fifty days after the feaſt of the Paſſover. It ſerved alſo as a day of ſolemn thankſgiving for the bleſſings of a plenteous harveſt. On the feaſt of Tabernacles they remembered the wanderings of their anceſtors through the wilderneſs, and expreſſed their gratitude to heaven for the more comfortable circumſtances in which they found themſelves placed. The feaſt of New Moons ſerved to fix their kalendar, and determine the times at which the other feſtivals were to be celebrated; on it trumpets were ſounded, to give public notice of the event which was the cauſe of the feſtival; no ſervile works were performed, divine ſervice was carefully attended, and the firſt fruits of the month were offered to the Lord. The Jewiſh legiſlator limited his feſtivals to a very ſmall number, while the heathens devoted a conſiderable part of the year to the celebration of theirs. But we perceive the occaſions upon which the Jewiſh feſtivals were celebrated to have been of ſuitable importance; whereas thoſe of the heathens were often celebrated on trifling or ridiculous occaſions. Piety and innocent recreation ſhared the Jewiſh feſtival; the feſtivals of the heathens were chiefly devoted to debauchery and idleneſs.

The Hebrews had other ſolemn ſeaſons of devotion beſides the weekly Sabbath and theſe annual feſtivals. Every ſeventh year they reſted from labour: they were then neither to plough, to ſow, nor to prune; and whatever the earth produced ſpontaneouſly that year belonged rather to ſtrangers, orphans, and the poor, than to the proprietors of the ground. On this year inſolvent debtors were diſcharged from all debts contracted by purchaſing the neceſſaries of life: and the great end of this releaſe from debts contracted during the preceding ſix years, appears to have been to prevent the Hebrew from flying to the Gentiles and forſaking his religion when embarraſſed in his circumſtances. None but native Iſraelites and proſelytes

of righteousness were admitted to this privilege; it was refused to strangers, and even to proselytes of the gate. The jubilee was a festival to be celebrated every fiftieth year. It produced the same effects with the sabbatical year as to rest from labour and the discharge of debts; with this addition, that on the year of the jubilee slaves obtained their freedom, and the lands reverted to the old proprietors. On the year of the jubilee, as on the sabbatical year, the lands were to rest uncultivated, and law-suits were now to terminate. The chief design of this institution appears to have been, to preserve the order of ranks and property originally established in the Hebrew state. None but Israelites or circumcised converts could enjoy the benefit of this institution; nor could even these hope to regain their estates on the year of the jubilee, if they sold them for any other purpose but to supply their necessities. The law relative to usury was evidently founded on the same plan of polity with respect to property. To almost any other nation such a law, it must be confessed, would have been unsuitable and unjust: but as the Jews were not designed for a trading nation, they could have little occasion to borrow, unless to relieve distress; and as an indulgence to people in such circumstances, the Jew was forbidden to exact usury from his brother to whom he had lent money.

The Jewish legislator, we may well think, would be disposed to adopt every proper method to prevent his nation from falling away into the idolatry of heathen nations. Probably one reason of the distinctions between *clean* beasts which they were permitted to eat, and *unclean* beasts, the eating of which they were taught to consider as pollution, was to prevent them from convivial intercourse with profane nations, by which they might be seduced to idolatry. We do not readily sit down at table with people who are fond of dishes which we regard with abhorrence. And if the Jews were taught to loathe the flesh of some of those animals which were among the greatest delicacies of the Gentiles, they would naturally of consequence avoid sitting down at meat with them, either at their ordinary meals, or at those entertainments which they prepared in honour of their deities; and this we may with good reason consider as one happy mean to preserve them from idolatry. Besides, the Jews were permitted, or rather enjoined, to eat animals which the Gentiles reverenced as sacred, and from which they religiously with-held all violence. Goats, sheep, and oxen, were worshipped in Egypt (see POLYTHEISM and PAN); and several learned writers are of opinion, that Moses directed his people to sacrifice and eat certain of the favourite animals of the Egyptians, in order to remove from their minds any opinions which they might have otherwise entertained of the sanctity of those pretended deities. Many of the observances which Moses enjoined with regard to food, appear to have been intended to inspire the Israelites with contempt for the superstitions of the people among whom they had so long sojourned. They were to kill the animal which the Egyptians worshipped; to roast the flesh which that people ate raw; to eat the head which they never ate; and to dress the entrails which they set apart for divination. These distinctions concurred with the peculiarities of their dress, language, government, customs, places, and times of worship, and even the natural situation of their country, by which they were in a manner confined and fortified on all sides, to separate them in such a manner from neighbouring nations, that they might escape the infection of their idolatry. And if we reflect both on the design for which Providence separated the Israelites from other nations, and on the probability that, in the state of society in which mankind were during the earlier period of the Jewish history, the Jews, by mixing with other nations, would rather have been themselves converted to idolatry than have converted idolatrous nations to the worship of the true God; we cannot but be satisfied, that even this, however it may at first appear, was a benefit, not a disadvantage; and in the author of their legislation wisdom, not caprice.

But not only in the distinctions of meats, and between clean and unclean animals, does the legislator of the Jews appear to have laboured to fix a barrier between them and other nations which might preserve them from the contagion of idolatry—we shall not err, perhaps, if we ascribe many particulars of their worship to this design in the institutor. The heathens had gods who presided over woods, rivers, mountains, and valleys, and to each of these they offered sacrifices, and performed other rites of worship, in a suitable place. Sometimes the grove, sometimes the mountain top, at other times the bank of the river or the brink of the spring, was the scene of their devotions. But as the unity of the divine nature was the truth the most earnestly inculcated on the children of Israel; so, in order to impress that truth on their minds with the more powerful efficacy, they were taught to offer their sacrifices and other offerings only in one place, the place chosen by the Lord; and death was threatened to those who dared to disobey the command. To confirm this idea, one of the prophets intimates, that when idolatry should be abolished, the worship of God should not be confined to Jerusalem, but it would then be lawful to worship him anywhere.

The whole institutions and observances of the Jewish religion appear to have been designed and happily calculated to impress the minds of the people with veneration and respect for the Deity. All the festivals which either commemorated some gracious dispensation of his providence towards their ancestors, or served as days of thanksgiving for the constant returns of his goodness to those who celebrated them, and all the other rites designed to fortify them against idolatry, served at the same time to impress their hearts with awful reverence for the God of Jacob. Various other particulars in the institutions of the Jewish economy appear to have been directed solely to that end. Into the most sacred place, the Holy of Holies, none but the high priest was admitted, and he only once a year. No fire was used in sacrifice but what was taken from the altar. Severe punishments were on various occasions inflicted on such as presumed to intermeddle in the service of the sanctuary in a manner contrary to what the law had directed. All the laws respecting the character, the circumstances, and the services, of the priests and the Levites, appear plainly to have a similar tendency.

In compliance with the notions of Deity which naturally prevailed among a gross and rude people, though no visible object of worship was granted to the Jews, yet they were allowed in their wanderings through the wilderness to have a tabernacle or portable temple, in which the sovereign of the universe sometimes deigned to display some rays of his glory. Incapable as they were of conceiving aright concerning the spiritual nature and the omnipresence of the Deity, they might possibly have thought Jehovah careless and indifferent about them, had they been at no time favoured with a visible demonstration of his presence.

The sacrifices in use among the Gentiles in their worship of idols were permitted by the Jewish legislator; but he directed them to be offered with views very different from those with which the Gentiles sacrificed to their idols. Some of the sacrifices of the Jewish ritual were designed to avert the indignation of the Deity; some to expiate offences and purify the heart; and all of them to abolish or remove idolatry. Lustrations or ablutions entered likewise into the Jewish ritual; but these were recommended and enjoined by Moses for purposes widely different from those which induced the heathens to place so high a value upon them. The heathens practised them with

magical and ſuperſtitious ceremonies; but in the Jewiſh ritual they were intended ſimply for the cleanſing away of impurities and pollutions.

The theocratical form of government to which the Jews were ſubject, the rewards which they were ſure of receiving, and the puniſhments which they were equally liable to ſuffer in the preſent life, had a powerful effect to remove ſuperſtition and preſerve them from idolatry, as well as to ſupport all the ſocial virtues among them. They were promiſed a numerous offspring, a land flowing with milk and honey, long life, and victory over their enemies, on the condition of their paying a faithful obedience to the will of their heavenly Sovereign; plague, famine, diſeaſe, defeats, and death, were threatened as the puniſhments to be inflicted on thoſe who violated his laws: and theſe ſanctions, it muſt be allowed, were happily accommodated to the genius of a rude and carnal-minded people, attentive only to preſent objects, and not likely to be influenced by remote and ſpiritual conſiderations.

There were other rites and prohibitions in the Moſaic law, which appear to have had but little connection with religion, morals, or policy. Theſe may be more liable to be objected againſt, as adding an unneceſſary weight to a burden which, though heavy, might yet have been otherwiſe borne in conſideration of the advantages connected with it. Even theſe, however, may perhaps admit of being viewed in a light in which they ſhall appear to have been in no way unfavourable to the happineſs of thoſe to whom they were enjoined. They appear to have had none of them an immoral tendency: all of them had, in all probability, a tendency to remove or prevent idolatry, or to ſupport, in ſome way or other, the religious and the civil eſtabliſhment to which they belonged.

From theſe views of the ſpirit and tendency of the Jewiſh religion, we may fairly conclude it to have been happily calculated to promote the welfare of ſociety. In comparing it with other religions, it is neceſſary to reflect on the peculiar purpoſes for which it was given; that its two principal objects were to preſerve the Jews a ſeparate people, and to guard them againſt the contagion of the ſurrounding idolatry. When theſe things are taken into conſideration, every candid mind acquainted with the hiſtory of ancient nations will readily acknowledge that the whole ſyſtem, though calculated indeed in a peculiar manner for them, was as happily adapted for the purpoſes for which it had been wiſely and graciouſly intended, as it is poſſible to imagine any ſuch ſyſtem to be. It would be unhappy, indeed, if, on a compariſon of pure theiſm with polytheiſm, the latter, with all its abſurdities, ſhould be found more beneficial to mankind than the former. The theiſm of the Jews was not formed to be diſſeminated through the earth; that would have been inconſiſtent with the purpoſes for which it is ſaid to have been deſigned. But, while the Jews were ſeparated by their religion from all other nations, and perhaps in ſome degree fixed and rendered ſtationary in their progreſs towards refinement, they were placed in circumſtances, in reſpect to laws and government, and religion, and moral light, which might with good reaſon render them the envy of every other nation in the ancient world.

IV. The Chriſtian religion next demands our attention. It is to be conſidered as an improvement of the Jewiſh, or a new ſuperſtructure raiſed on the ſame baſis. If the effects of the Jewiſh religion were beneficial to thoſe among whom it was eſtabliſhed, they were confined almoſt to them alone. But is the ſpirit of Chriſtianity equally pure and benignant? Is its influence equally beneficial and more diffuſive than that of Judaiſm? Does it really merit to have triumphed over both the theiſm of the Jews and the polytheiſm of the heathens?

If we conſider the doctrines and precepts of the Chriſtian religion, nothing can be more happily calculated to raiſe the dignity of human nature, and promote the happineſs of mankind. The happineſs of the individual is beſt promoted by the exerciſe of love and gratitude towards God, and reſignation to his providence; of humanity, integrity, and good will towards men; and by the due government of our appetites and paſſions. Social happineſs again proceeds from the members of ſociety entertaining a diſintereſted regard for the public welfare; being actively induſtrious each in his proper ſphere of exertion; and being ſtrictly juſt and faithful, and generouſly benevolent in their mutual intercourſe. The tenor of the goſpel inculcates theſe virtues; it ſeems everywhere through the whole of the Chriſtian code to have been the great deſign of its Author to inſpire mankind with mild, benevolent, and peaceable diſpoſitions, and to form them to courteous manners. Chriſtianity again repreſents the Deity and his attributes in the faireſt light; even ſo as to render our ideas of his nature, and the manner in which he exerts his power, conſiſtent with the moſt correct principles of morality that can be collected from all the other religions that have prevailed in the earth, and from the writings of the moſt admired philoſophers. The ritual obſervances which Chriſtianity enjoins are few in number, eaſy to perform, decent, expreſſive, and edifying. It inculcates no duties but what are founded on the principles of human nature, and on the relation in which men ſtand to God, their Creator, Redeemer, and Sanctifier; and it preſcribes accurate rules for the regulation of the conduct. The aſſiſtance of the ſpirit of God is promiſed in this ſacred volume to thoſe who aſſiduouſly labour to diſcharge the duties which it enjoins; and it exhibits a ſtriking example of ſpotleſs purity, which we may ſafely venture to imitate. The goſpel teaches that worldly afflictions are incident to both good and bad men; a doctrine highly conducive to virtue, which conſoles us in diſtreſs, prevents deſpair, and encourages us to perſiſt firmly in our integrity under every difficulty and trial. Chriſtianity repreſents all men as children of the ſame God, and heirs of the ſame ſalvation, and levels all diſtinctions of rich and poor, as accidental and inſignificant in the ſight of him who rewards or puniſhes with impartiality according to the merits or demerits of his creatures. This doctrine is highly favourable to virtue, as it tends to humble the proud, and to communicate dignity of ſentiment to the lowly; to render princes and inferior magiſtrates moderate and juſt, gentle and condeſcending, to their inferiors. It further requires huſbands to be affectionate and indulgent to their wives, wives to be faithful and reſpectful to their huſbands, and both to be true and conſtant to each other. Such is the purity of the goſpel, that it forbids us even to harbour impure thoughts; it requires us to abandon our vices, however dear to us; and to the cautious wiſdom of the ſerpent it directs us to join the innocent ſimplicity of the dove. The Chriſtian diſpenſation, to prevent a perſeverance in immorality, offers pardon for the paſt, provided the offender forſake his vicious practices, with a firm reſolution to act differently in future. The ſanctions of the goſpel have a natural tendency to exalt the mind above the paltry purſuits of this world, and, to render the Chriſtian incorruptible by wealth, honours, or pleaſures. The true Chriſtian not only abſtains from injuſtice towards others, but even forgives thoſe injuries which he himſelf ſuffers, knowing that he cannot otherwiſe hope for forgiveneſs from God. Such are the precepts, ſuch the ſpirit, and ſuch the general tendency of the goſpel. Even thoſe who refuſed to give credit to its doctrines and hiſtory have yet acknowledged the excellence of its precepts. They have acknowledged that "no religion ever yet appeared in the world of which the natural tendency was ſo much directed to promote the peace

and happineſs of mankind as the Chriſtian; and that the goſpel of Chriſt is one continued leſſon of the ſtricteſt morality, of juſtice, benevolence, and univerſal charity." Theſe are the words of Bolingbroke; one of its keeneſt and moſt infidious opponents. Without examining the effects of this religion on ſociety, we might almoſt venture to pronounce with confidence, that a religion, the precepts of which are ſo happily formed to promote all that is juſt and excellent, cannot but be in the higheſt degree beneficial to mankind. By reviewing the effects which it has actually produced, the favourable opinion which we naturally conceive of it, after conſidering its precepts, cannot but be confirmed.

One circumſtance we muſt take notice of as rather unfavourable to this review. It is really impoſſible to do juſtice to Chriſtianity by ſuch a diſcuſſion of its merits. The virtues which it has a natural tendency to produce and cheriſh in the human heart, are not of a noiſy oſtentatious kind; they often eſcape the obſervation of the world. Temperance, gentleneſs, patience, benevolence, juſtice, and general purity of manners, are not the qualities which moſt readily attract the admiration and obtain the applauſe of men. The man of Roſs, whom Mr. Pope has ſo juſtly celebrated, was a private character; his name is now likely to live, and his virtues to be known to the lateſt poſterity: and yet, however diſintereſted his virtues, however beneficial his influence to all around him, had his character not attracted the notice of that eminent poet, his name would perhaps ere this time have been loſt in oblivion. Individuals in private life ſeldom engage the attention of the hiſtorian; his object is to record the actions of princes, warriors, and ſtateſmen. Had not the profeſſors of Chriſtianity in the earlier ages of its exiſtence been expoſed to perſecutions, and unjuſt accuſations from which they were called on to vindicate themſelves, we ſhould be ſtrangers to the names and virtues of ſaints and martyrs, and to the learning and endowments of the firſt apologiſts for Chriſtianity. We can therefore only trace the general influence of the inſtitutions of Chriſtianity on ſociety. We cannot hope to make an accurate enumeration of particulars. In many of the countries in which it has been eſtabliſhed, it has produced a very favourable change on the circumſtances of domeſtic life. Polygamy, a practice repugnant to the will of our Creator (ſee Polygamy), who has declared his intentions in this inſtance in the plaineſt manner, by cauſing nearly equal numbers of males and females to be brought into the world, was never completely aboliſhed but by Chriſtianity.

The practice of divorce, too, though in ſome caſes proper and even neceſſary, had been ſo much abuſed at the time of our Saviour's appearance in the world, that he found reaſon to declare it unlawful, unleſs in the caſe of adultery. The propriety and reaſonableneſs of this prohibition will ſufficiently appear, if we conſider, that when divorces are eaſily obtained, both parties will often have nothing elſe in view at the period of marriage than the diſſolution of their nuptial engagements after a ſhort cohabitation; the intereſts of the huſband and the wife will almoſt always be ſeparate; and the children of ſuch a marriage are ſcarce likely to enjoy the cordial affection and tender watchful care of either parent. The huſband in ſuch a caſe will naturally be to his wife not a friend and protector, but a tyrant; fear and deceit, not love, gratitude, or a ſenſe of duty, will be the principles of the wife's obedience.

In another inſtance, likewiſe, Chriſtianity has produced a happy change on the circumſtances of domeſtic life; it muſt be acknowledged to have contributed greatly to the abolition of ſlavery, or at leaſt to the mitigation of the rigour of ſervitude. The cuſtoms and laws of the Romans in relation to ſlaves were cruel and ſevere. Maſters were often ſo inhuman as to remove aged, ſick, or infirm ſlaves into an iſland in the Tiber, where they ſuffered them to periſh without pity or aſſiſtance. The greater part of the ſubjects of many of thoſe republics which enjoyed the moſt liberty, groaned under tyrannical oppreſſion; they were condemned to drag out a miſerable exiſtence in hard labour, under inhuman uſage, and to be transferred like beaſts from one maſter to another. The hardſhips of ſlavery were eaſed, not by any particular precept of the Goſpel, but by the gentle and humane ſpirit which breathed through the general tenor of the whole ſyſtem of doctrines and precepts of which the Goſpel conſiſts. It muſt indeed be allowed, that a trade in ſlaves is at preſent carried on by people who preſume to call themſelves Chriſtians, and protected by the legiſlature of Chriſtian ſtates: but the ſpirit of the Chriſtian code condemns the practice, and the true Chriſtian will not engage in it.

Partly by the direct and conſpicuous, partly by the ſecret and unſeen, influence of Chriſtianity ſince its promulgation in the world, the hearts of men have been gradually ſoftened; even barbarians have been formed to mildneſs and humanity; the influence of ſelfiſhneſs has been checked and reſtrained; and even war, amid all the pernicious improvements by which men have ſought to render it more terrible, has aſſumed much more of the ſpirit of mildneſs and peace than ever entered into it during the reign of heatheniſm.

If we review the hiſtory of mankind with a view to their political circumſtances, we ſhall find, that by ſome means or other it has happened, ſince the time when the Goſpel was firſt preached, that both ſyſtems of legiſlature and forms of government have been raiſed to much greater perfection, at leaſt in thoſe parts of the world into which the religion of Jeſus has made its way and obtained an eſtabliſhment.

The popular government of the Romans, notwithſtanding the multiplicity of their laws and the imperfections of their political conſtitution, was, no doubt, happily enough adapted to promote the increaſe of the power and the extenſion of the empire of Rome. In Greece there were various republics, the wiſdom and impartiality of whoſe laws have been highly celebrated. But we apprehend that there is a ſufficient number of well-authenticated facts to warrant us to affirm, that ſince Chriſtianity has been propagated, and has had ſufficient time to produce its full effect on arts, manners, and literature, even under governments the form of which might appear leſs favourable than the celebrated models of antiquity to the liberty and happineſs of the people in general, theſe actually have been much better provided for than under the laws of Athens or Sparta, or even of Rome in the days of the conſuls. It is a juſt and happy obſervation of Monteſquieu, who has attributed ſo much to the influence of climate and local circumſtances, that "the mildneſs ſo frequently recommended in the Goſpel is incompatible with the deſpotic rage with which an arbitrary tyrant puniſhes his ſubjects, and exerciſes himſelf in cruelty. It is the Chriſtian religion (ſays he) which, in ſpite of the extent of empire, and the influence of climate, has hindered deſpotiſm from being eſtabliſhed in Ethiopia, and has carried into Africa the manners of Europe. The heir to the empire of Ethiopia enjoys a principality, and gives to other ſubjects an example of love and obedience.—Not far from hence may be ſeen the Mahometan ſhutting up the children of the king of Sennaar, at whoſe death the council ſends to murder them in favour of the prince who aſcends the throne. Let us ſet before our eyes (continues that eloquent writer, in the third chaper of the 24th book of his Spirit of Laws,) on one hand the continual maſſacres of the kings and generals of the Greeks and Romans, and on the other the deſtruction of people and cities by the famous conquerors Timur Beg and Jenghiz Kan, who ravaged Aſia, and we ſhall perceive, that we owe to Chriſtianity in government a certain political law, and in war a certain law of nations, which allows to the conquered the

great advantages of liberty, laws, wealth, and always religion, when the conqueror is not blind to his own intereſt."

Theſe are the reflections of no common judge in this matter, but one who had long ſtudied the hiſtory of nations, and obſerved the phenomena of the various forms of ſociety, with ſuch ſucceſs as few others have attained.

But on no occaſion has the mild influence of Chriſtianity been more eminently diſplayed, or more happily exerted, than in ſoftening and humanizing the barbarians who overturned the Roman empire. The idolatrous religion which prevailed among thoſe tribes before their converſion to Chriſtianity, inſtead of diſpoſing them to cultivate humanity and mildneſs of manners, contributed ſtrongly to render them fierce and blood-thirſty, and eager to diſtinguiſh themſelves by deeds of ſavage valour. But no ſooner had they ſettled in the dominions of Rome, and embraced the principles of Chriſtianity, than they became a mild and generous people.

We are informed by Moſheim, who was at pains to collect his materials from the moſt authentic ſources, that in the 10th century Chriſtian princes exerted themſelves in the converſion of nations whoſe fierceneſs they had experienced, in order to ſoften and render them more gentle. The mutual humanity with which nations at war treat each other in modern times, is certainly owing, in a great meaſure, to the influence of the mild precepts of the Goſpel. It is a fact worthy of notice too, that during the barbarous ages the ſpiritual courts of juſtice were more rational and impartial in their deciſions than civil tribunals.

How many criminal practices which prevailed among heathen nations have been aboliſhed by their converſion to Chriſtianity! Chriſtians of all nations have been obſerved to retain the virtues and reject the vicious practices of their reſpective countries. In Parthia, where polygamy prevailed, they are not polygamiſts; in Perſia, the Chriſtian father does not marry his own daughter. By the laws of Zoroaſter, the Perſians committed inceſt until they embraced the Goſpel; after which period they abſtained from that crime, and obſerved the duties of chaſtity and temperance, as enjoined by its precepts. Even the poliſhed and enlightened Romans were cruel and blood-thirſty before the propagation of the Goſpel. The breaking of a glaſs, or ſome ſuch trifling offence, was ſufficient to provoke Vidius Pollio to caſt his ſlaves into fiſh-ponds to be devoured by lampreys. The effuſion of human blood was their favourite entertainment; they delighted to ſee men combating with beaſts, or with one another; and we are informed on reſpectable authority, that no wars ever made ſuch havock on mankind as the fights of gladiators, which ſometimes deprived Europe of 20,000 lives in one month. Not the humanity of Titus, nor the wiſdom and virtue of Trajan, could aboliſh the barbarous ſpectacle. However humane and wiſe in other inſtances, in this practice thoſe princes complied with the cuſtom of their country, and exhibited ſplendid ſhows of gladiators, in which the combatants were matched by pairs; who, though they had never injured nor offended each other, yet were obliged to maim and murder one another in cold blood. Chriſtian divines ſoon exerciſed their pens againſt theſe horrid practices; the Chriſtian emperor Conſtantine reſtrained them by edicts, and Honorius finally aboliſhed them. It would be tedious to proceed through an enumeration of particulars; but wherever Chriſtianity has been propagated, it has conſtantly operated to the civilization of the manners of mankind, and to the abolition of abſurd and criminal practices. The Iriſh, the Scotch, and all the ancient inhabitants of the Britiſh iſles, were, notwithſtanding their intercourſe with the Romans, rude barbarians, till ſuch time as they were converted to Chriſtianity. The inhuman practice of expoſing infants, which once prevailed ſo generally over the world, and ſtill prevails among ſome Pagan nations, even under very humane and enlightened legiſlatures, yielded to the influence of Chriſtianity.

Let us likewiſe remember, in honour of Chriſtianity, that it has contributed eminently to the diffuſion of knowledge, the preſervation and the advancement of learning. When the barbarians overſpread Europe, what muſt have become of the precious remains of poliſhed, enlightened antiquity, had there been no other depoſitaries to preſerve them but the heathen prieſts? We allow that even the Romiſh clergy, during the dark ages, did not ſtudy the celebrated models of ancient times with much advantage themſelves, and did not labour with much aſſiduity to make the laity acquainted with them. It muſt even be acknowledged, that they did not always preſerve thoſe monuments of genius with ſufficient care, as they were often ignorant of their real value. Yet, after all, it will be granted, it cannot be denied, that had it not been for the clergy of the Chriſtian church, the lamp of learning would, in all probability, have been entirely extinguiſhed, during that night of ignorance and barbarity in which all Europe were buried for a long ſeries of centuries after the irruption of the barbarians into the Roman empire.

Such is the excellence of the Chriſtian ſyſtem, and ſuch its tendency to meliorate the human character, that its beneficial influence has not been confined to thoſe who have received its doctrines and precepts, and have profeſſed themſelves Chriſtians; it has even produced many happy effects on the circumſtances and the characters of Pagans and infidels, who have had opportunities of beholding the virtues of Chriſtians, and learning the excellence of the morality of the goſpel. Thoſe virtues which diſtinguiſhed the character of the apoſtate Julian were ſurely owing in no inconſiderable degree to his acquaintance with Chriſtianity; and it is an undeniable fact, that, after the propagation of Chriſtianity through the Roman empire, even while the purity of that holy religion was gradually debaſed, the manners of thoſe Pagans who remained unconverted became more pure, and their religious doctrines and worſhip leſs immoral and abſurd.—We might here adduce a tedious ſeries of facts to the ſame purpoſe. Whenever Chriſtians have had any intercourſe with Pagan idolaters, and have not concealed the laws of the goſpel, nor ſhown by their conduct that they diſregarded them, even thoſe who have not been converted to Chriſtianity have, however, been improved in their diſpoſitions and manners by its influence. The emperor whoſe virtues we have mentioned as ariſing, in a certain degree, from his acquaintance with Chriſtianity, in a letter to a Heathen pontiff, deſires him to turn his eyes to the means by which the ſuperſtition of Chriſtians was propagated: by kindneſs to ſtrangers, by ſanctity of life, and by the attention which they paid to the burial of the dead. He recommends an imitation of their virtues, exhorts him to cauſe the prieſts of Galatia to be attentive to the worſhip of their gods, and authoriſes him to ſtrip them of the ſacerdotal function, unleſs they obliged their wives, children, and ſervants, to pay attention to the ſame duties. He likewiſe enjoins works of beneficence, deſires the prieſt to relieve the diſtreſſed, and to build houſes for the accommodation of ſtrangers of whatever religion; and ſays, it is a diſgrace for Pagans to diſregard thoſe of their own religion, while Chriſtians do kind offices to ſtrangers and enemies. This is indeed an eminent inſtance of the happy influence of Chriſtianity even on the ſentiments and manners of thoſe who regarded the Chriſtian name with abhorrence.

Upon the whole, then, may we not, from the particulars here exhibited concerning the influence of this religion on the manners and happineſs of men in ſociety, conclude that Chriſtianity is infinitely ſuperior to the ſuperſtitions of Paganiſm?

as being in its tendency uniformly favourable to the virtue and the happineſs of mankind, and even to the ſyſtem of religion and laws delivered by Moſes to the children of Iſrael: becauſe, while the religion of the Jews was calculated only for one particular nation, and it may almoſt be ſaid for one particular ſtage in the progreſs of ſociety, Chriſtianity is an univerſal religion, formed to exert its happy influence in all ages and among all nations; and has a tendency to diſpel the ſhades of barbariſm and ignorance, to promote the cultivation of the powers of the human underſtanding, and to encourage every virtuous refinement of manners.

V. Another religion, which has made and ſtill makes a conſpicuous figure in the world, remains yet to be examined. The religion of Mahomet is that which we here allude to. Whether we conſider through what an extenſive part of the globe that religion prevails, the political importance of the nations among whom it is profeſſed, or the ſtriking peculiarity of character by which it is diſtinguiſhed from all other religious ſyſtems—it is for all theſe reaſons well worthy of particular notice. Like the Jewiſh religion, it is not barely a ſyſtem of religious doctrines and general moral precepts; it forms both the civil legiſlature and the religious ſyſtem of thoſe nations among whom it is profeſſed; and, like it too, it would appear to be calculated rather for one particular period in the progreſs of mankind from rudeneſs to refinement, than for all ages and all ſtates of ſociety.

The hiſtory of its origin is pretty well known, and we have had occaſion to enlarge upon it under a former article (ſee Mahomet and Mahometanism). We are not here to trace the impoſtures of the prophet, or to conſider the arts by which he ſo ſucceſsfully accompliſhed his deſigns; but merely to conſider the morality of his religion, and its influence on civil order and the happineſs of ſociety.

If we view the ſtate of the nations among whom it is eſtabliſhed, we cannot heſitate a moment to declare it friendly to ignorance, to deſpotiſm, and to impurity of manners. The Turks, the Perſians, and the Malays, are all Mahometans; and in reviewing their hiſtory and conſidering their preſent ſtate, we might find a ſufficient number of facts to juſtify the above aſſertion: and we muſt not neglect to obſerve, that, as thoſe nations are not known to have ever been ſince their converſion to Mahometaniſm under a much happier government, or in a much more civiliſed ſtate than at preſent, it cannot be, with any degree of fairneſs, argued, with reſpect to Mahometaniſm as with reſpect to Chriſtianity, that it is only when its influence is ſo oppoſed by other cauſes as to prevent it from producing its full effects, that it does not conduct thoſe ſocieties among which it is eſtabliſhed to a high ſtate of civilization and refinement.

One, and that by no means an inconſiderable, part of the Koran was occaſionally invented to ſolve ſome difficulty with which the prophet found himſelf at the time perplexed, or to help him to the gratification of his ruling paſſions, luſt and ambition. When he and his followers were, at any time, unſucceſsful in thoſe wars by which he ſought to propagate his religion, to prevent them from falling away into unbelief, or ſinking into deſpondency, he took care to inform them that God ſuffered ſuch misfortunes to befall believers, as a puniſhment for their ſins, and to try their faith. The doctrine of predeſtination, which he aſſiduouſly inculcated, had a happy effect to perſuade his followers to ruſh boldly into the midſt of death and danger at his command. He prevailed with Zeyd to put away his wife, married her himſelf, and pretended that his crime had the approbation of heaven; and, in the Koran, he introduces the Deity approving of this marriage. Being repulſed from the ſiege of Mecca, he made a league with the inhabitants; but, on the very next year, finding it convenient to ſurpriſe the city by violating this treaty, he juſtified his perfidy by teaching his followers to diſregard promiſes or leagues made with infidels. In ſome inſtances, again, we find abſurd prohibitions enjoined for ſimilar reaſons: his officers having on ſome occaſion drunk to exceſs, and excited much riot and confuſion in the camp, he prohibited the uſe of wine and other inebriating liquors among his followers in future. Now, though it muſt be acknowledged that many evils ariſe from the uſe of theſe liquors, yet we cannot but think that, when uſed in moderation, they are in many caſes beneficial to men; and certainly as much allowed by God as opium, which the Mahometans have ſubſtituted in their place.

Mahomet is allowed to have copied from the Chriſtian and the Jewiſh religions, as well as from the idolatrous ſuperſtitions which prevailed through Arabia, and thus to have formed a motley mixture of reaſon and abſurdity, of pure theiſm and wild ſuperſtition. He conſidered alſo the circumſtances of his country, and the prejudices of his countrymen. When he attended to the former, he was generally judicious enough to ſuit his doctrines and deciſions to them with ſufficient ſkill; the latter he alſo managed with the greateſt art: but he entered into accommodation with them in inſtances when a true prophet or a wiſe and upright legiſlator would ſurely have oppoſed them with deciſive vigour. Where the prophet indulges his own fancy, or borrows from the ſuperſtitions of his countrymen, nothing can be more ridiculous than that rhapſody of lies, contradictions, and extravagant fables, which he delivers to his followers. Amazing are the abſurdities which he relates concerning the patriarchs, concerning Solomon, and concerning the animals that were aſſembled in Noah's ark.

But in the whole tiſſue of abſurdities of which his ſyſtem conſiſts, there is nothing more abſurd, or more happily calculated to promote impurity of manners, than his deſcriptions of heaven and hell; the ideas of future rewards and puniſhments which he ſought to impreſs on the minds of his followers. Paradiſe was to abound with rivers, trees, fruits, and ſhady groves; wine which would not intoxicate was to be there plentifully ſerved up to believers: the inhabitants of that happy region were all to enjoy perpetual youth; and their powers of enjoyment were to be enlarged and invigorated, in order that ſo many fine things might not be thrown away upon them. "Inſtead of inſpiring the bleſſed inhabitants of paradiſe with a liberal taſte for harmony and ſcience, converſation and friendſhip (ſays Mr. Gibbon), Mahomet idly celebrates the pearls and diamonds, the robes of ſilk, palaces of marble, diſhes of gold, rich wines, artificial dainties, numerous attendants, and the whole train of ſenſual luxury.—Seventy-two houris, or black-eyed girls of reſplendent beauty, blooming youth, virgin purity, and exquiſite ſenſibility, will be created for the uſe of the meaneſt believer; a moment of pleaſure will be prolonged for 1000 years, and his faculties will be increaſed 100 fold, to render him worthy of his felicity." It muſt be acknowledged that he allows believers other more refined enjoyments than theſe: thus, they are to ſee the face of God morning and evening; a pleaſure which is far to exceed all the other pleaſures of paradiſe. The following is his deſcription of the puniſhments of hell: The wicked are there to drink nothing but boiling ſtinking water; breathe nothing but hot winds; dwell for ever in continual burning fire and ſmoke; eat nothing but briers and thorns, and the fruit of a tree that riſeth out of the bottom of hell, whoſe branches reſemble the heads of devils, and whoſe fruits ſhall be in their bellies like burning pitch.

All that we can conclude from a general view of the religion

of Mahomet, from confidering the character of the prophet; or from reviewing the hiftory of the nations among whom it has been eftablifhed, is, that it is one tiffue of abfurdities, with a few truths, however, and valuable precepts incongruoufly intermixed; that a great part of it is unfavourable to virtuous manners, to wife and equal laws, and to the progrefs of knowledge and refinement. It often inculcates in a direct manner fentiments that are highly immoral; it fubftitutes trifling, fuperftitious obfervances in the room of genuine piety and moral virtue; and it gives fuch views of futurity as render purity of heart no neceffary qualification for feeing God.

Surely, therefore, even the deift, who rejects all but natural religion, would not hefitate to prefer Chriftianity, and even Judaifm, to the religion of Mahomet. Judaifm, calculated for a peculiar people, was undoubtedly much more fublime and much more happily framed to render that people virtuous and happy in the circumftances in which they were placed; and Chriftianity we find to be an univerfal religion, fuited to all circumftances and to all the ftages of fociety, and acting, wherever it is received, with more of lefs force to the fupport of civil order, virtuous manners, improvement of arts, and the advancement of fcience. However, as Mahometanifm forms in fome meafure a regular fyftem, as it has borrowed many of the precepts and doctrines of Judaifm and Chiftianity, not indeed without corrupting and degrading them; and as it has contributed confiderably to the fupport of civil government, although in a very imperfect form, in thofe countries in which it has obtained an eftablifhment; for all thefe reafons we cannot but give it the preference to the fuperftitions of Paganifm.

The whole refult of our inquiries under this article, therefore, is, 1. That as man, by the conftitution of his mind, is naturally fitted for acquiring certain notions concerning the exiftence of invifible, fuperior beings, and their influence on human life; fo the religious ideas which we find to have in all ages of the world, and in all the different ftages of the progrefs of fociety, prevailed among mankind, appear to have originated partly from the natural exertions of the human imagination, underftanding, and paffions, in various circumftances, and partly from fupernatural revelation.

2. That though religious opinions, together with the moral precepts and the rites of worfhip connected with them, may appear to have been in numerous inftances injurious to the virtue and happinefs of fociety; yet, as they have often contributed to lead the mind to form moral diftinctions, when it would otherwife in all probability have been an entire ftranger to fuch diftinctions; and as they have always contributed in an effential manner to the eftablifhment and the fupport of civil government—it muft therefore be acknowledged that they have always, even in their humbleft ftate, been more beneficial than hurtful to mankind.

3. That, when the different fyftems of religion that have prevailed in the world are comparatively viewed with refpect to their influence on the welfare of fociety, we find reafon to prefer the polytheifm of the Greeks and Romans to the ruder, wilder, religious ideas and ceremonies that have prevailed among favages; Mahometanifm, perhaps in fome refpects, to the polytheifm of the Greeks and Romans; Judaifm however to Mahometanifm; and Chriftianity to all of them.

RELIGIOUS, in a general fenfe, fomething that relates to religion.—We fay, a religious life, religious fociety, &c.—Churches and church yards are religious places.—A religious war is alfo called a *croifade*. See Croisade.

Religious, is alfo ufed fubftantively for a perfon engaged by folemn vows to the monaftic life; or a perfon fhut up in a monaftery to lead a life of devotion and aufterity, under fome rule or inftitution. The male religious we popularly call *monks* and *friars*; the female, *nuns* and *canoneffes*.

REMBRANDT (Van Rhin), a Flemifh painter and engraver of great eminence, was born in 1606, in a mill upon the banks of the Rhine, from whence he derived his name of *Van Rhin*. This mafter was born with a creative genius, which never attained perfection. It was faid of him, that he would have invented painting, if he had not found it already difcovered. Without ftudy, without the affiftance of any mafter, but by his own inftinct, he formed rules and a certain practical method for colouring; and the mixture produced the defigned effect. Nature is not fet off to the greateft advantage in his pictures; but there is fuch a ftriking truth and fimplicity in them, that his heads, particularly his portraits, feem animated, and rifing from the canvas. He was fond of ftrong contrafts of light and fhade. The light entered in his working-room only by a hole, in the manner of a camera obfcura, by which he judged with greater certainty of his productions. This artift confidered painting like the ftage, where the characters do not ftrike unlefs they are exaggerated. He did not purfue the method of the Flemifh painters of finifhing his pieces. He fometimes gave his light fuch thick touches, that it feemed more like modelling than painting. A head of his has been fhown, the nofe of which was fo thick of paint, as to equal the projection of that which he copied from nature. He was told one day, that by his peculiar method of employing colours, his pieces appeared rugged and uneven—he replied, that he was a painter, and not a dyer. He took a pleafure in dreffing his figures in an extraordinary manner: with this view he had collected a great number of eaftern caps, ancient armour, and drapery long fince out of fafhion. When he was advifed to confult antiquity to attain a better tafte in drawing, as his was ufually heavy and uneven, he took his counfellor to the clofet where thefe old veftments were depofited, faying, by way of derifion, thofe were his antiques.

Rembrandt, like moft men of genius, had many caprices. Being one day at work, painting a whole family in a fingle picture, word being brought him that his monkey was dead, he was fo affected at the lofs of this animal, that, without paying any attention to the perfons who were fitting for their pictures, he painted the monkey upon the fame canvas. This whim could not fail of difpleafing thofe for whom the piece was defigned; but he would not efface it, choofing rather to lofe the fale of his picture.

This freak will appear ftill more extraordinary in Rembrandt when it is confidered that he was extremely avaricious; which vice daily grew upon him. He practifed various ftratagems to fell his prints at a high price. The public were very defirous of purchafing them, and not without reafon. In his prints the fame tafte prevails as in his pictures; they are rough and irregular, but picturefque. In order to heighten the value of his prints, and increafe their price, he made his fon fell them as if he had purloined them from his father; others he expofed at public fales, and went thither himfelf in difguife to bid for them; fometimes he gave out that he was going to leave Holland, and fettle in another country. Thefe ftratagems were fuccefsful, and he got his own price for his prints. At other times he would print his plates half finifhed, and expofe them to fale; he afterwards finifhed them, and they became frefh plates. When they wanted retouching, he made fome alterations in them, which promoted the fale of his prints a third time, though they differed but little from the firft impreffions.

His pupils, who were not ignorant of his avarice, one day painted fome pieces of money upon cards, and Rembrandt no fooner faw them than he was going to take them up. He

was not angry at the pleaſantry, but his avarice ſtill prevailed. He died in 1674.

REMEMBRANCE, is when the idea of ſomething formerly known recurs again to the mind without the operation of a like object on the external ſenſory. See MEMORY and REMINISCENCE.

REMEMBRANCERS, anciently called *clerks of the remembrance*, certain officers in the exchequer, whereof three are diſtinguiſhed by the names of the *king's remembrancer*, the *lord treaſurer's remembrancer*, and the *remembrancer of the firſt fruits*. The king's remembrancer enters in his office all recognizances taken before the barons for any of the king's debts, for appearances or obſerving of orders; he alſo takes all bonds for the king's debts, &c. and makes out proceſſes thereon. He likewiſe iſſues proceſſes againſt the collectors of the cuſtoms, exciſe, and others, for their accounts; and informations upon penal ſtatutes are entered and ſued in his office, where all proceedings in matters upon Engliſh bills in the exchequer-chamber remain. His duty further is to make out the bills of compoſitions upon penal laws, to take the ſtatement of debts; and into his office are delivered all kinds of indentures and other evidences which concern the aſſuring any lands to the crown. He every year *in craſtino animarum* reads in open court the ſtatute for election of ſheriffs; and likewiſe openly reads in court the oaths of all the officers, when they are admitted.

The lord treaſurer's remembrancer is charged to make out proceſs againſt all ſheriffs, eſcheators, receivers, and bailiffs, for their accounts. He alſo makes out writs of *fieri facias*, and extent for debts due to the king, either in the pipe or with the auditors; and proceſs for all ſuch revenue as is due to the king on account of his tenures. He takes the account of ſheriffs; and alſo keeps a record, by which it appears whether the ſheriffs or other accountants pay their proffers due at Eaſter and Michaelmas; and at the ſame time he makes a record, whereby the ſheriffs or other accountants keep their prefixed days: there are likewiſe brought into his office all the accounts of cuſtomers, comptrollers, and accountants, in order to make entry thereof on record: alſo all eſtreats and amercements are certified here, &c.

The remembrancer of the firſt-fruits takes all compoſitions and bonds for the payment of firſt-fruits and tenths; and makes out proceſs againſt ſuch as do not pay the ſame.

REMINISCENCE, that power of the human mind, whereby it recollects itſelf, or calls again into its remembrance ſuch ideas or notions as it had really forgot: in which it differs from memory, which is a treaſuring up of things in the mind, and keeping them there, without forgetting them.

REMISSION, in phyſics, the abatement of the power or efficacy of any quality; in oppoſition to the *increaſe* of the ſame, which is called *intenſion*.

REMISSION, in law, &c. denotes the pardon of a crime, or the giving up the puniſhment due thereto.

REMISSION, in medicine, is when a diſtemper abates for a time. but does not go quite off.

REMITTANCE, in commerce, the traffic or return of money from one place to another, by bills of exchange, orders, or the like.

REMONSTRANCE, an expoſtulation or humble ſupplication, addreſſed to a king, or other ſuperior, beſeeching him to reflect on the inconveniences or ill conſequences of ſome order, edict, or the like. This word is alſo uſed for an expoſtulatory counſel, or advice; or a gentle and handſome reproof, made either in general, or particular, to apprize of or correct ſome fault, &c.

REMORA, or SUCKING-FISH, a ſpecies of ECHENEIS. Many incredible things are related of this animal by the ancients; as, that it had the power of ſtopping the largeſt and ſwifteſt veſſel in its courſe; and even to this day it is aſſerted by the fiſhermen in the Mediterranean, that it has a power of retarding the motion of their boats by attaching itſelf to them; for which reaſon they kill it whenever they perceive this retardation. But in what manner the remora performs this, we have no account.

REMORSE, in its worſt ſenſe, means that pain or anguiſh which one feels after having committed ſome bad action. It alſo means tenderneſs, pity, or ſympathetic ſorrow. It is moſt generally uſed in a bad ſenſe, and is applied to perſons who feel compunction for ſome great crime, as murder and ſuch like. Murders which have been committed with the utmoſt circumſpection and ſecrecy, and the authors of which could never have been diſcovered by any human inveſtigation, have been frequently unfolded by the remorſe and confeſſion of the perpetrators, and that too many years afterwards. Of this there are numerous inſtances, which are well authenticated, and which are ſo generally known that it is needleſs to relate them here. See REPENTANCE.

REMPHAN, an idol or Pagan god whom St. Stephen ſays the Iſraelites worſhipped in the wilderneſs as they paſſed from Egypt to the Land of Promiſe: "Yea, ye took up the tabernacle of Moloch, and the ſtar of your god REMPHAN: figures which ye made to worſhip them." That the martyr here quotes the following words of the prophet Amos, all commentators are agreed: "Ye have borne the tabernacle of your Moloch and CHIUN your images, the ſtar of your god, which ye made to yourſelves." But if this coincidence between the Chriſtian preacher and the Jewiſh prophet be admitted, it follows, that *Chiun* and *Remphan* are two names of one and the ſame deity. This is indeed further evident from the LXX tranſlators having ſubſtituted in their verſion the word Ραιφαν, inſtead of *Chiun*, which we read in the Hebrew and Engliſh bibles. But the queſtion which ſtill remains to be anſwered is, what god was worſhipped by the name of *Remphan*, *Raiphan*, or *Chiun*? for about the other divinity here mentioned there is no diſpute. See MOLOCH.

That *Chiun* or *Remphan* was an Egyptian divinity, cannot be queſtioned; for at the era of the *Exodus* the Hebrews muſt have been ſtrangers to the idolatrous worſhip of all other nations; nor are they ever accuſed of any other than Egyptian idolatries during their 40 years wanderings in the wilderneſs, till towards the end of that period that they became infected by the Moabites with the worſhip of *Baal-peor*. That *Moloch*, *Moleck*, *Melek*, or *Milcom*, in its original acceptation denotes a *king* or *chief*, is known to every oriental ſcholar: and therefore when it is uſed as the name of a god, it undoubtedly ſignifies the *ſun*, and is the ſame divinity with the *Egyptian Oſiris*. Reaſoning in this way, many critics, and we believe Selden is in the number, have concluded that *Chiun*, and of courſe *Remphan*, is the planet *Saturn*; becauſe *Chiun* is written *Ciun*, *Cevan*, *Ceuan*, *Chevvin*; all of which are modern oriental names of that planet.

But againſt this hypotheſis inſurmountable objections preſent themſelves to our minds. It is univerſally allowed (ſee POLYTHEISM), that the firſt objects of idolatrous worſhip were the *ſun* and *moon*, conſidered as the king and queen of heaven. The fixed ſtars, indeed, and the planets, were afterwards gradually admitted into the Pagan rubric; but we may be ſure that thoſe would be firſt aſſociated with the two prime luminaries which moſt reſembled them in brightneſs, and were ſuppoſed to be moſt benignant to man. But the planet Saturn appears to the naked eye with ſo feeble a luſtre, that, in the infancy of aſtronomy, it could not make ſuch an impreſſion on the mind as to excite that admiration which we muſt conceive to have always preceded planetary worſhip. It is to be obſerved, too, that by the Pagan writers of antiquity Saturn is conſtantly repreſented as a ſtar of baleful influence. He is termed the *leaden planet*; the

planet of malevolent aspect; the *dismal*, the *inhumane star*. That the Egyptians, at so early a period as that under consideration, should have adored as one of their greatest gods a planet obscure in its appearance, distant in its situation, and baleful in its influence, is wholly incredible.

There is, however, another star which they might naturally adore, and which we know they actually did adore, as one of their most beneficent gods, at a very early period. This is the *αστροκυων* or *σειριος* of the Greeks, the *canis* or *stella canicularis* of the Romans, and the *dog-star* of modern Europe. By the Egyptians it was called *Sothis* or *Soth*, which signifies *safety, beneficence, fecundity*; and it received this name, because, making its appearance in the heavens at the very time when the Nile overflowed the country, it was supposed to regulate the inundation. On this account Plutarch (*Is. et Osir.*) tells us, they believed the soul of their illustrious benefactress *Isis* to have transmigrated into the star *Sothis*, which they therefore worshipped as the divinity which rendered their country fruitful. It made its appearance, too, on the first day of the month *Thoth**, which was the beginning of the Egyptian year, and as such celebrated with feasting and festivity; and being by much the brightest star in the heavens, Horopollo (*cap.* 3.) informs us it was considered as sovereign over the rest. A combination of so many important circumstances might have induced a people less superstitious than the Egyptians to pay divine homage to that glorious luminary, which was confounded with *Isis*, who had been long regarded with the highest veneration; and as Isis was the wife and sister of Osiris, and always associated with him, the star of Isis or *Remphan* was naturally associated with *Moloch*, the same with Osiris.

But it will be asked, how the star which by the Egyptians was called *Soth* or *Sothis* came to be worshipped by the Hebrews under the appellation of *Chiun* or *Remphan?* This is a very pertinent question, and we shall endeavour to answer it.

Every one knows that the pronunciation of oriental words is very uncertain; and that, as the vowels were often omitted in writing, it is of very little importance to the meaning how they be supplied, provided we retain the radical consonants. The word *Chiun* may with equal propriety be written *Kiun*, *Kion*, or even *Kyon*, the Hebrew *jod* being convertible into the Greek υ or the Roman *y*; but the words *Cane, Chan, Kan*, or *Khan*, which are often diversified into *Ken, Kyn, Cohen, Cahan*, signifying *Head, Chief, Prince, King*, &c. are diffused through a great part of Asia and Europe. In the Chinese language *Quin*, which signifies a *King*, is so similar to the word *Chiun* or *Khiun* under consideration, that no etymologist will hesitate to pronounce them of the same original and the same import. The word *Kan* or *Khan* is universally known to be an honorary title in Tartary; and *Kaian* or *Kain*, which is manifestly cognate of the word *Chiun* or *Kiun*, is, in the *Plhevi* or old Persian language, the epithet applied to the dynasty of princes which succeeded Cyrus the Great. Among the Scythians or ancient Tartars, *Ghiun* signifies the *Sun* and likewise the *day*; and *Kung, Kinung, Kun*, runs through all the dialects of the Gothic tongue, every where denoting a *chief* or *sovereign*. In the Syrian dialect, *Kon* signifies a prince; and hence the Almighty is styled (Gen. xiv. 19.) *Konah*, which is translated *possessor*, but might have, with perhaps more propriety, been rendered *Sovereign* of heaven and earth. In Hebrew, the word *Kahan* or *Kahen*, which is the very same with *Khan* or *Kan*, signifies either a *priest* or a *prince*; and in Egypt *Kon* was the name of the first Hercules or the *sun*. Hence the same word in composition denotes greatness, as *Can-obus* the great serpent; *Can athoth*, the great *Thoth* or Mercury; *Can-osiris*, the great *Osiris*.

From this deduction we would conclude, that the word, which is found in so many tongues, and always denotes *Chief, Prince, Sovereign*, is the very word *Chiun* which the Egyptians and Hebrews applied to *Sothis*, as being, in their conceptions, the chief or sovereign of all the stars. This will appear still more probable, when we have ascertained the import of the word *Remphan*, or, as the LXX have it, *Raiphan*.

Phan, the latter part of this word, is unquestionably the same with *Pan*, the most ancient of the Egyptian gods (see Pan). It is likewise a cognate of the Hebrew *Phanah*, conspexit, spectavit, vidit; and the radical word seems to be PHAH, which signifies sometimes the countenance, and sometimes *light*. Hence *Phaethon*, which is compounded of *pha* light, *eth* or *esh* fire, and *on* strength, came to be one of the names of the sun. *Rai*, which we commonly write *Rajah*, has long signified, among the Indians, a subordinate prince; and we know, that between India and Egypt there was a very early intercourse. *Raiphan*, therefore, may be either the *royal light* or the *bright prince*, subordinate to Osiris; and in either sense it was a very proper epithet of *Sothis* in the Egyptian kalendar. The word *Rem* or *Rom*, again (for it is sometimes written Remphan, and sometimes Rompha), is no other than the Hebrew רום *Rum* "high, exalted." Hence Remphan is the *high* or *exalted light*, which Sothis certainly was.

For this etymological disquisition we are indebted to Dr. Doig, the learned author of *Letters on the Savage State*, who has written a dissertation on *Chiun* and *Remphan*, of such value that we hope it will not be much longer withheld from the public. The ascertaining the identity of those names, and the god to which they belonged, is the least of its merit; for it will be found to throw much light upon many passages in the Old Testament. What confirms his interpretation is, that the idol consecrated by the Egyptians to *Sothis*, or the dog-star, was a female figure with a star on her head; and hence the prophet upbraids his countrymen with having borne the *Star* of their deity.

REMURIA, festivals established at Rome by Romulus to appease the manes of his brother Remus. They were afterwards called *Lemuria*, and celebrated yearly.

REMUS, the brother of Romulus, was exposed together with his brother by the cruelty of his grandfather. In the contest which happened between the two brothers about building a city, Romulus obtained the preference, and Remus, for ridiculing the rising walls, was put to death by his brother's orders, or by Romulus himself (see Romulus). The Romans were afflicted with a plague after this murder; upon which the oracle was consulted, and the manes of Remus appeased by the institution of the Remuria.

RENAL, something belonging to the reins or Kidneys.

RENCOUNTER, in the military art, the encounter of two little bodies or parties of forces. In which sense *rencounter* is used in opposition to a pitched battle.

Rencounter, in single combats, is used by way of contradistinction to duel.—When two persons fall out and fight on the spot without having premeditated the combat, it is called a *rencounter*.

RENDEZVOUS, or Rendevous, a place appointed to meet in at a certain day and hour.

RENEALMIA, in botany; a genus of the monogynia order, belonging to the monandria class of plants. The corolla is trifid; the nectarium oblong; the calyx monophyllous; the anthera sessile, opposite to the nectarium; the berry

* This was the case at a very remote period; but it is otherwise at present, owing to the Precession *of the Equinoxes*. See that article.

is fleſhy. There is only one ſpecies, which is a native of Surinam.

RENEGADE, or Renegado, a perſon who has apoſtatized or renounced the Chriſtian faith, to embrace ſome other religion, particularly Mahometaniſm.

RENFREW, the county-town of Renfrewſhire, ſtanding on the ſmall river Cathcart, which flows into the Clyde at the diſtance of five miles from Glaſgow, is a ſmall but ancient royal borough, the ſeat of the ſheriff's court and of a preſbytery. The town is neatly built, and the inhabitants enjoy a tolerable ſhare of commerce. Renfrew was originally joined to Lanerk, but was made an independent ſheriffdom by Robert II. who had a palace here. W. lon. 4. 26. N. lat. 55. 51.

RENFREWSHIRE, a county of Scotland, ſtyled by way of eminence the *barony*, becauſe it was the ancient inheritance of the Stuarts, is a ſmall county, extending about 20 miles from north to ſouth, and 13 from eaſt to weſt, parted from Dumbartonſhire by the river Clyde on the weſt, bordering on the eaſt with Lanerkſhire, and on the north with Cunningham. The face of the country is varied with hill and vale, wood and ſtream; crowded with populous villages, and adorned with the ſeats of gentlemen. The ſoil is in general fertile, producing rye, barley, oats, peaſe, beans, flax, and ſome wheat: it likewiſe yields plenty of coal, and turf for fuel: and affords abundance of paſturage for ſheep and cattle. The inhabitants are Lowlanders and Preſbyterians; wealthy and induſtrious, addicted to traffic, and particularly expert in the linen manufacture. Their genius is ſtimulated to commerce by the example of their neighbours of Glaſgow, as well as the convenience of the river and frith of Clyde, along the courſe of which they are ſituated.

RENNES, an ancient city of France, in the department of Iſle and Vilaine and late province of Bretagne. The inhabitants are computed at 35,000. Its ſtreets are now broad and ſtraight; but they were very narrow before the fire in 1720, which laſted ſeven days, and conſumed 850 houſes. In the great ſquare is the Palace of Juſtice and the Hotel de Ville. Rennes is an archbiſhopric, and the capital of the department. It is ſeated on the Vilaine, which divides it into two parts, 58 miles N. by W. of Nantes, and 42 S. E. of St. Malo. W. lon. 1. 36. N. lat. 48. 7.

RENNET. See Runnet.

RENT, in law, a ſum of money, or other conſideration, iſſuing yearly out of lands or tenements.

RENTERING, in the manufactories, the ſame with fine-drawing. It conſiſts in ſewing two pieces of cloth edge to edge, without doubling them, ſo that the ſeam ſcarce appears; and hence it is denominated *fine drawing*. It is a French word meaning the ſame thing, and is derived from the Latin *retrahere*, or *re*, *in*, and *trahere*, becauſe the ſeam is drawn in or covered. We are told that in the Eaſt Indies, if a piece of fine muſlin be torn, and afterwards mended by the fine-drawers, it will be impoſſible to diſcover where the rent was. In this country the dexterity of the fine-drawers is not ſo great as that of thoſe in the eaſt; but it is ſtill ſuch as to enable them to defraud the revenue, by ſewing a head or ſlip of Engliſh cloth on a piece of Dutch, Spaniſh, or other foreign cloth: or a ſlip of foreign cloth on a piece of Engliſh, ſo as to paſs the whole as of a piece; and by that means avoid the duties, penalties, &c. The trick was firſt diſcovered in France by M. Savary.

Rentering, in tapeſtry, is the working new warp into a piece of damaged tapeſtry, whether eaten by the rats or otherwiſe deſtroyed, and on this warp to reſtore the ancient pattern or deſign. The warp is to be of woollen. not linen. Among the titles of the French tapeſtry makers is included that of renterers. Fine-drawing is particularly uſed for a rent or hole, which happens in dreſſing or preparing a piece of cloth artfully ſewed up or mended with ſilk. All fine-drawings are reckoned defects or blemiſhes; and ſhould be allowed for in the price of the piece.

RENVERSE, inverted, in heraldry, is when any thing is ſet with the head downwards, or contrary to its natural way of ſtanding. Thus, a chevron renverſe is a chevron with the point downwards. They uſe alſo the ſame term when a beaſt is laid on its back.

RENUNCIATION, the act of renouncing, abdicating, or relinquiſhing, any right, real or pretended.

REPARTEE, a ſmart, ready reply, eſpecially in matters of wit, humour, or raillery. See Raillery.

REPEALING, in law, the revoking or annulling of a ſtatute or the like. No act of parliament ſhall be repealed the ſame ſeſſion in which it was made. A deed or will may be repealed in part, and ſtand good for the reſt. It is held that a pardon of felony may be repealed on diſproving the ſuggeſtion thereof.

REPELLENTS, in medicine, remedies which drive back a morbid humour into the maſs of blood, from whence it was unduly ſecreted.

REPENTANCE, in general, means ſorrow for any thing paſt. In theology it means ſuch a ſorrow for ſin as produces newneſs of life, or ſuch a conviction of the evil and danger of a ſinful courſe as is ſufficient to produce ſhame and ſorrow in the review of it, and effectual reſolutions of amendment. In this ſenſe the evangelical writers uſe μεταμελεια and μετανοια. See Penitence and Theology.

REPERCUSSION, in muſic, a frequent repetition of the ſame ſound.

REPERTORY, a place wherein things are orderly diſpoſed, ſo as to be eaſily found when wanted. The indices of books are repertories, ſhowing where the matters ſought for are treated of. Common-place books are alſo kinds of repertories.

REPETITION, the reiterating of an action.

Repetition, in muſic, denotes a reiterating or playing over again the ſame part of a compoſition, whether it be a whole ſtrain, part of a ſtrain, or double ſtrain, &c. When the ſong ends with a repetition of the firſt ſtrain, or part of it, the repetition is denoted by *da capo*, or D. C. *i. e.* "from the beginning."

Repetition, in rhetoric, a figure which gracefully and emphatically repeats either the ſame word, or the ſame ſenſe in different words. See Oratory. The nature and deſign of this figure is to make deep impreſſions on thoſe we addreſs. It expreſſes anger and indignation, full aſſurance of what we affirm, and a vehement concern for what we have eſpouſed.

REPHIDIM (anc. geog.), a ſtation of the Iſraelites near mount Horeb, where they murmured for want of water; when Moſes was ordered to ſmite the rock Horeb, upon which it yielded water. Here Joſhua diſcomfited the Amalekites. This rock, out of which Moſes brought water, is a ſtone of a prodigious height and thickneſs, riſing out of the ground; on two ſides of which are ſeveral holes, by which the water ran. (Thevenot.)

REPLEGIARE, in law, ſignifies to redeem a thing taken or detained by another, by putting in legal ſureties.

De homine REPLEGIANDO. See Homine.

REPLEVIN, in law, a remedy granted on a diſtreſs, by which the firſt poſſeſſor has his goods reſtored to him again, on his giving ſecurity to the ſheriff that he will purſue his action againſt the party diſtraining, and return the goods or cattle if the taking them ſhall be adjudged lawful. In a replevin the perſon diſtrained becomes plaintiff; and the perſon diſtraining is called the *defendant* or *avowant*, and his juſtification an *avowry*. At the common law replevins are by writ, either out of the king's-

bench or common-pleas; but by ſtatute, they are by plaint in the ſheriff's court, and court-baron, for a perſon's more ſpeedily obtaining the goods diſtrained. If a plaint in replevin be removed into the court of king's-bench, &c. and the plaintiff makes default and becomes non-ſuit, or judgment is given againſt him, the defendant in replevin ſhall have the writ of *retorno habendo* of the goods taken in diſtreſs. See the next article.

REPLEVY, in law, is a tenant's bringing a writ of replevin, or *replegiari facias*, where his goods are taken by diſtreſs for rent; which muſt be done within five days after the diſtreſs, otherwiſe at the five days end they are to be appraiſed and ſold. This word is alſo uſed for *bailing* a perſon, as in the caſe of a *homine replegiando*.

REPORT, the relation made upon oath, by officers or perſons appointed to viſit, examine, or eſtimate the ſtate, expenſes, &c. of any thing.

REPORT, in law, is a public relation of caſes judicially argued, debated, reſolved, or adjudged in any of the king's courts of juſtice, with the cauſes and reaſons of the ſame, as delivered by the judges. Alſo when the court of chancery, or any other court, refers the ſtating of a caſe, or the comparing of an account, to a maſter of chancery, or other referee, his certificate thereon is called a *report*.

REPOSE, in poetry, &c. the ſame with reſt and pauſe. See REST, &c.

REPOSE, in painting, certain maſſes or large aſſemblages of light and ſhade, which being well conducted prevent the confuſion of objects and figures, by engaging and fixing the eye ſo as it cannot attend to the other parts of the painting for ſome time; and thus leading it to conſider the ſeveral groups gradually, proceeding as it were from ſtage to ſtage.

REPRESENTATION, in the drama, the exhibition of a theatrical piece, together with the ſcenes, machinery, &c.

REPRESENTATIVE, one who perſonates or ſupplies the place of another, and is inveſted with his right and authority. Thus, the houſe of commons are the repreſentatives of the people in parliament. See COMMONS and PARLIAMENT.

REPRIEVE, in criminal law (from *reprendre*, "to take back"), is the withdrawing of a ſentence for an interval of time; whereby the execution is ſuſpended. See JUDGMENT. According to judge Blackſtone, this may be, firſt, *ex arbitrio judicis*, either before or after judgment: as, where the judge is not ſatisfied with the verdict, or the evidence is ſuſpicious, or the indictment is inſufficient, or he is doubtful whether the offence be within clergy; or, ſometimes, if it be a ſmall felony, or any favourable circumſtances appear in the criminal's character, in order to give room to apply to the crown for either an abſolute or conditional pardon. Theſe arbitrary reprieves may be granted or taken off by the juſtices of gaol-delivery, although their ſeſſion be finiſhed, and their commiſſion expired: but this rather by common uſage than of ſtrict right.

Reprieves may alſo be *ex neceſſitate legis*: as where a woman is capitally convicted, and pleads her pregnancy. Though this is no cauſe to ſtay judgment, yet it is to reſpite the execution till ſhe be delivered. This is a mercy dictated by the law of nature, *in favorem prolis*; and therefore no part of the bloody proceedings in the reign of queen Mary hath been more juſtly deteſted, than the cruelty that was exerciſed in the iſland of Guernſey, of burning a woman big with child; and, when through the violence of the flames the infant ſprang forth at the ſtake, and was preſerved by the by-ſtanders, after ſome deliberations of the prieſts who aſſiſted at the ſacrifice, they caſt it into the fire as a young heretic. A barbarity which they never learned from the laws of ancient Rome; which direct, with the ſame humanity as our own, *quod prægnantis mulieris damnatæ pœna differatur, quoad pariat*: which doctrine has alſo prevailed in England, as early as the firſt memorials of our law will reach. In caſe this plea be made in ſtay of execution, the judge muſt direct a jury of twelve matrons or diſcreet women to inquire into the fact: and if they bring in their verdict *quick with child* (for barely *with child*, unleſs it be alive in the womb, is not ſufficient), execution ſhall be ſtaid generally till the next ſeſſion; and ſo from ſeſſion to ſeſſion, till either ſhe is delivered, or proves by the courſe of nature not to have been with child at all. But if ſhe once hath had the benefit of this reprieve, and been delivered, and afterwards becomes pregnant again, ſhe ſhall not be entitled to the benefit of a further reſpite for that cauſe. For ſhe may now be executed before the child is quick in the womb; and ſhall not, by her own incontinence, evade the ſentence of juſtice.

Another cauſe of regular reprieve is, if the offender become *non compos* between the judgment and the award of execution: for, regularly, though a man be *compos* when he commits a capital crime, yet, if he becomes *non compos* after, he ſhall not be indicted; if after indictment, he ſhall not be convicted: if after conviction, he ſhall not receive judgment; if after judgment, he ſhall not be ordered for execution: for *furioſus ſolo furore punitur*; and the law knows not but he might have offered ſome reaſon, if in his ſenſes, to have ſtayed theſe reſpective proceedings. It is therefore an invariable rule, when any time intervenes between the attainder and the award of execution, to demand of the priſoner what he hath to allege why execution ſhould not be awarded againſt him; and, if he appears to be inſane, the judge in his diſcretion may and ought to reprieve him. Or, the party may plead in bar of execution; which plea may be either pregnancy, the king's pardon, an act of grace, or diverſity of perſon, *viz.* that he is not the ſame that was attainted, and the like. In this laſt caſe a jury ſhall be impanelled to try this collateral iſſue, namely, the identity of his perſon; and not whether guilty or innocent, for that has been decided before. And in theſe collateral iſſues the trial ſhall be *inſtanter*; and no time allowed the priſoner to make his defence or produce his witneſſes, unleſs he will make oath that he is not the perſon attainted: neither ſhall any peremptory challenges of the injury be allowed the priſoner, though formerly ſuch challenges were held to be allowable whenever a man's life was in queſtion. If neither pregnancy, inſanity, non-identity, nor other plea, will avail to avoid the judgment, and ſtay the execution conſequent thereupon, the laſt and ſureſt reſort is in the king's moſt gracious pardon; the granting of which is the moſt amiable prerogative of the crown. See the article PARDON.

REPRISALS, a right which princes claim of taking from their enemies any thing equivalent to what they unjuſtly detain from them or their ſubjects. For, as the delay of making war may ſometimes be detrimental to individuals who have ſuffered by depredations from foreign potentates, our laws have in ſome reſpects armed the ſubject with powers to impel the prerogative, by directing the miniſters of the crown to iſſue letters of marque and repriſal upon due demand: the prerogative of granting which is nearly related to, and plainly derived from, that other of making war; this being indeed only an incomplete ſtate of hoſtilities, and generally ending in a formal denunciation of war. Theſe letters are grantable by the law of nations, whenever the ſubjects of one ſtate are oppreſſed and injured by thoſe of another, and juſtice is denied by that ſtate to which the oppreſſor belongs. In this caſe, letters of marque and repriſal (words uſed as ſynonymous; and ſignifyng, the latter a taking in return, the former the paſſing the frontiers in order to ſuch taking) may be obtained, in order to ſeize the bodies or goods of the ſubjects of the offending ſtate, until ſatisfaction be

made, wherever they happen to be found. And indeed this custom of reprisals seems dictated by nature herself; for which reason we find in the most ancient times very notable instances of it. But here the necessity is obvious of calling in the sovereign power, to determine when reprisals may be made; else every private sufferer would be a judge in his own cause. In pursuance of which principle, it is with us declared by the stat. 4 Hen. V. c. 7. that, if any subjects of the realm are oppressed in time of truce by any foreigners, the king will grant marque in due form to all that feel themselves grieved. Which form is thus directed to be observed: the sufferer must first apply to the lord privy seal, and he shall make out letters of request under the privy seal; and if, after such request of satisfaction made, the party required do not within convenient time make due satisfaction or restitution to the party grieved, the lord-chancellor shall make him out letters of marque under the great seal; and by virtue of these he may attack and seize the property of the aggressor nation, without hazard of being condemned as a robber or pirate.

Reprisal, or *Recaption*, is a species of remedy allowed to an injured person. This happens when any one hath deprived another of his property in goods or chattels personal, or wrongfully detains one's wife, child, or servant: in which case the owner of the goods, and the husband, parent, or master, may lawfully claim and retake them, wherever he happens to find them; so it be not in a riotous manner, or attended with a breach of the peace. The reason for this is obvious; since it may frequently happen that the owner may have this only opportunity of doing himself justice: his goods may be afterwards conveyed away or destroyed; and his wife, children, or servants, concealed or carried out of his reach; if he had no speedier remedy than the ordinary process of law. If therefore he can so contrive it as to gain possession of his property again, without force or terror, the law favours and will justify his proceeding. But, as the public peace is a superior consideration to any one man's private property; and as, if individuals were once allowed to use private force as a remedy for private injuries, all social justice must cease, the strong would give law to the weak, and every man would revert to a state of nature; for these reasons it is provided, that this natural right of recaption shall never be exerted, where such exertion must occasion strife and bodily contention, or endanger the peace of society. If, for instance, my horse is taken away, and I find him in a common, a fair, or a public inn, I may lawfully seize him to my own use: but I cannot justify breaking open a private stable, or entering on the grounds of a third person, to take him, except he be feloniously stolen; but must have recourse to an action at law.

REPROBATION, in theology, means the act of abandoning, or state of being abandoned, to eternal destruction, and is applied to that decree or resolve which God has taken from all eternity to punish sinners who shall die in impenitence; in which sense it is directly opposed to election. When a sinner is so hardened as to feel no remorse or misgiving of conscience, it is considered as a sign of reprobation; which by the casuists has been distinguished into positive and negative. The first is that whereby God is supposed to create men with a positive and absolute resolution to damn them eternally. This opinion is countenanced by St. Augustine and other Christian fathers, and is a peculiar tenet of Calvin and most of his followers. The church of England, in *The Thirty-nine Articles*, teaches something like it; and the church of Scotland, in the *Confession of Faith*, maintains it in the strongest terms. But the notion is generally exploded, and is believed by no rational divine in either church, being totally injurious to the justice of the Deity. Negative or conditional reprobation is that whereby God, though he has a sincere desire to save men, and furnishes them with the necessary means, so that all if they will may be saved, yet sees that there are many who will not be saved by the means, however powerful, that are afforded them; though by other means which the Deity sees, but will not afford them, they might be saved. Reprobation respects angels as well as men, and respects the latter either fallen or unfallen. See Predestination.

REPRODUCTION, is usually understood to mean the restoration of a thing before existing, and since destroyed. It is very well known that trees and plants may be raised from slips and cuttings; and some late observations have shown, that there are some animals which have the same property. The polype (see Polypus) was the first instance we had of this; but we had scarce time to wonder at the discovery Mr. Trembley had made, when Mr. Bonett discovered the same property in a species of water-worm. Amongst the plants which may be raised from cuttings, there are some which seem to possess this quality in so eminent a degree, that the smallest portion of them will become a complete tree again.

It deserves inquiry, whether or not the great Author of nature, when he ordained that certain insects, as these polypes and worms, should resemble those plants in that particular, allowed them this power of being reproduced in the same degree? or, which is the same thing, whether this reproduction will or will not take place in whatever part the worm is cut? In order to try this, Mr. Bonett entered on a course of many experiments on the water-worms which have this property. These are, at their common growth, from two to three inches long, and of a brownish colour, with a cast of reddish. From one of these worms he cut off the head and tail, taking from each extremity only a small piece of a twelfth of an inch in length; but neither of these pieces were able to reproduce what was wanting. They both perished in about 24 hours; the tail first, and afterwards the head. As to the body of the worm from which these pieces were separated, it lived as well as before, and seemed indeed to suffer nothing by the loss, the head-part being immediately used as if the head was thereon, boring the creature's way into the mud. There are, besides this, two other points in which the reproduction will not take place: the one of these is about the fifth or sixth ring from the head, and the other at the same distance from the tail; and in all probability the condition of the great artery in these parts is the cause of this.

What is said of the want of the reproductive power of these parts relates only to the head and tail ends; for, as to the body, it feels very little inconvenience from the loss of what is taken off, and very speedily reproduces those parts. Where then does the principle of life reside in such worms, which, after having their heads cut off, will have not only the same motions, but even the inclinations, that they had before? And yet this difficulty is very small, compared to several others which at the same time offer themselves to our reason. Is this wonderful reproduction of parts only a natural consequence of the laws of motion? or is there lodged in the body of the creature a chain of minute buds or shoots, a sort of little embryos, already formed and placed in such parts where the reproductions are to begin? Are these worms only mere machines? or are they, like more perfect animals, a sort of compound, the springs of whose motions are actuated or regulated by a sort of soul? And if they have themselves such a principle, how is it that this principle is multiplied, and is found in every separate piece? Is it to be granted, that there are in these worms, not a single soul (if it is to be so called) in each, but that each contains as many souls as there are pieces capable of reproducing perfect animals? Are we to believe with Malpighi, that these sorts of worms are all heart and brain from one end to the other? This may be; but, yet if

we knew that it was so, we should know in reality but very little the more for knowing it: and it seems, after all, that, in cases of this kind, we are only to admire the works of the great Creator, and sit down in silence.

The nice sense of feeling in spiders has been much talked of by naturalists; but it appears that these worms have yet somewhat more surprising in them in regard to this particular. If a piece of stick, or any other substance, be brought near them, they do not stay for its touching them, but begin to leap and frisk about as soon as it comes towards them. There want, however, some further experiments to ascertain whether this be really owing to feeling or sight; for though we can discover no distinct organs of sight in these creatures, yet they seem affected by the light of the sun or a candle, and always frisk about in the same manner at the approach of either; nay, even the moon-light has some effect upon them.

A twig of willow, poplar, or many other trees, being planted in the earth, takes root, and becomes a tree, every piece of which will in the same manner produce other trees. The case is the same with these worms: they are cut to pieces, and these several pieces become perfect animals; and each of these may be again cut into a number of pieces, each of which will in the same manner produce an animal. It had been supposed by some that these worms were oviparous: but Mr. Bonett, on cutting one of them to pieces, having observed a slender substance, resembling a small filament, to move at the end of one of the pieces, separated it; and on examining it with glasses, found it to be a perfect worm, of the same form with its parent, which lived and grew larger in a vessel of water into which he put it. These small bodies are easily divided, and very readily complete themselves again, a day usually serving for the production of a head to the part that wants one; and, in general, the smaller and slenderer the worms are, the sooner they complete themselves after this operation. When the bodies of the large worms are examined by the microscope, it is very easy to see the appearance of the young worms alive, and moving about within them: but it requires great precision and exactness to be certain of this; since the ramifications of the great artery have very much the appearance of young worms, and they are kept in a sort of continual motion by the systoles and diastoles of the several portions of the artery, which serve as so many hearts. It is very certain, that what we force in regard to these animals by our operations, is done also naturally every day in the brooks and ditches where they live. A curious observer will find in these places many of them without heads or tails, and some without either; as also other fragments of various kinds, all which are then in the act of completing themselves: but whether accidents have reduced them to this state, or they thus purposely throw off parts of their own body for the reproduction of more animals, it is not easy to determine. They are plainly liable to many accidents, by which they lose the several parts of their body, and must perish very early if they had not a power of reproducing what was lost: they often are broken into two pieces, by the resistance of some hard piece of mud which they enter; and they are subject to a disease, a kind of gangrene, rotting off the several parts of their bodies, and must inevitably perish by it had they not this surprising property.

This worm was a second instance, after the polype, of the surprising power in an animal of recovering its most essential parts when lost. But Nature does not seem to have limited her beneficence in this respect to these two creatures. Mr. Bonett tried the same experiments on another species of water-worm, differing from the former in being much thicker. This kind of worm, when divided in the summer season, very often shows the same property: for, if it be cut into three or four pieces, the pieces will lie like dead for a long time, but afterwards will move about again; and will be found in this state of rest to have recovered a head, or a tail, or both. After recovering their parts, they move very little; and, according to this gentleman's experiments, seldom live more than a month.

It should seem, that the more difficult success of this last kind of worm, after cutting, and the long time it takes to recover the lost parts, if it do recover them at all, is owing to its thickness; since we always find in that species of worms which succeeds best of all, that those which are thinnest always recover their parts much sooner than the others.

The water-insects also are not the only creatures which have this power of recovering their lost parts. The earth affords us some already discovered to grow in this manner from their cuttings, and these not less deserving our admiration than those of the water: the common earth-worms are of this kind. Some of these worms have been divided into two, others into three or four pieces; and some of these pieces, after having passed two or three months without any appearance of life or motion, have then begun to reproduce a head or tail, or both. The reproduction of the anus, after such a state of rest, is no long work; a few days do it: but it is otherwise with the head; that does not seem to perform its functions in the divided pieces till about seven months after the separation. It is to be observed, that in all these operations both on earth and water-worms, the hinder part suffers greatly more than the fore part in the cutting; for it always twists itself about a long time, as if actuated by strong convulsions; whereas the head usually crawls away without the appearance of any great uneasiness.

The reproduction of several parts of lobsters, crabs, &c. makes also one of the great curiosities in natural history. That, in lieu of an organical part of an animal broken off, another shall rise perfectly like it, may seem inconsistent with the modern system of generation, where the animal is supposed to be wholly formed in the egg. Yet has the matter of fact been well attested by the fishermen, and even by several virtuosos who have taken the point into examination, particularly M. de Reaumur and M. Perrault, whose skill and exactness in things of this nature will hardly be questioned. The legs of lobsters, &c. consist each of five articulations: now, when any legs happen to break by any accident, as in walking, &c. which frequenly happens, the fracture is always found to be in a part near the fourth articulation; and what they thus lose is precisely reproduced some time afterwards; that is, a part of a leg shoots out, consisting of four articulations, the first whereof has two claws as before; so that the loss is entirely repaired.

If a lobster's leg be broken off by design at the fourth or fifth articulation, what is thus broken off always comes again; but it is not so if the fracture be made in the first, second, or third articulation. In those cases, the reproduction is very rare if things continue as they are. But what is exceedingly surprising is, that they do not; for, upon visiting the lobster maimed in these barren and unhappy articulations, at the end of two or three days, all the other articulations are found broken off to the fourth; and it is suspected they have performed the operation on themselves, to make the reproduction of a leg certain.

The part reproduced is not only perfectly like that retrenched, but also, in a certain space of time, grows equal to it. Hence it is that we frequently see lobsters which have their two big legs unequal, and that in all proportions. This shows the smaller leg to be a new one.

A part thus reproduced being broken, there is a second reproduction. The summer, which is the only season of the year when the lobsters eat, is the most favourable time for the reproduction. It is then performed in four or five weeks;

whereas it takes up eight or nine months in any other feafon. The fmall legs are fometimes reproduced, but more rarely, as well as more flowly, than the great ones: the horns do the fame. The experiment is moft eafily tried on the common crab.

REPTILES, in natural hiftory, a kind of animals denominated from their creeping or advancing on the belly. Or, reptiles are a genus of animals and infects, which, inftead of feet, reft on one part of the body, while they advance forward with the reft. Such are earthworms, fnakes, caterpillars, &c. Indeed, moft of the clafs of reptiles have feet; only thofe very fmall, and the legs remarkably fhort in proportion to the bulk of the body.

Naturalifts obferve a world of artful contrivance for the motion of reptiles. Thus, particularly in the earthworm, Dr. Willis tells us, the whole body is only a chain of annular mufcles; or, as Dr. Derham fays, it is only one continued fpiral mufcle, the orbicular fibres whereof being contracted render each ring narrower and longer than before; by which means it is enabled, like the worm of an augre, to bore its paffage into the earth. Its reptile motion might alfo be explained by a wire wound on a cylinder, which, when flipped off, and one end extended and held faft, will bring the other near to it. So the earthworm having fhot out or extended his body (which is with a writhing), it takes hold by thefe fmall feet it hath, and fo contracts the hinder part of its body. Dr. Tyfon adds, that when the fore part of the body is ftretched out, and applied to a plane at a diftance, the hind part relaxing and fhortening is eafily drawn towards it as a centre. Its feet are difpofed in a quadruple row the whole length of the worm, with which, as with fo many hooks, it faftens down fometimes this and fometimes that part of the body to the plane, and at the fame time ftretches out or drags after it another.

The creeping of ferpents is effected after a fomewhat different manner; there being a difference in their ftructure, in that thefe laft have a compages of bones articulated together. The body here is not drawn together, but as it were complicated: part of it being applied on the rough ground, and the reft ejaculated and fhot from it, which being fet on the ground in its turn, brings the other after it. The fpine of the back varioufly writhed has the fame effect in leaping, as the joints in the feet of other animals; they make their leaps by means of mufcles, and extend the plicæ or folds. See Zoology.

REPUBLIC, or commonwealth, a popular ftate or government; or a nation where the people have the government in their own hands. See Government, Aristocracy, Democracy, and Monarchy.

Republic *of Letters*, a phrafe ufed collectively of the whole body of the ftudious and learned people.

REPUDIATION, in the civil law, the act of divorcing. See Divorce.

REPULSION, in phyfics, that property of bodies whereby they recede from each other, and, on certain occafions, mutually avoid coming into contact.

Repulsion, as well as attraction, has of late been confidered as one of the primary qualities of all matter, and has been much ufed in explaining the phenomena of nature: thus, the particles of air, fire, fteam, electric fluid, &c. are all faid to have a repulfive power with refpect to one another.—That this is the cafe with the air, and vapour of all kinds, is certain; becaufe, when they are compreffed into a fmall fpace, they expand with great force: but as to fire, light, and electricity, our experiments fail; nay, the fuppofition of a repulfive power among the particles of the electric fluid is inconfiftent with the phenomena, as has been demonftrated under the article Electricity. Even in thofe fluids, air and fteam, where a repulfive power moft manifeftly exifts, it is demonftrable that the repulfion cannot be a *primary* quality, fince it can be increafed to a great degree by heat, and diminifhed by cold: but it is impoffible that a *primary* quality of matter can be increafed or diminifhed by any external circumftances whatever; for, whatever property depends upon external circumftances is not a primary but a fecondary one.—The repulfion of electrified bodies is explained under the article Electricity: that of others is lefs fubject to inveftigation; and the moft that can be faid concerning it is, that in many cafes it feems to be the confequence of a modification of fire, and in others of electricity.

REPUTATION means credit, honour, or the character of good; and, fince we are deftined to live in fociety, is neceffary and ufeful more or lefs to every human being. There is no man, except one who is overgrown with pride and felf-conceit, or whofe actions are bad, but pays attention to his reputation, and wifhes to poffefs the good opinion of his neighbours or the world. The love of reputation and the love of fame are moft powerful fprings of action; but, though they proceed from the fame principle, the means of attaining them, and the effects of them, are not altogether the fame.

Many means indeed ferve equally to fupport the reputation and to increafe the fame, differing only in degrees; others, however, belong peculiarly either to the one or to the other. An honeft reputation is within the reach of the bulk of mankind; it is obtained by the focial virtues and the conftant practice of the common duties of life. This kind of reputation indeed is neither extenfive nor brilliant, but it is often the moft ufeful in point of happinefs. Wit, talents, and genius, are the neceffary requifites for fame; but thofe advantages are perhaps lefs real in their confequences than thofe arifing from a good reputation. What is of real ufe cofts little; things rare and fplendid, require the greateft labour to procure, and yield perhaps a more ideal happinefs.

Fame can be poffeffed, comparatively fpeaking, but by few individuals; as it requires either very fuperior abilities, fupported by great efforts, or very fortunate circumftances. It is conftituted by the applaufe of mankind, or at leaft by that of a fingle nation; whilft reputation is of much lefs extent, and arifes from different circumftances. That reputation which is founded on deceit and artifice is never folid; and the moft honourable will always be found to be the moft ufeful. Every one may fafely, and indeed ought to, afpire to the confideration and praife due to his condition and merit; but he who afpires to more, or who feeks it by difhoneft means, will at length meet with contempt.

REQUEST, in law, a fupplication or petition preferred to a prince, or to a court of juftice, begging relief in fome confcionable cafes where the common law grants no immediate redrefs.

Court of Requests, *(curia requifitionum)* was a court of equity, of the fame nature with the court of chancery, but inferior to it; principally inftituted for the relief of fuch petitioners as in confcionable cafes addreffed themfelves by fupplication to his majefty. Of this court the lord privy-feal was chief judge, affifted by the mafters of requefts; and it had beginning about the 9 Hen. VII. according to Sir Julius Cæfar's tractate upon this fubject: though Mr. Gwyn, in his preface to his Readings, faith it began from a commiffion firft granted by king Henry VIII.—This court having affumed great power to itfelf, fo that it became burthenfome, *Mich.* anno 40 and 41 *Eliz.* in the court of common pleas it was adjudged upon folemn argument, that the court of requefts was no court of judicature, &c. and by ftat. 16 and 17 Car. I. c. 10. it was taken away.

There are ſtill courts of requeſts, or courts of conſcience, conſtituted in London and other trading and populous diſtricts, for the recovery of ſmall debts. The firſt of theſe was eſtabliſhed in London ſo early as the reign of Henry VIII. by an act of their common council; which however was certainly inſufficient for that purpoſe, and illegal, till confirmed by ſtatute 3 Jac. I. c. 15. which has ſince been explained and amended by ſtatute 14 Geo. II. c. 10. The conſtitution is this: two aldermen and four commoners ſit twice a week to hear all cauſes of debt not exceeding the value of forty ſhillings; which they examine in a ſummary way, by the oath of the parties or other witneſſes, and make ſuch order therein as is conſonant to equity and good conſcience. The time and expenſe of obtaining this ſummary redreſs are very inconſiderable, which make it a great benefit to trade; and thereupon divers trading towns and other diſtricts have obtained acts of parliament for eſtabliſhing in them courts of conſcience upon nearly the ſame plan as that in the city of London.

By 25 Geo. III. c. 45. (which is confined to proſecutions in courts of conſcience in London, Middleſex, and the borough of Southwark), and by 26 Geo. III. c. 38. (which extends the proviſions of the former act to all other courts inſtituted for the recovery of ſmall debts), it is enacted, that after the firſt day of September 1786, no perſon whoſoever, being a debtor or defendant, and who has been or ſhall be committed to any gaol or priſon by order of any court or commiſſioners authoriſed by any act or acts of parliament for conſtituting or regulating any court or courts for the recovery of ſmall debts, where the debt does not exceed twenty ſhillings, ſhall be kept or continued in cuſtody, on any pretence whatſoever, more than twenty days from the commencement of the laſt-mentioned act; or from the time of his, her, or their commitment to priſon: and where the original debt does not amount to or exceed the ſum of forty ſhillings, more than forty days from the commencement of the ſaid act, or from the time of his, her, or their commitment as aforeſaid; and all gaolers are thereby required to diſcharge ſuch perſons accordingly. And by ſect. 2. if it ſhall be proved to the ſatisfaction of the court, that any ſuch debtor has money or goods which he has wilfully and fraudulently concealed; in that caſe the court ſhall have power to enlarge the aforeſaid times of impriſonment for debts under twenty ſhillings, to any time not exceeding thirty days, and for debts under forty ſhillings, to any time not exceeding ſixty days; which ſaid ground of further detention ſhall be ſpecified in the ſaid commitment. And (by ſect. 3.) at the expiration of the ſaid reſpective times of impriſonment, every ſuch perſon ſhall immediately be diſcharged, without paying any ſum of money, or other reward or gratuity whatſoever, to the gaoler of ſuch gaol, on any pretence whatſoever; and every gaoler demanding or receiving any fee for the diſcharge of any ſuch perſon, or keeping any ſuch perſon priſoner after the ſaid reſpective times limited by the ſaid act, ſhall forfeit five pounds, to be recovered in a ſummary way before two juſtices of the peace, one moiety thereof to be paid to the overſeers of the poor of the pariſh where the offence ſhall be committed, and the other to the informer.

REQUIEM, in the Romiſh hiſtory, a maſs ſung for the reſt of the ſoul of a perſon deceaſed.

RESCISSION, in the civil law, an action intended for the annulling or ſetting aſide any contract, deed, &c.

RESCRIPT, an anſwer delivered by an emperor, or a pope, when conſulted by particular perſons on ſome difficult queſtion or point of law, to ſerve as a deciſion thereof.

RESEDA, DYER'S-WEED, *Yellow-weed*, *Weld*, or *Wild-woad*: A genus of the order of trigynia, belonging to the dodecandria claſs of plants; and in the natural method ranking under the 54th order, *Miſcellaneæ*. The calyx is monophyllous and partite; the petals laciniated; the capſule unilocular, and opening at the mouth. There are 11 ſpecies; of which the moſt remarkable is the luteola or common dyer's weed, growing naturally in waſte places in many parts of Britain. The young leaves are often undulated; the ſtalk is a yard high, or more, terminated with a long naked ſpike of yellowiſh-green flowers: the plant is cultivated and much uſed for dyeing ſilk and wool of a yellow colour. The great recommendation of the plant is, that it will grow with very little trouble, without dung, and on the very worſt ſoils. For this reaſon it is commonly ſown with, or immediately after, barley or oats, without any additional care, except drawing a buſh over it to harrow it in. The reaping of the corn does it little or no hurt, as it grows but little the firſt year; and the next ſummer it is pulled and dried like flax. Much care and nicety, however, is requiſite, ſo as not to injure either the ſeed or ſtalk; or, which ſometimes happens, damaging both, by letting it ſtand too long, or pulling it too green. To avoid theſe inconveniences, a better method of culture has been deviſed. This new method is, to plough and harrow the ground very fine, without dung, as equally as poſſible, and then ſowing about a gallon of ſeed, which is very ſmall, upon an acre, ſome time in the month of Auguſt. In about two months it will be high enough to hoe, which muſt be carefully done, and the plants left about ſix inches aſunder. In March it is to be hoed again, and this labour is to be repeated a third time in May. About the cloſe of June, when the flower is in full vigour, and the ſtalk is become of a greeniſh-yellow, it ſhould be pulled; a ſufficient quantity of ſtems being left growing for ſeed till September. By this means the flower and ſtalk, both of them being carefully dried, will ſell at a good price to the dyers, who employ it conſtantly, and in large quantities; add to this, that the ſeed being ripe and in perfect order will yield a very conſiderable profit. In a tolerable year, when the ſeaſons have not been unfavourable, the advantages derived from this vegetable will anſwer very well; but if the ſummer ſhould be remarkably fine, and proper care is taken in getting it in, there will be a very large produce upon an acre. The crop being, as has been ſhown, ſo early removed, the ground may be conveniently prepared for growing wheat the next year. Upon the whole, weld is in its nature a very valuable commodity in many reſpects, as it ſerves equally for woollen, linen, or ſilk; dyeing not only a rich and laſting yellow, but alſo, properly managed, all the different ſhades of yellow, with brightneſs and beauty; and if theſe be previouſly dipped blue, they are by the weld changed into a very pleaſing green, which our artiſts can alſo diverſify into a great variety of ſhades.

RESEMBLANCE *and* DISSIMILITUDE, the relations of likeneſs and difference among objects. See COMPARISON. The connection that man hath with the beings around him, requires ſome acquaintance with their nature, their powers, and their qualities, for regulating his conduct. For acquiring a branch of knowledge ſo eſſential to our well-being, motives alone of reaſon and intereſt are not ſufficient: nature hath providentially ſuperadded curioſity, a vigorous propenſity which never is at reſt. This propenſity alone attaches us to every new object; and incites us to compare objects, in order to diſcover their differences and reſemblances.

Reſemblance among objects of the ſame kind, and diſſimilitude among objects of different kinds, are too obvious and familiar to gratify our curioſity in any degree: its gratification lies in diſcovering differences among things where reſemblance prevails, and reſemblances where difference prevails. Thus, a difference in individuals of the ſame kind of plants or animals is deemed a diſcovery, while the many particulars in which they agree are neglected; and in different kinds, any reſem-

blance is greedily remarked, without attending to the many particulars in which they differ.

A comparison of the former neither tends to gratify our curiosity, nor to set the objects compared in a stronger light: two apartments in a palace, similar in shape, size, and furniture, make separately as good a figure as when compared; and the same observation is applicable to two similar compartments in a garden: on the other hand, oppose a regular building to a fall of water, or a good picture to a towering hill, or even a little dog to a large horse, and the contrast will produce no effect. But a resemblance between objects of different kinds, and a difference between objects of the same kind, have remarkably an enlivening effect. The poets, such of them as have a just taste, draw all their similies from things that in the main differ widely from the principal subject; and they never attempt a contrast, but where the things have a common genus, and a resemblance in the capital circumstances: place together a large and a small-sized animal of the same species, the one will appear greater, the other less, than when viewed separately: when we oppose beauty to deformity, each makes a greater figure by the comparison. We compare the dress of different nations with curiosity, but without surprise; because they have no such resemblance in the capital parts as to please us by contrasting the smaller parts. But a new cut of a sleeve, or of a pocket, enchants by its novelty; and, in opposition to the former fashion, raises some degree of surprise.

That resemblance and dissimilitude have an enlivening effect upon objects of sight, is made sufficiently evident; and that they have the same effect upon objects of the other senses, is also certain. Nor is that law confined to the external senses; for characters contrasted make a greater figure by the opposition: Iago, in the tragedy of Othello, says,

> He hath a daily beauty in his life
> That makes me ugly.

The character of a fop, and of a rough warrior, are nowhere more successfully contrasted than in Shakespeare's first part of Henry IV. act 1. sc. 4.

Passions and emotions are also enflamed by comparison. A man of high rank humbles the bystanders even to annihilate them in their own opinion: Cæsar, beholding the statue of Alexander, was greatly mortified, that now, at the age of 32, when Alexander died, he had not performed one memorable action.

Our opinions also are much influenced by comparison. A man whose opulence exceeds the ordinary standard is reputed richer than he is in reality; and wisdom or weakness, if at all remarkable in an individual, is generally carried beyond the truth.

The opinion a man forms of his present distress is heightened by contrasting it with his former happiness. This subject is ingeniously treated, and at some length, by lord Kaimes in his Elements of Criticism.

RESEN, (Moses): a town on the Tigris, built by Nimrod; thought to be the *Larissa* of Xenophon; which see. But as *Larissa* is a name in imitation of a Greek city; and as there were no Greek cities, consequently no *Larissa* in Assyria, before Alexander the Great; it is probable that, the Greeks asking of what city those were the ruins they saw, the Assyrians might answer, *Laresen*, "Of *Resen*;" which word Xenophon expressed by *Larissa*, a more familiar sound to a Greek ear, (Wells).

RESENTMENT, means a strong perception of good or ill, generally a deep sense of injury, and may be distinguished into *anger* and *revenge*. "By anger (says Archdeacon Paley), I mean the pain we suffer upon the receipt of an injury or affront, with the usual effects of that pain upon ourselves. By revenge, the inflicting of pain upon the person who has injured or offended us, further than the just ends of punishment or reparation require. Anger prompts to revenge; but it is possible to suspend the effect when we cannot altogether quell the principle. We are bound also to endeavour to qualify and correct the principle itself. So that our duty requires two different applications of the mind: and for that reason anger and revenge should be considered separately." See REVENGE.

RESERVATION, in law, an action or clause whereby something is reserved, or secured to one's self.

Mental RESERVATION, a proposition which, strictly taken, and according to the natural import of the terms, is false; but, if qualified by something concealed in the mind, becomes true. Mental reservations are the great refuge of religious hypocrites, who use them to accommodate their consciences with their interests: the Jesuits are zealous advocates for mental reservations; yet are they real lies, as including an intention to deceive.

RESERVE, in law, the same with reservation. See RESERVATION.

Body of RESERVE, *or Corps de* RESERVE, in military affairs, the third or last line of an army, drawn up for battle; so called because they are reserved to sustain the rest as occasion requires, and not to engage but in case of necessity.

RESERVOIR, a place where water is collected and reserved, in order to be conveyed to distant places through pipes, or supply a fountain or jet d'eau.

RESET, in law, the receiving or harbouring an outlawed person. See OUTLAWRY.

RESIDENCE, in the canon and common law, the abode of a person or incumbent upon his benefice; and his assiduity in attending on the same.

RESIDENT, a public minister, who manages the affairs of a kingdom or state, at a foreign court. Residents are a class of public ministers, inferior to ambassadors or envoys; but, like them, are under the protection of the law of nations.

RESIDUE, the remainder or balance of an account, debt, or obligation.

RESIGNATION, in general, signifies the implicit submission of ourselves, or of something we possess, to the will of another. In a religious sense it signifies a perfect submission, without discontent, to the will of God. See MORAL PHILOSOPHY.

RESIN, in natural history, a viscid juice oozing either spontaneously, or by incision, from several trees, as the pine, fir, &c. Resins are distinguished from GUMS, by being inflammable, and soluble only in ardent spirits.—A premium for several years has been offered by the London Society for Encouraging Arts, &c. for discovering a mode of reducing the inflammable quality of resin, so as to adapt it to the purposes of making candles; but no such discovery has yet been made.

Elastic RESIN. See CAOUTCHOUC.

Gum RESIN, a substance uniting the properties of gum and resin: of these the instances are numerous.

Red Gum RESIN, is procured from the red gum tree, or eucalyptus resinifera; a tree so large and lofty as to exceed in size the English oak. The wood of the tree is brittle, and of little use but for fire-wood, from the large quantity of resinous gum it contains. The tree is distinguished by having pedunculated flowers, and an acute or pointed conical calyptra. To obtain the juice from this tree incisions are made in the trunk of it, and sometimes upwards of 60 gallons of red resinous juice have been obtained from one of them. "When this juice is dried, it becomes a very powerful astringent gum-resin, of a red colour, much resembling that known in the shops by the name of *kino*, and, for all medical purposes, fully as efficacious. Mr. White (see his "Voyage," App.) administered it to patients

in the dyſentery, which prevailed much ſoon after the landing of the convicts, and in no one inſtance found it to fail. This gum-reſin diſſolves almoſt entirely in ſpirit of wine, to which it gives a blood-red tincture. Water diſſolves about one-ſixth part only, and the watery ſolution is of a bright red. Both theſe ſolutions are powerfully aſtringent."

Yellow Gum RESIN, is procured from the yellow reſin tree, which is as large as the Engliſh walnut tree. The properties of this reſin are equal to thoſe of the moſt fragrant balſams. It exudes from the bark ſpontaneouſly, but more readily if inciſions are made. The colour of it is yellow, and at firſt it is fluid; but after being inſpiſſated in the ſun it becomes ſolid. When burnt on hot coals, it ſmells like a mixture of balſam of Tolu and benzoin, approaching ſomewhat to ſtorax. "It is perfectly ſoluble in ſpirit of wine, but not in water, nor even in eſſential oil of turpentine, unleſs it be digeſted in a ſtrong heat. The varniſh which it makes with either is very weak, and of little uſe. With reſpect to its medicinal qualities, Mr. White (ſee his "Voyage") found it a good pectoral medicine, and very balſamic. It is not obtainable in ſo great abundance as the red gum produced by the eucalyptus reſinifera. The plant which produces the yellow gum ſeems to be perfectly unknown to botaniſts, but Mr. White has communicated no ſpecimens by which its genus or even claſs could be determined."

RESINOUS ELECTRICITY, is that kind of electricity which is produced by exciting bodies of the reſinous kind, and which is generally negative. See ELECTRICITY *paſſim*.

RESISTANCE, or RESISTING *Force*, in philoſophy, denotes, in general, any power which acts in an oppoſite direction to another, ſo as to deſtroy or diminiſh its effect. See MECHANICS, HYDROSTATICS, and PNEUMATICS.

Of all the reſiſtances of bodies to each other, there is none of greater importance than the reſiſtance or reaction of fluids. It is here that we muſt look for a theory of naval architecture; for the impulſe of the air is our moving power, and this muſt be modified ſo as to produce every motion we want by the form and diſpoſition of our ſails; and it is the reſiſtance of the water which muſt be overcome, that the ſhip may proceed in her courſe; and this muſt alſo be modified to our purpoſe, that the ſhip may not drive like a log to leeward, but on the contrary may ply to windward, that ſhe may anſwer her helm briſkly, and that ſhe may be eaſy in all her motions on the ſurface of the troubled ocean. The impulſe of wind and water makes them ready and indefatigable ſervants in a thouſand ſhapes for driving our machines; and we ſhould loſe much of their ſervice did we remain ignorant of the laws of their action: they would ſometimes become terrible maſters, if we did not fall upon methods of eluding or ſoftening their attacks.

We cannot refuſe the ancients a conſiderable knowledge of this ſubject. It was equally intereſting to them as to us; and we cannot read the accounts of the naval exertions of Phœnicia, Carthage, and of Rome, exertions which have not been ſurpaſſed by any thing of modern date, without believing that they poſſeſſed much practical and experimental knowledge of this ſubject. It was not, perhaps, poſſeſſed by them in a ſtrict and ſyſtematic form, as it is now taught by our mathematicians; but the maſter-builders, in their dock-yards, did undoubtedly exerciſe their genius in comparing the forms of their fineſt ſhips, and in marking thoſe circumſtances of form and dimenſion which were *in fact* accompanied with the deſirable properties of a ſhip, and thus framing to themſelves maxims of naval architecture in the ſame manner as we do now. For we believe that our naval architects are not diſpoſed to grant that they have profited much by all the labours of the mathematicians. But the ancients had not made any great progreſs in the phyſico-mathematical ſciences, which conſiſt chiefly in the application of calculus to the phenomena of nature. In this branch they could make none, becauſe they had not the means of inveſtigation. A knowledge of the motions and actions of fluids is acceſſible only to thoſe who are familiarly acquainted with the fluxionary mathematics; and without this key there is no admittance. Even when poſſeſſed of this guide, our progreſs has been very ſlow, heſitating, and devious; and we have not yet been able to eſtabliſh any ſet of doctrines which are ſuſceptible of an eaſy and confident application to the arts of life. If we have advanced further than the ancients, it is becauſe we have come after them, and have profited by their labours, and even by their miſtakes.

Sir Iſaac Newton was the firſt (as far as we can recollect) who attempted to make the motions and actions of fluids the ſubject of mathematical diſcuſſion. He had invented the method of fluxions long before he engaged in his phyſical reſearches; and he proceeded in theſe *ſuâ matheſi facem præferente*. Yet even with this guide he was often obliged to grope his way, and to try various by-paths, in the hopes of obtaining a legitimate theory. Having exerted all his powers in eſtabliſhing a theory of the lunar motions, he was obliged to reſt contented with an approximation inſtead of a perfect ſolution of the problem which aſcertains the motions of three bodies mutually acting on each other. This convinced him that it was in vain to expect an accurate inveſtigation of the motions and actions of fluids, where millions of unſeen particles combine their influence. He therefore caſt about to find ſome particular caſe of the problem which would admit of an accurate determination, and at the ſame time furniſh circumſtances of analogy or reſemblance ſufficiently numerous for giving limiting caſes, which ſhould include between them thoſe other caſes that did not admit of this accurate inveſtigation. And thus, by knowing the limit to which the caſe propoſed did approximate, and the circumſtance which regulated the approximation, many uſeful propoſitions might be deduced for directing us in the application of theſe doctrines to the arts of life.

He therefore figured to himſelf a hypothetical collection of matter which poſſeſſed the characteriſtic property of fluidity, viz. the *quâquâverſum* propagation of preſſure, and the moſt perfect intermobility (pardon the uncouth term) of parts, and which formed a phyſical whole or aggregate, whoſe parts were connected by mechanical forces, determined both in degree and in direction, and ſuch as rendered the determination of certain important circumſtances of their motion ſuſceptible of preciſe inveſtigation. And he concluded, that the laws which he ſhould diſcover in theſe motions muſt have a great analogy with the laws of the motions of real fluids: and from this hypotheſis he deduced a ſeries of propoſitions, which form the baſis of almoſt all the theories of the impulſe and reſiſtance of fluids which have been offered to the public ſince his time.

It muſt be acknowledged, that the reſults of this theory agree but ill with experiment, and that, *in the way in which it has been zealouſly proſecuted by ſubſequent mathematicians*, it proceeds on principles or aſſumptions which are not only gratuitous, but even falſe. But it affords ſuch a beautiful application of geometry and calculus, that mathematicians have been as it were faſcinated by it, and have publiſhed ſyſtems ſo elegant and ſo extenſively applicable, that one cannot help lamenting that the foundation is ſo flimſy. John Bernoulli's theory, in his diſſertation on the communication of motion, and Bouguer's in his *Traité du Navire*, and in his *Theorie du Manœuvre et de la Mâture des Vaiſſeaux*, muſt ever be conſidered as among the fineſt ſpecimens of phyſico-mathematical ſcience which the world has ſeen. And, with all its imperfections, this theory ſtill furniſhes (as was expected by its illuſtrious author) many propoſitions of immenſe practical uſe, they being the limits to which the real phenomena of the impulſe and

resistance of fluids really approximate. So that, when the law by which the phenomena deviate from the theory is once determined by a well chosen series of experiments, this hypothetical theory becomes almost as valuable as a true one. And we may add, that although M, d'Alembert, by treading warily in the steps of Sir Isaac Newton in another route, has discovered a genuine and unexceptionable theory, the process of investigation is so intricate, requiring every finesse of the most abstruse analysis, and the final equations are so complicated, that even their most expert author has not been able to deduce more than one simple proposition (which too was discovered by Daniel Bernouili by a more simple process) which can be applied to any use. The hypothetical theory of Newton, therefore, continues to be the ground work of all our practical knowledge of the subject.

We shall therefore lay before our readers a very short view of the theory, and the manner of applying it. We shall then shew its defects (all of which were pointed out by its great author), and give an historical account of the many attempts which have been made to amend it, or to substitute another: in all which we think it our duty to show, that Sir Isaac Newton took the lead, and pointed out every path which others have taken, if we except Daniel Bernoulli and D'Alembert; and we shall give an account of the chief sets of experiments which have been made on this important subject, in the hopes of establishing an empirical theory, which may be employed with confidence in the arts of life.

We know by experience that force must be applied to a body in order that it may move through a fluid, such as air or water; and that a body projected with any velocity is gradually retarded in its motion, and generally brought to rest. The analogy of nature makes us imagine that there is a force acting in the opposite direction, or opposing the motion, and that this force resides in, or is exerted by the fluid. And the phenomena resemble those which accompany the known resistance of active beings, such as animals. Therefore we give to this supposed force the metaphorical name of RESISTANCE. We also know that a fluid in motion will hurry a solid body along with the stream, and that it requires force to maintain it in its place. A similar analogy makes us suppose that the fluid exerts force, in the same manner as when an active being impels the body before him; therefore we call this the IMPULSION *of a Fluid.* And as our knowledge of nature informs us that the mutual actions of bodies are in every case equal and opposite, and that the observed change of motion is the only indication, characteristic, and measure, of the changing force, the forces are the same (whether we call them impulsions or resistances) when the relative motions are the same, and therefore depend entirely on these relative motions. The force, therefore, which is necessary for keeping a body immoveable in a stream of water, flowing with a certain velocity, is the same with what is required for moving this body with this velocity through stagnant water. To any one who admits the motion of the earth round the sun, it is evident that we can neither observe nor reason from a case of a body moving through still water, nor of a stream of water pressing upon or impelling a quiescent body.

A body in motion appears to be resisted by a stagnant fluid, because it is a law of mechanical nature that force must be employed in order to put any body in motion. Now, the body cannot move forward without putting the contiguous fluid in motion, and force must be employed for producing this motion. In like manner, a quiescent body is impelled by a stream of fluid, because the motion of the contiguous fluid is diminished by this solid obstacle; the resistance, therefore, or impulse, no way differs from the ordinary communications of motion among solid bodies.

Sir Isaac Newton, therefore, begins his theory of the resistance and impulse of fluids, by selecting a case where, although he cannot pretend to ascertain the motions themselves which are produced in the particles of a contiguous fluid, he can tell precisely their mutual ratios.

He supposes two systems of bodies such, that each body of the first is similar to a corresponding body of the second, and that each is to each in a constant ratio. He also supposes them to be similarly situated, that is, at the angles of similar figures, and that the homologous lines of these figures are in the same ratio with the diameters of the bodies. He further supposes, that they attract or repel each other in similar directions, and that the accelerating connecting forces are also proportional; that is, the forces in the one system are to the corresponding forces in the other system in a constant ratio, and that, in each system taken apart, the forces are as the squares of the velocities directly, and as the diameters of the corresponding bodies, or their distances, inversely.

This being the case, it legitimately follows, that if similar parts of the two systems are put into similar motions, in any given instant, they will *continue* to move similarly, each correspondent body describing similar curves, with proportional velocities: for, the bodies being similarly situated, the forces which act on a body in one system, arising from the combination of any number of adjoining particles, will have the same direction with the force acting on the corresponding body in the other system, arising from the combined action of the similar and similarly directed forces of the adjoining correspondent bodies of the other system; and these compound forces will have the same ratio with the simple forces which constitute them, and will be as the squares of the velocities directly, and as the distances, or any homologous lines inversely; and therefore the chords of curvature, having the direction of the centripetal or centrifugal forces, and similarly inclined to the tangents of the curves described by the corresponding bodies, will have the same ratio with the distances of the particles. The curves described by the corresponding bodies will therefore be similar, the velocities will be proportional, and the bodies will be similarly situated at the end of the first moment, and exposed to the action of similar and similarly situated centripetal or centrifugal forces; and this will again produce similar motions during the next moment, and so on for ever. All this is evident to any person acquainted with the elementary doctrines of curvilineal motions, as delivered in the theory of physical astronomy.

From this fundamental proposition, it clearly follows, that if two similar bodies, having their homologous lines proportional to those of the two systems, be similarly projected among the bodies of those two systems with any velocities, they will produce similar motions in the two systems, and will themselves continue to move similarly; and therefore will, in every subsequent moment, suffer similar diminutions or retardations. If the initial velocities of projection be the same, but the densities of the two systems, that is, the quantities of matter contained in an equal bulk or extent, be different, it is evident that the quantities of motion produced in the two systems in the same time will be proportional to the densities; and if the densities are the same, and uniform in each system, the quantities of motion produced will be as the squares of the velocities, because the motion communicated to each corresponding body will be proportional to the velocity communicated, that is, to the velocity of the impelling body; and the number of similarly situated particles which will be agitated will also be proportional to this velocity. Therefore, the whole quantities of motion produced in the same moment of time will be proportional to the squares of the velocities. And lastly, if the densities of the two systems are uniform, or the same through the whole extent of the systems, the number of particles

impelled by fimilar bodies will be as the furfaces of thefe bodies.

Now the diminutions of the motions of the projected bodies are (by Newton's third law of motion) equal to the motions produced in the fyftems; and thefe diminutions are the meafures of what are called the refiftances oppofed to the motions of the projected bodies. Therefore, combining all thefe circumftances, the refiftances are proportional to the fimilar furfaces of the moving bodies, to the denfities of the fyftems through which the motions are performed, and to the fquares of the velocities, jointly.

We cannot form to ourfelves any diftinct notion of a fluid, otherwife than as a fyftem of fmall bodies, or a collection of particles, fimilarly or fymmetrically arranged, the centres of each being fituated in the angles of regular folids. We muft form this notion of it, whether we fuppofe, with the vulgar, that the particles are little globules in mutual contact, or, with the partifans of corpufcular attractions and repulfions, we fuppofe the particles to be kept at a diftance from each other by means of thefe attractions and repulfions mutually balancing each other. In this laft cafe, no other arrangement is confiftent with a quiefcent equilibrium: and in this cafe, it is evident, from the theory of curvilineal motions, that the agitations of the particles will always be fuch, that the connecting forces, in actual exertion, will be proportional to the fquares of the velocities directly, and to the chords of curvature having the direction of the forces inverfely.

From thefe premifes, therefore, we might deduce, in the ftricteft manner, the demonftration of the leading theorem of the refiftance and impulfe of fluids; but the extenfive nature of the fubject would lead us far beyond our limits; for which reafon we muft refer the reader to the articles already fpecified, and to the works of Newton and other philofophers who have confidered the fubjects in detail.

RESOLUTION *of* IDEAS. See LOGIC.

RESOLUTION, in mufic. To *refolve* a difcord or diffonance, fays Rouffeau, is to carry it according to rule into a confonance in the fubfequent chord. There is for that purpofe a procedure prefcribed, both for the fundamental bafs of the diffonant chord, and for the part by which the diffonance is formed.

There is no poffible manner of refolving a diffonance which is not derived from an operation of cadence: it is then by the kind of cadence which we wifh to form, that the motion of the fundamental bafs is determined, (fee CADENCE.) With refpect to the part by which the diffonance is formed, it ought neither to continue in its place, nor to move by disjointed gradations; but to rife or defcend diatonically, according to the nature of the diffonance. Theorifts fay, that major diffonances ought to rife, and minor to defcend; which is not however without exception, fince, in particular chords of harmony, a feventh, although major, ought not to rife, but to defcend, unlefs in that chord which is, very incorrectly, called *the chord of the feventh redundant*. It is better then to fay, that the feventh and all its derivative diffonances ought to defcend; and that the fixth fuperadded, and all its derivative diffonances, fhould rife. This is a rule truly general, and without any exception. It is the fame cafe with the rule of refolving diffonances. There are fome diffonances which cannot be prepared; but there is by no means one which ought not to be refolved.

With refpect to the fenfible note, improperly called a *major diffonance*, if it ought to afcend, this is lefs on account of the rule for refolving diffonances, than on account of that which prefcribes a diatonic procedure, and prefers the fhorteft road; and, in reality, there are cafes, as that of the interrupted cadence, in which this fenfible note does not afcend.

In chords by fuppofition, one fingle chord often produces two diffonances; as the feventh and ninth, the ninth and fourth, &c. Then thefe two diffonances ought to have been prepared, and both muft likewife be refolved; it is becaufe regard fhould be paid to every thing which is difcordant, not only in the fundamental, but even in the continued bafs.

RESOLUTION, in chemiftry, the reduction of a mixed body into its component parts or firft principles, as far as can be done by a proper analyfis.

RESOLUTION, in furgery, the difappearing of any tumour without coming to fuppuration or forming an abfcefs.

RESOLVENTS, in furgery, fuch as are proper for diffipating tumours, without allowing them to come to fuppuration.

RESONANCE, R. SOUNDING, in mufic, &c. a found returned by the air enclofed in the bodies of ftringed inftruments, fuch as lutes, &c or even in thofe of wind inftruments, as flutes, &c.

RESPIRATION, the act of refpiring or breathing the air. Refpiration conftitutes one of thofe functions which are properly termed *vital*, as being effential to life; for to live and to breathe are in fact fynonymous terms. It confifts in an alternate contraction and dilatation of the thorax, by firft infpiring air into the lungs, and then expelling it from them in exfpiration.

It will perhaps be eafy to diftinguifh and point out the feveral phenomena of refpiration; but to explain their phyfical caufe will be attended with difficulty: for it will naturally be inquired, how the lungs, when emptied of their air, and contracted by exfpiration, become again inflated, they themfelves being perfectly paffive?—How the ribs are elevated in oppofition to their own natural fituation? and why the diaphragm is contracted downwards towards the abdomen? Were we to affert, that the air, by forcing its way into the cavity of the lungs, dilated them, and confequently elevated the ribs and preffed down the diaphragm, we fhould fpeak erroneoufly. What induces the firft infpiration it is not eafy to afcertain; but after an animal has once refpired, it would feem likely that the blood, after exfpiration, finding its paffage through the lungs obftructed, becomes a ftimulus, which induces the intercoftal mufcles and the diaphragm to contract, and enlarge the cavity of the thorax, in confequence perhaps of a certain nervous influence, which we will not here attempt to explain. The air then rufhes into the lungs; every branch of the bronchial tubes, and all the cellular fpaces into which they open, become fully dilated; and the pulmonary veffels being equally diftended, the blood flows through them with eafe. But as the ftimulus which firft occafioned this dilatation ceafes to operate, the mufcles gradually contract, the diaphragm rifes upwards again and diminifhes the cavity of the cheft, the ribs return to their former ftate, and, as the air paffes out in exfpiration, the lungs gradually collapfe, and a refiftance to the paffage of the blood again takes place. But the heart continuing to receive and expel the blood, the pulmonary artery begins again to be diftended, the ftimulus is renewed, and the fame procefs is repeated, and continues to be repeated in a regular fucceffion during life: for though the mufcles of refpiration, having a mixed motion, are (unlike the heart) in fome meafure dependent on the will, yet no human being, after having once refpired, can live many moments without it. In an attempt to hold one's breath, the blood foon begins to diftend the veins, which are unable to empty their contents into the heart, and we are able only during a very little time to refift the ftimulus to infpiration. In drowning, the circulation feems to be ftopped upon this principle; and in hanging, the preffure made on the jugular veins may co-operate with the ftoppage of refpiration in bringing on death.

Of all the authors who have written concerning refpiration, the ancients are thofe who have had the moft accurate ideas of it. They admitted in the air a principle proper to nourifh and fupport life, which they denoted by the name of *pabulum vitæ*; and Hippocrates exprefsly fays, *fpiritus etiam alimentum eft*.

This idea, which was connected with no hypothesis, has been successively replaced by systems void of all foundation. Sometimes the air has been considered as a stimulus in the lungs, which kept up the circulation by its continual action. Vide Haller.—Sometimes the lungs have been considered as bellows designed to cool the body, heated by a thousand imaginary causes: and when it was proved that the volume of air was diminished in the lungs, it was thought to be an explanation of every difficulty, to say that the air was deprived of its spring.

At this day, however, we are enabled to throw some light on one of the most important functions of the human body. In order to proceed with more perspicuity, we shall reduce our notions to several principles. 1. No animal can live without the assistance of air. This fact is universally admitted; but it has not been known until lately that the faculty which the air possesses of answering the purpose of respiration, arises only from one of the principles of atmospheric air, known by the name of vital air. 2. All animals do not require the same purity in the air. Birds, as well as men, and the greatest part of quadrupeds, require a very pure air; but those which live in the earth, or which hide themselves in a state of stupefaction during the winter, can subsist by means of a less pure air. 3. The manner of respiring the air is different in the several subjects. In general, nature has given to animals an organ, which by its involuntary dilatation and contraction receives and expels the fluid in which the animal moves and exists. This organ is more or less perfect, more or less concealed and defended from external injury, according to its importance and influence upon the life of the creature, as Mr. Broussonet has observed.

Amphibious animals respire by means of lungs: but they can suspend their motion even whilst they are in the air; as has been observed with regard to frogs, which stop their respiration at pleasure.

The manner of respiration in fishes is very different; these animals come from time to time to inhale the air at the surface of the water, where they fill their vesicle, and digest it afterwards at their ease.

Insects with tracheæ exhibit organs still more remote from ours in their construction. In these animals, respiration is effected by the tracheæ distributed along the body. They accompany all the vessels, and terminate by losing themselves in insensible pores at the surface of the skin.

These insects appear to exhibit several very evident points of analogy with vegetables. 1. Their respiratory organs are formed in the same manner, being disposed through the whole body of the vegetable and the animal. 2. Insects do not require a great degree of purity in the air; and plants are nourished with atmospherical mephitis. 3. Both the one and the other transpire vital air. The abbé Fontana discovered several insects in stagnant waters, which, when exposed to the sun, afforded vital air: and the green matter which is formed in stagnant waters, and is by Dr. Priestley placed among the confervæ, in conformity with the opinion of his friend Mr. Bewley—which Mr. Senebier has supposed to be the *conferva cespitosa filis rectis undique divergentibus Halleri*, and which has appeared to Dr. Ingenhousz to be nothing else but a mass of animalcula—affords a prodigious quantity of this air when exposed to the sun. 4. Insects likewise afford, by chemical analysis, principles similar to those of plants, such as resins, volatile oils, &c.

Animals with lungs respire only by virtue of the oxygen or vital air which surrounds them. Any gas deprived of this mixture becomes immediately improper for respiration; and this function is exercised with so much the greater liberty, as vital air exists in a greater proportion in the air respired.

It now remains to examine what are the changes produced by respiration. 1. In the air. 2. In the blood.

I. The gas emitted by expiration is a mixture of nitrogen gas, carbonic acid, and vital air. If the air which issues from the lungs be made to pass through lime-water, it renders it turbid; if it be received through tincture of turnsole, it reddens it; and if a pure alkali be substituted instead of the tincture of turnsole, it becomes effervescent.

When the carbonic acid has been absorbed by the foregoing process, the remainder of this air consists of nitrogen gas and vital air. The vital air is shown to be present by means of nitrous air. The air in which I had caused five sparrows to perish, afforded seventeen hundredth parts of vital air. After having thus deprived the expired air of all its vital air, and all its carbonic acid, the remainder is nitrogen gas.

It has been observed that frugivorous animals vitiate the air less than carnivorous animals.

A portion of the air is absorbed in respiration. Borelli formerly took notice of this; and Dr. Jurin had calculated that a man inspired forty cubic inches of air in his usual inhalations, and that in the greatest he could receive two hundred and twenty inches; but that a portion was always absorbed. The celebrated Dr. Hales endeavoured to determine this absorption more strictly, and he estimated it at a sixty-eighth of the total of the respired air: but he did not consider it as more than a hundred and thirty-sixth, on account of errors which he supposed to have taken place. Now a man respires twenty times in a minute, and inhales forty cubic inches of air at each inspiration: this makes forty-eight thousand per hour; which, divided by one hundred and thirty-six, gives about three hundred and fifty-three inches of air absorbed and destroyed in the hour. The process of Hales is not exact; because he passed the air expired through the water, which must have retained a sensible proportion. From more accurate experiments, Mr. de la Metherie has proved that three hundred and sixty cubic inches of vital air are absorbed in an hour.

This fact affords a proof of the facility with which air is vitiated by respiration when it is not renewed, and shows why the air of theatres is in general so unwholesome.

II. The first effect which the air appears to produce upon the blood is, that of giving it a vermilion colour. If the blackish venous blood be exposed in a pure atmosphere, it becomes of a vermilion colour at its surface: this fact is daily observed when blood is suffered to remain exposed in a porringer to the air. Air which has remained in contact with blood, extinguishes candles, and precipitates lime-water. Air injected into a determinate portion of a vein between two ligatures, renders the blood of a higher colour, according to the fine experiments of Dr. Hewson.

The blood which returns from the lungs is of a higher colour, according to the observations of Messrs. Cigna, Hewson, &c. Hence arises the great intensity of the colour of arterial blood, compared with venous blood.

Mr. Thouvenel has proved that by withdrawing the air which is in contact with the blood, it may be again made to lose its colour.

Mr. Beccaria exposed blood in a vacuum, where it remained black, but assumed the most beautiful vermilion-colour as soon as it was again exposed to the air. Mr. Cigna covered blood with oil, and it preserved its black colour.

Dr. Priestley caused the blood of a sheep to pass successively into vital air, common air, mephitic air, &c. and he found that the blackest parts assumed a red colour in respirable air, and that the intensity of this colour was in proportion to the quantity of vital air present. The same philosopher filled a bladder with blood, and exposed it to pure air. That por-

tion of blood which touched the furface of the bladder, became red, while the internal part remained black; an abforption of air therefore took place through the bladder, in the fame manner as when the contact is immediate.

All thefe facts incontestably prove that the vermilion-colour affumed by the blood in the lungs is owing to the oxygen which combines with it.

The experiments of the late Dr. Adair Crauford have fhown that the fecond effect of refpiration is to eftablifh a real focus of heat in the lungs; which is a circumftance very oppofite to the precarious and ridiculous notion of thofe who have confidered the lungs as a kind of bellows defigned to cool the human body. Two celebrated phyficians, Hales and Boerhaave, have obferved that the blood acquired heat in paffing through the lungs; and modern phyfiologifts have eftimated this augmentation of heat at eleven hundredths. The heat in each clafs of individual animals is proportioned to the magnitude of their lungs, according to Meffrs. De Buffon and Brouffonnet.

Ancient and modern facts indeed unite to prove that a fupply of heat really is maintained and kept up by the action of the lungs in refpiration. We are able, at prefent, to explain all thefe phenomena. In fact there is an abforption of vital air in refpiration. Refpiration then may be confidered as an operation by means of which vital air paffes continually from the gafeous to the concrete ftate; it muft therefore at each inftant abandon the heat which held it in folution, and in the ftate of gas. This heat produced at every infpiration muft be proportioned to the volume of the lungs, to the activity of this organ, to the purity of the air, the rapidity of the infpirations, &c. Hence it follows that, during the winter, the heat produced muft be more confiderable, becaufe the air is more condenfed, and exhibits more vital air under the fame volume. By the fame reafon, refpiration ought to produce more heat in the inhabitants of northern climates; and this is one of the caufes prepared by nature to temperate, and continually balance, the extreme cold of thefe climates. It follows likewife that the lungs of afthmatic perfons are lefs capable of digefting the air: and it has been faid that they emit the air without vitiating it; from which caufe their complexion is cold, and their lungs continually languifhing; vital air is therefore wonderfully comfortable to them. It may be eafily conceived from thefe principles why the heat of animals is proportioned to the volume of their lungs; and why thofe which have only one auricle, and one ventricle, have cold blood, &c. See Air, Blood, and Putrefaction, *paffim*.

Respiration *of Fifhes*. See Ichthyology.

RESPITE, in law, fignifies a delay, forbearance, or prolongation of time, granted to any one for the payment of a debt or the like. See Reprieve.

RESPONDENT, in the fchools, one who maintains a thefis in any art or fcience; who is thus called from his being to anfwer all the objections propofed by the opponent.

RESPONDENTIA. See Bottomry.

RESPONSE, an anfwer or reply. A word chiefly ufed in fpeaking of the anfwers made by the people to the prieft, in the litany, the pfalms, &c.

RESSORT, a French word, fometimes ufed by Englifh authors to fignify the jurifdiction of a court, and particularly one from which there is no appeal. Thus it is faid that the houfe of lords judge *en dernier reffort*, or in the laft reffort.

REST is the continuance of a body in the fame place, or its continual application or contiguity to the fame parts of the ambient or contiguous bodies; and therefore is oppofed to motion. See the article Motion.

Rest, in poetry, is a fhort paufe of the voice in reading, being the fame with the cæfura, which, in Alexandrine verfes, falls on the fixth fyllable; but, in verfes of 10 or 11 fyllables, falls on the fourth. See Poetry.

REST-HARROW, or Cammock, the *Ononis Arvenfis*. A decoction of this plant has been much recommended to horfes labouring under a ftoppage of urine. It is the peft of fome corn-fields; but in its younger ftate, before the plant has acquired its thorns, it is a moft acceptable food to fheep.

RESTAURATION, the act of re-eftablifhing or fetting a thing or perfon in its former good ftate.

RESTIO, in botany; a genus of the triandria order, belonging to the diœcia clafs of plants. The male calyx is an ovate fpike of membranaceous fcales; the corolla is proper, hexapetalous, and perfiftent. The female calyx and corolla are as in the male; the germen is roundifh, and fex-fulcated; there are three erect and perfiftent ftyles; the capfule is roundifh, with fix plaits, and is roftrated and trilocular; the feeds are oblong and cylindrical.

RESTITUTION, in a moral and legal fenfe, is reftoring a perfon to his right, or returning fomething unjuftly taken or detained from him.

Restitution *of Medals*, or *Reftituted Medals*, is a term ufed by antiquaries for fuch medals as were ftruck by the emperors, to retrieve the memory of their predeceffors. Hence, in feveral medals, we find the letters rest. This practice was firft begun by Claudius, by his ftriking afrefh feveral medals of Auguftus. Nero did the fame; and Titus, after his father's example, ftruck reftitutions of moft of his predeceffors. Gallienus ftruck a general reftitution of all the preceding emperors on two medals; the one bearing an altar, the other an eagle, without the reft.

RESTIVE, or Resty, in the manege, a ftubborn, unruly, ill-broken horfe, that ftops, or runs back, inftead of advancing forward.

RESTORATION, the fame with reftauration. See Restauration. In England the return of king Charles II. in 1660, is, by way of eminence, called the *Reftoration*; and the 29th of May is kept as an anniverfary feftival, in commemoration of that event, by which the regal and epifcopal government was reftored.

RESTORATIVE, in medicine, a remedy proper for reftoring and retrieving the ftrength and vigour both of the body and animal fpirits. All under this clafs, fays Quincy, are rather nutrimental than medicinal; and are more adminiftered to repair the waftes of the conftitution, than to alter and rectify its diforders.

RESTRICTION, among logicians, is limiting a term, fo as to make it fignify lefs than it ufually does.

RESTRINGENT, in medicine, the fame with aftringent. See Astringents.

RESULT, what is gathered from a conference, inquiry, meditation, or the like; or the conclufion and effect thereof.

RESURRECTION, in theology, rifing again from the dead; or a perfon's returning to a fecond life, with new bodily organs adapted to the ftate of its new exiftence.

One of the greateft arguments for the truth of Chriftianity is drawn from the refurrection of our Saviour: the circumftances of which are handed down to us in fo plain and diftinct a manner by the Evangelifts, as make the evidence of this important truth amount to a demonftration.

Chriftians generally believe that, at the day of judgment, the very identical body they have now, with the fame flefh, blood, and bones, will be raifed from the dead. But, in oppofition to this opinion, many texts of Scripture have been urged, particularly the account given of this important event by St. Paul; befides feveral philofophical objections, the principal of which are thefe:

That the fame fubftance may happen to be a part of two or more bodies: thus a fifh feeding on a man, and another man afterwards feeding on the fifh, part of the body of the firft man becomes incorporated with the fifh, and afterwards with the body of the laft man. Again, inftances have been known of one man's immediately feeding on the body of another; and among the cannibals in the Weft Indies, who devour their enemies, the practice is frequent. Now it is alleged, where the fubftance of one is thus converted into the fubftance of another, each cannot arife with his whole body; to which then fhall the common part be allotted?

To this objection fome anfwer, That as all matter is not capable of being affimilated to the body, and incorporated with it, human flefh may very probably be of this kind; and therefore what is thus eaten, may be again excreted and carried off.

But Mr. Leibnitz obferves, that all that is effential to the body, is the original ftamen, which exifted in the femen of the father: that this may be conceived as the moft minute point imaginable, and therefore not to be feparated, nor any part of it united to the ftamen of any other man: that all this bulk which we fee in the body, is only an accretion to this original ftamen; and therefore there is no reciprocation of the proper matter of the human body.

Another objection is, that we know, by the late difcoveries in the animal œconomy, that the human body is continually changing, and that a man has not entirely the fame body today as he had yefterday; and it is even computed, that in lefs than feven years time the whole body undergoes a change. Which of thofe many bodies, then, which the fame perfon has in the courfe of his life, is it that fhall rife? or does all the matter that has ever belonged to him rife again? or does only fome particular fyftem thereof? the body, for example, he had at 20. at 40, or at 60 years old? If only this or that body arife, how fhall it be rewarded or punifhed for what was done by the other? and with what juftice does one perfon fuffer for another?

To this it has been anfwered, on the principles of Leibnitz, that, notwithftanding thefe fucceffive changes, this ftamen, which is the only effential part of the body, has always remained the fame; and that, on Mr. Locke's principles, perfonal identity, or the famenefs of a rational being, confifts in felf-confcioufnefs, in the power of confidering itfelf the fame thing in different times and places. By this, every one is to himfelf what he calls felf; without confidering whether that felf be continued in the fame, or in feveral fubftances. It is the fame felf now it was then; and it was by the fame felf which now reflects on an action, that that action was performed. Now it is this perfonal indentity that is the object of rewards and punifhments, which it is obferved may exift in different fucceffions of matter; fo that to render the rewards and punifhments juft and pertinent, we need only to rife again with fuch a body, as that we retain the confcioufnefs of our paft actions.

RESUSCITATION, the fame with refurrection and revivification. See the preceding article and Reanimation. The term *refufcitation*, however, is more particularly ufed by chemifts for the reproducing a mixed body from its afhes; an art to which many have pretended, as to reproduce plants, &c. from their afhes.

RETAIL, in commerce, is the felling of goods in fmall parcels, in oppofition to wholefale. See Commerce.

RETAINER, a fervant who does not continually dwell in the houfe of his mafter, but only attends upon fpecial occafions.

RETAINING fee, the firft fee given to a ferjeant or counfellor at law, in order to make him fure, and prevent his pleading on the contrary fide.

RETALIATION, among civilians, the act of returning like for like.

RETARDATION, in phyfics, the act of diminifhing the velocity of a moving body. See Gunnery, Mechanics, Pneumatics, and Projectiles.

RETE mirabile, in anatomy, a fmall plexus or net-work of veffels in the brain, furrounding the pituitary gland.

RETENTION is defined by Mr. Locke to be a faculty of the mind, whereby it keeps or retains thofe fimple ideas it has once received, by fenfation or reflection. See Metaphysics.

Retention is alfo ufed, in medicine, &c. for the ftate of contraction in the folids or vafcular parts of the body, which makes them hold faft their proper contents. In this fenfe, retention is oppofed to evacuation and excretion.

RETICULAR body *(corpus reticulare)*, in anatomy, a very fine membrane, perforated, in the manner of a net, with a multitude of foramina. It is placed immediately under the cuticle; and, when that is feparated from the cutis, whether by art or accident, this adheres firmly to it, and is fcarce poffible to be parted from it, feeming rather to be its inner fuperficies than a diftinct fubftance. In regard to this, we are to obferve, firft, the places in which it is found, being all thofe in which the fenfe of feeling is moft acute, as in the palms of the hands, the extremities of the fingers, and on the foles of the feet. The tongue, however, is the part where it is moft accurately to be obferved: it is more eafily diftinguifhable there than anywhere elfe, and its nature and ftructure are moft evidently feen there. Its colour in the Europeans is white; but in the negroes and other black nations it is black; in the tawney it is yellowifh: the fkin itfelf in both is white; and the blacknefs and yellownefs depend altogether on the colour of this membrane. The ufes of the corpus reticulare are to preferve the ftructure of the other parts of the integuments, and keep them in their determinate form and fituation. Its apertures give paffage to the hairs and fweat through the papillæ and excretory ducts of the fkin: it retains thefe in a certain and determinate order, that they cannot be removed out of their places, and has fome fhare in preferving the foftnefs of the papillæ, which renders them fit for the fenfe of feeling. See Anatomy.

Reticulum, is a Latin word, fignifying a *little* or *cafting net*. It was applied by the Romans to a particular mode of conftructing their buildings. In the city of Salino (fee Salino) are ftill to be feen remains of fome walls, evidently of Roman origin from the *reticulum*. This ftructure confifts of fmall pieces of baked earth cut lozengewife, and difpofed with great regularity on the angles, fo as to exhibit to the eye the appearance of cut diamonds; and was called *reticular*, from its refemblance to fifhing nets. The Romans always concealed it under a regular coating of other matter; and Mr. Houel informs us, that this was the only fpecimen of it which he faw in all his travels through Sicily, Malta, and Lipari. It appears to be the remains of fome baths which have been built for the convenience of fea-bathing.

RETIMO, the ancient *Rhitymnia* of Stephen the geographer, and called by Ptolemy *Rhitymna*, is a fine city, lying at one end of a rich and fertile plain, on the north coaft of the ifland of Candia. It is but a fmall place, containing fcarce 6000 inhabitants; but it is a bifhop's fee, and the harbour is defended by a citadel, where a bafhaw refides. It was taken by the Turks in 1647, and has been in their hands ever fince. It is about 45 miles from Candia. E. lon. 24. 45. N. lat. 35. 22.

The citadel, which ftands on a rock jutting out into the fea, would be fufficient for the defence of the city, were it not fituated at the foot of a high hill, from which it might be cannonaded with great advantage. The harbour is now almoft filled with fand, and is no longer acceffible to fhipping; nor do the Turks in any meafure oppofe the ravages of time, but behold with a carelefs eye the moft valuable works in a ftate of ruin.

The French had formerly a vice-conſul at Retimo, to which ſhips uſed to repair for cargoes of oil; but they have been long unable to get into the harbour: to repair which, however, and to revive the commerce of Retimo, would be a moſt uſeful attempt. The plains around the city abound in a variety of productions. Great quantities of oil, cotton, ſaffron, and wax, are produced here; and they would be produced in ſtill greater quantities if the inhabitants could export their commodities. The gardens of Retimo bear the beſt fruits in the iſland; excellent pomegranates, almonds, piſtacho nuts, and oranges. The apricot-tree, bearing the michmich, the juice of which is ſo delicious, and its flavour ſo exquiſite, is found here. It is a kind of early peach, but ſmaller and more juicy than thoſe of France.

RETINA, in anatomy, the expanſion of the optic nerves over the bottom of the eye, where the ſenſe of viſion is firſt received. See ANATOMY, and OPTICS.

RETINUE, the attendants or followers of a prince or perſon of quality, chiefly in a journey.

RETIRADE, in fortification, a kind of retrenchment made in the body of a baſtion, or other work, which is to be diſputed, inch by inch, after the defences are diſmantled. It uſually conſiſts of two faces, which make a re-entering angle. When a breach is made in a baſtion, the enemy may alſo make a retirade or new fortification behind it.

RETIREMENT, means a private way of life or a ſecret habitation. "Few (ſays Dr. Knox) are able to bear ſolitude; and though retirement is the oſtenſible object of the greater part, yet, when they are enabled by ſucceſs to retire, they feel themſelves unhappy. Peculiar powers and elegance of mind are neceſſary to enable us to draw all our reſources from ourſelves. In a remote and ſolitary village the mind muſt be internally active in a great degree, or it will be miſerable for want of employment. But in great and populous cities, even while it is paſſive, it will be conſtantly amuſed. It is impoſſible to walk the ſtreets without finding the attention powerfully ſolicited on every ſide. No exertion is neceſſary. Objects pour themſelves into the ſenſes, and it would be difficult to prevent their admittance. But, in retirement, there muſt be a ſpirit of philoſophy and a ſtore of learning, or elſe the fancied ſcenes of bliſs will vaniſh like the colours of the rainbow. Poor Cowley might be ſaid to be melancholy mad. He languiſhed for ſolitude, and wiſhed to hide himſelf in the wilds of America. But, alas! he was not able to ſupport the ſolitude of a country village within a few miles of the metropolis! With a virtuous and cheerful family, with a few faithful and good-humoured friends, with a well-ſelected collection of elegant books, and with a competency, one may enjoy comforts, even in the deſerted village, which the city, with all its diverſions, cannot ſupply."

RETORT, in chemiſtry, an oblong or globular veſſel with its neck bent, proper for diſtillation. See CHEMISTRY.

In the fifth volume of the Tranſactions of the London Society for the Encouragement of Arts, p. 96. we find a paper containing a method for preventing ſtone retorts from breaking; or ſtopping them when cracked, during any chemical operation, without loſing any of the contained ſubject. "I have always found it neceſſary (ſays the writer) to uſe a previous coating for filling up the interſtices of the earth or ſtone, which is made by diſſolving two ounces of borax in a pint of boiling water, and adding to the ſolution as much ſlaked lime as will make it into a thin paſte; this, with a common painter's bruſh, may be ſpread over ſeveral retorts, which when dry are then ready for the proper preſerving coating. The intention of this firſt coating is, that the ſubſtances thus ſpread over, readily vitrifying in the fire, prevent any of the diſtilling matters from pervading the retort, but does in nowiſe prevent it from cracking.

"Whenever I want to uſe any of the above coated retorts; after I have charged them with the ſubſtance to be diſtilled, I prepare a thin paſte, made with common linſeed oil and ſlaked lime well mixed, and perfectly plaſtic, that it may be eaſily ſpread: with this let the retorts be covered all over except that part of the neck which is to be inſerted into the receiver; this is readily done with a painter's bruſh: the coating will be ſufficiently dry in a day or two, and they will then be fit for uſe. With this coating I have for ſeveral years worked my ſtone retorts, without any danger of their breaking, and have frequently uſed the ſame retort four or five times; obſerving particularly to coat it over with the laſt-mentioned compoſition every time it is charged with freſh materials: Before I made uſe of this expedient, it was an even chance, in conducting operations in ſtone and earthen retorts, whether they did not crack every time; by which means great loſs has been ſuſtained. If at any time during the operation the retorts ſhould crack, ſpread ſome of the oil compoſition thick on the part, and ſprinkle ſome powder of ſlacked lime on it, and it immediately ſtops the fiſſure, and prevents any of the diſtilling matter from pervading; even that ſubtile penetrating ſubſtance the ſolid phoſphorus will not penetrate through it. It may be applied without any danger, even when the retort is red hot; and when it is made a little ſtiffer, is more proper for luting veſſels than any other I ever have tried; becauſe if properly mixed it will never crack, nor will it indurate ſo as to endanger the breaking the necks of the veſſels when taken off."

RETRACTS, among horſemen, pricks in a horſe's feet, ariſing from the fault of the farrier in driving nails that are weak, or in driving them ill-pointed, or otherwiſe amiſs.

RETREAT, in a military ſenſe. An army or body of men are ſaid to retreat when they turn their backs upon the enemy, or are retiring from the ground they occupied: hence every march in withdrawing from the enemy is called a *retreat*. That which is done in ſight of an active enemy, who purſues with a ſuperior force, is the moſt important part of the ſubject; and is, with reaſon, looked upon as the glory of the profeſſion It is a manœuvre the moſt delicate, and the propereſt to diſplay the prudence, genius, courage, and addreſs, of an officer who commands: the hiſtorians of all ages teſtify it; and hiſtorians have never been ſo laviſh of eulogiums as on the ſubject of the brilliant retreats of our heroes. If it is important, it is no leſs difficult to regulate, on account of the variety of circumſtances, each of which demands different principles, and an almoſt endleſs detail. Hence a good retreat is eſteemed, by experienced officers, the maſterpiece of a general. He ſhould therefore be well acquainted with the ſituation of the country through which he intends to make it, and careful that nothing is omitted to make it ſafe and honourable. See WAR.

RETREAT, is alſo a beat of the drum, at the firing of the evening gun; at which the drum-major, with all the drums of the battalion, except ſuch as are upon duty, beats from the camp-colours on the right to thoſe on the left, on the parade of encampment: the drums of all the guards beat alſo; the trumpets at the ſame time ſounding at the head of their reſpective troops. This is to warn the ſoldiers to forbear firing, and the centinels to challenge, till the break of day that the reveille is beat. The retreat is likewiſe called *ſetting the watch*.

RETRENCHMENT literally ſignifies ſomething cut off or taken from a thing; in which ſenſe it is the ſame with ſubtraction, diminution, &c.

RETRENCHMENT, in the art of war, any kind of work raiſed to cover a poſt, and fortify it againſt the enemy, ſuch as faſcines loaded with earth, gambions, barrels of earth, ſand-bags, and generally all things that can cover the men and ſtop the enemy. See FORTIFICATION and WAR.

RETRIBUTION, a handſome preſent, gratuity, or acknowledgment, given, inſtead of a formal ſalary or hire, to perſons employed in affairs that do not ſo immediately fall under eſtimation, nor within the ordinary commerce in money.

RETROMINGENTS, in natural hiftory, a clafs or divifion of animals, whofe characteriftic is, that they ftale or make water backwards, both male and female.

RETURN *(returna* or *retorna)*, in law, is ufed in divers fenfes. 1. Return of writs by fheriffs and bailiffs is a certificate made by them to the court, of what they have done in relation to the execution of the writ directed to them. This is written on the back of the writ by the officer, who thus fends the writ back to the court from whence it iffued, in order that it may be filed. 2. Return of a commiffion, is a certificate or anfwer fent to the court from whence the commiffion iffues, concerning what has been done by the commiffioners. 3. Returns, or days in bank, are certain days in each term, appointed for the return of writs, &c. Thus Hilary term has four returns, viz. in the king's-bench, on the day next after the octave, or eighth day after Hilary day: on the day next after the fifteenth day from St. Hilary; on the day after the purification; and on the next after the octave of the purification. In the common pleas, in eight days of St. Hilary: from the day of St. Hilary, in fifteen days: on the day after the purification: in eight days of the purification. Eafter term has five returns, viz. in the king's-bench, on the day next after the fifteenth day from Eafter: on the day next after the three weeks from Eafter: on the day next after one month from Eafter: on the day next after five weeks from Eafter: and on the day next after the day following afcenfion-day. In the common pleas, in fifteen days from the feaft of Eafter: in three weeks from the feaft of Eafter: in one month from Eafter day: in five weeks from Eafter day: on the day after the afcenfion-day. Trinity term has four returns, viz. on the day following the fecond day after Trinity: on the day following the eighth day after Trinity: on the day next after the fifteenth day from Trinity: on the day next after three weeks from Trinity. In the common pleas, on the day after Trinity: in eight days of Trinity: in fifteen days from Trinity: in three weeks from Trinity. Michaelmas term has fix returns, viz. on the day next after three weeks from St. Michael: on the day next after one month of St. Michael: on the day following the fecond day after All-fouls: on the day next after the fecond day after St. Martin: on the day following the octave of St. Martin: on the day next after fifteen days of St. Martin. In the common pleas, in three weeks from St. Michael: in one month from St. Michael: on the day after All-fouls: on the day after St. Martin: on the octave of St. Martin: in fifteen days from St. Martin. It is to be obferved, that, as in the king's-bench, all returns are to be made on fome particular day of the week in each term, care muft be taken not to make the writs out of that court returnable on a non-judicial day; fuch as Sunday, and All-faints, in Michaelmas term, the purification in Hilary, the afcenfion in Eafter, and Midfummer-day, except it fhould fall on the firft day of Trinity term.

RETURNS, in a military fenfe, are of various forts, but all tending to explain the ftate of the army, regiment, or company; namely, how many capable of doing duty, on duty, fick in quarters, barracks, infirmary, or hofpital; prifoners, abfent with or without leave; total effective; wanting to complete the eftablifhment, &c.

RETUSARI, an ifland in Ruffia, is a long flip of land, or rather fand, through the middle of which runs a ridge of granite. It is 20 miles from Peterfburg by water, four from the fhore of Ingria, and nine from the coaft of Carelia. It is about 10 miles in circumference, and was overfpread with firs and pines when Peter firft conquered it from the Swedes. It contains at prefent about 30,000 inhabitants, including the failors and garrifon, the former of whom amount to about 12,000, the latter to 1500 men. The ifland affords a fmall quantity of pafture, produces vegetables, and a few fruits, fuch as apples, currants, goofeberries, and ftrawberries, which thrive in this northern climate.

RETZ (Cardinal de). See GONDI.

RETZIA, in botany; a genus of the monogynia order, belonging to the pentandria clafs of plants, and to the 29th natural order, *Campanaceæ*. The capfule is bilocular, the corolla cylindrical, and villous without; the ftigma bifid.

REUTLINGEN, a handfome, free, and imperial town of Germany, in the circle of Suabia, and duchy of Wirtemberg; feated in a plain on the river Efchez, near the Necker, adorned with handfome public buildings, and has a well frequented college. E. lon. 9. 10. N. lat. 48. 31.

REVE, REEVE, or *Greve*, the bailiff of a franchife, or manor, thus called, efpecially in the weft of England. Hence fhire-reeve, fheriff, port-greve, &c.

REVEILLE, a beat of drum about break of day, to give notice that it is time for the foldiers to arife, and that the fentries are to forbear challenging.

REVEL, a ftrong feaport of Ruffia, capital of the government of Efthonia, with a bifhop's fee. It is furrounded by high walls and deep ditches, and defended by a caftle and good baftions. The houfes are well built, and have very fine gardens. There is a college, with four profeffors; and, in 1733, two churches were allowed to the Proteftants. It is become a place of great trade fince the Ruffians obtained poffeffion of it; and there are two great fairs, in May and September, frequented by Englifh and Dutch merchants. It is feated on the gulf of Finland, partly in a pleafant plain, and partly on a mountain, 85 miles S. E. of Abo, and 133 W. by S. of Peterfburgh. E. lon. 23. 57. N. lat. 59. 20.

REVELATION, the act of revealing, or making a thing public that was before unknown; it is alfo ufed for the difcoveries made by God to his prophets, and by them to the world; and more particularly for the books of the Old and New Teftament. See BIBLE, CHRISTIANITY, MIRACLE, RELIGION, and THEOLOGY. The principal tefts of the truth of any revelation are, the tendency of its practical doctrines; its confiftency with itfelf, and with the known attributes of God; and fome fatisfactory evidence that it cannot have been derived from a human fource.

Before any man can receive a written book as a revelation from God, he muft be convinced that God exifts, and that he is poffeffed of almighty power, infinite wifdom, and perfect juftice. Now, fhould a book teaching abfurd or immoral doctrines (as many chapters of the Koran do, and as all the traditionary fyftems of Paganifm did) pretend to be revealed by a God of wifdom and juftice, we may fafely reject its pretenfions without further examination than what is neceffary to fatisfy us that we have not mifunderftood its doctrine. Should a book claiming this high origin, enjoin in one part of it, and forbid in another, the fame thing to be done under the fame circumftances, we may reject it with contempt and indignation; becaufe a being of infinite wifdom can never act capricioufly or abfurdly. Still, however, as it is impoffible for us to know how far the powers of men may reach in the inveftigation or difcovery of ufeful truth, fome further evidence is neceffary to prove a doctrine of divine origin, than its mere confiftency with itfelf, and with the principles of morality; and this evidence can be nothing but the power of working miracles exhibited by him by whom it was originally revealed. In every revelation confirmed by this evidence, many doctrines are to be looked for which human reafon cannot fully comprehend; and thefe are to be believed on the teftimony of God, and fuffered to produce their practical confequences. At this kind of belief the fhallow infidel may fmile contemptuoufly; but it has place in arts and fciences as well as in religion. Whoever avails himfelf of the demonftrations of

Newton, Bernoulli, and others, refpecting the refiftance of fluids, and applies their conclufions to the art of fhip-building, is as implicit a believer, if he underftand not the principles of fluxions, as any Chriftian; and yet no man will fay that his faith is not productive of important practical confequences. He believes, however, in man, while the Chriftian believes in God; and therefore he cannot pretend that his faith refts on a furer foundation.

Mr. Locke, in laying down the diftinct provinces of reafon and faith, obferves, 1. That the fame truths may be difcovered by revelation which are difcoverable to us by reafon. 2. That no revelation can be admitted againft the clear evidence of reafon. 3. That there are many things of which we have but imperfect notions, or none at all; and others, of whofe paft, prefent or future exiftence, by the natural ufe of our faculties we cannot have the leaft knowledge: and thefe, being beyond the difcoverey of our faculties, and above reafon, when revealed, become the proper object of our faith. He then adds, that our reafon is not injured or difturbed, but affifted and improved, by new difcoveries of truth coming from the fountain of knowledge. Whatever God has revealed is certainly true; but whether it be a divine revelation or not, reafon muft judge, which can never permit the mind to reject a greater evidence to embrace what is lefs evident. There can be no evidence that any traditional revelation is of divine original, in the words we receive it, and the fenfe we underftand it, fo clear and fo certain as that of the principles of reafon: and, therefore, nothing that is contrary to the clear and felf-evident dictates of reafon, has a right to be urged or affented to as a matter of faith, wherein reafon has nothing to do.

REVELATION *of St.* JOHN. See APOCALYPSE.

REVELS, entertainments of dancing, mafking, acting comedies, farces, &c. anciently very frequent in the inns of court and in noblemen's houfes, but now much difufed. The officer who has the direction of the revels at court is called the MASTER *of the Revels.*

REVENGE, means the return of injury for injury, and differs materially from that fudden refentment which rifes in the mind immediately on being injured; which, fo far from being culpable when reftrained within due bounds, is abfolutely neceffary for felf-prefervation. Revenge, on the contrary, is a cool and deliberate wickednefs, and is often executed years after the offence was given; and the defire of it is generally the effect of littlenefs, weaknefs, and vice; while, to do right, and to fuffer wrong, is an argument of a great foul, that fcorns to ftoop to fuggefted revenge. The inftitution of law prevents the execution of private revenge, and the growth of civilization fhows its impropriety. Though in modern times a fpecies of revenge is fanctioned by what is called the law of honour, which evades the law of the land indeed, but which is equally mean and difgraceful as the other kinds, and is of confequences equally baneful. See ANGER, DUELLING, and RESENTMENT.

REVENUE, the annual income a perfon receives from the rent of his lands, houfes, intereft of money in the ftocks, &c.

Royal REVENUE, that which the Britifh conftitution hath vefted in the royal perfon, in order to fupport his dignity and maintain his power; being a portion which each fubject contributes of his property, in order to fecure the remainder. This revenue is either *ordinary* or *extraordinary.*

I. The king's *ordinary* revenue is fuch as has either fubfifted time out of mind in the crown; or elfe has been granted by parliament, by way of purchafe or exchange for fuch of the king's inherent hereditary revenues as were found inconvenient to the fubject.—In faying that it has fubfifted time out of mind in the crown, we do not mean that the king is at prefent in the actual poffeffion of the whole of his revenue. Much (nay the greateft part) of it is at this day in the hands of fubjects; to whom it has been granted out from time to time by the kings of England; which has rendered the crown in fome meafure dependent on the people for its ordinary fupport and fubfiftence. So that we muft be obliged to recount, as part of the royal revenue, what lords of manors and other fubjects frequently look upon to be their own abfolute rights; becaufe they and their anceftors are and have been vefted in them for ages, though in reality originally derived from the grants of our ancient princes.

1. The firft of the king's ordinary revenues, which may be taken notice of, is of an ecclefiaftical kind (as are alfo the three fucceeding ones), viz. the cuftody of the temporalities of bifhops. See TEMPORALITIES.

2. The king is entitled to a CORODY, as the law calls it, out of every bifhopric; that is, to fend one of his chaplains to be maintained by the bifhop, or to have a penfion allowed him till the bifhop promotes him to a benefice. This is alfo in the nature of an acknowledgement to the king, as founder of the fee, fince he had formerly the fame corody or penfion from every abbey or priory of royal foundation. It is fuppofed to be now fallen into total difufe; though Sir Matthew Hale fays, that it is due of common right, and that no prefcription will difcharge it.

3. The king alfo is entitled to all the tithes arifing in extraparochial places; though perhaps it may be doubted how far this article, as well as the laft, can be properly reckoned a part of the king's own royal revenue; fince a corody fupports only his chaplains, and thefe extraparochial tithes are held under an implied truft that the king will diftribute them for the good of the clergy in general.

4. The next branch confifts in the firft-fruits and tenths of all fpiritual preferments in the kingdom. See TENTHS.

5. The next branch of the king's ordinary revenue (which, as well as the fubfequent branches, is of a lay or temporal nature) confifts in the rents and profits of the demefne lands of the crown. Thefe demefne lands, *terræ dominicales regis*, being either the fhare referved to the crown at the original diftribution of landed property, or fuch as came to it afterwards by forfeitures or other means, were anciently very large and extenfive; comprifing divers manors, honours, and lordfhips; the tenants of which had very peculiar privileges, when we fpeak of the tenure in ancient demefne. At prefent they are contracted within a very narrow compafs, having been almoft entirely granted away to private fubjects. This has occafioned the parliament frequently to interpofe; and particularly after king William III. had greatly impoverifhed the crown, an act paffed, whereby all future grants or leafes from the crown for any longer term than 31 years, or three lives, are declared to be void; except with regard to houfes, which may be granted for 50 years. And no reverfionary leafe can be made, fo as to exceed, together with the eftate in being, the fame term of three lives, or 31 years; that is, when there is a fubfifting leafe, of which there are 20 years ftill to come, the king cannot grant a future intereft, to commence after the expiration of the former, for any longer term than 11 years. The tenant muft alfo be made liable to be punifhed for committing wafte; and the ufual rent muft be referved, or, where there has ufually been no rent, one-third of the clear yearly value. The misfortune is, that this act was made too late, after almoft every valuable poffeffion of the crown had been granted away for ever, or elfe upon very long leafes; but may be of benefit to pofterity, when thofe leafes come to expire.

6. Hither might have been referred the advantages which were ufed to arife to the king from the profits of his military tenures, to which moft lands in the kingdom were fubject, till the ftatute 12 Car. II. c. 24. which in great meafure abolifhed them all. Hither alfo might have been referred the profitable prerogative of purveyance and pre-emption: which was a right enjoyed by

the crown of buying up proviſions and other neceſſaries, by the intervention of the king's purveyors, for the uſe of his royal houſehold, at an appraiſed valuation, in preference to all others, and even without conſent of the owner: and alſo of forcibly impreſſing the carriages and horſes of the ſubject, to do the king's buſineſs on the public roads, in the conveyance of timber, baggage, and the like, however inconvenient to the proprietor, upon paying him a ſettled price. A prerogative which prevailed pretty generally throughout Europe during the ſcarcity of gold and ſilver, and the high valuation of money conſequential thereupon. In thoſe early times, the king's houſehold (as well as thoſe of inferior lords) were ſupported by ſpecific renders of corn, and other victuals, from the tenants of the reſpective demeſnes; and there was alſo a continual market kept at the palace-gate to furniſh viands for the royal uſe. And this anſwered all purpoſes, in thoſe ages of ſimplicity, ſo long as the king's court continued in any certain place. But when it removed from one part of the kingdom to another (as was formerly very frequently done), it was found neceſſary to ſend purveyors beforehand, to get together a ſufficient quantity of proviſions and other neceſſaries for the houſehold: and, leſt the unuſual demand ſhould raiſe them to an exorbitant price, the powers beforementioned were veſted in theſe purveyors; who in proceſs of time very greatly abuſed their authority, and became a great oppreſſion to the ſubject, though of little advantage to the crown; ready money in open market (when the royal reſidence was more permanent, and ſpecie began to be plenty) being found upon experience to be the beſt proveditor of any. Wherefore, by degrees, the powers of purveyance have declined, in foreign countries as well as our own; and particularly were aboliſhed in Sweden by Guſtavus Adolphus, towards the beginning of the laſt century. And, with us in England, having fallen into diſuſe during the ſuſpenſion of monarchy, king Charles, at his reſtoration, conſented, by the ſame ſtatute, to reſign entirely thoſe branches of his revenue and power: and the parliament, in part of recompenſe, ſettled on him, his heirs, and ſucceſſors, for ever, the hereditary exciſe of 15d. per barrel on all beer and ale ſold in the kingdom, and a proportionable ſum for certain other liquors. So that this hereditary exciſe now forms the ſixth branch of his majeſty's ordinary revenue.

7. A ſeventh branch might alſo be computed to have ariſen from wine licences, or the rents payable to the crown by ſuch perſons as are licenſed to ſell wine by retail throughout Britain, except in a few privileged places. Theſe were firſt ſettled on the crown by the ſtatute 12 Car. II. c. 25. and, together with the hereditary exciſe, made up the equivalent in value for the loſs ſuſtained by the prerogative in the abolition of the military tenures, and the right of pre-emption and purveyance: but this revenue was aboliſhed by the ſtatute 30 Geo. II. c. 19. and an annual ſum of upwards of 7000l. *per annum*, iſſuing out of the new ſtamp-duties impoſed on wine-licences, was ſettled on the crown in its ſtead.

8. An eighth branch of the king's ordinary revenue is uſually reckoned to conſiſt in the profits ariſing from his foreſts. See Forest. Theſe conſiſt principally in the amercements or fines levied for offences againſt the foreſt-laws. But as few, if any, courts of this kind for levying amercements have been held ſince 1632, 8 Car. I. and as, from the accounts given of the proceedings in that court by our hiſtories and law-books, nobody would wiſh to ſee them again revived, it is needleſs to purſue this inquiry any further.

9. The profits ariſing from the king's ordinary courts of juſtice make a ninth branch of his revenue. And theſe conſiſt not only in fines impoſed upon offenders, forfeitures of recognizances, and amercements levied upon defaulters; but alſo in certain fees due to the crown in a variety of legal matters, as, for ſetting the great ſeal to charters, original writs, and other forenſic proceedings, and for permitting fines to be levied of lands in order to bar entails, or otherwiſe to inſure their title. As none of theſe can be done without the immediate intervention of the king by himſelf or his officers, the law allows him certain perquiſites and profits, as a recompenſe for the trouble he undertakes for the public. Theſe, in proceſs of time, have been almoſt all granted out to private perſons, or elſe appropriated to certain particular uſes: ſo that, though our law proceedings are ſtill loaded with their payment, very little of them is now returned into the king's exchequer; for a part of whoſe royal maintenance they were originally intended. All future grants of them, however, by the ſtatute 1 Ann. ſt. 2. c. 7. are to endure for no longer time than the prince's life who grants them.

10. A tenth branch of the king's ordinary revenue, ſaid to be grounded on the conſideration of his guarding and protecting the ſeas from pirates and robbers, is the right to *royal fiſh*, which are whale and ſturgeon: and theſe, when either thrown aſhore, or caught near the coaſts, are the property of the king, on account of their ſuperior excellence. Indeed, our anceſtors ſeem to have entertained a very high notion of the importance of this right; it being the prerogative of the kings of Denmark and the dukes of Normandy; and from one of theſe it was probably derived to our princes.

11. Another maritime revenue, and founded partly upon the ſame reaſon, is that of shipwrecks. See Wreck.

12. A twelfth branch of the royal revenue, the right to mines, has its original from the king's prerogative of coinage, in order to ſupply him with materials; and therefore thoſe mines which are properly royal, and to which the king is entitled when found, are only thoſe of ſilver and gold. See Mine.

13. To the ſame original may in part be referred the revenue of treaſure-trove. See Treasure-*Trove*.

14. Waifs. See Waif.

15. Eſtrays. See Estray. Beſides the particular reaſons, given in the different articles, why the king ſhould have the ſeveral revenues of royal fiſh, ſhipwrecks, treaſure-trove, waifs, and eſtrays, there is alſo one general reaſon which holds for them all; and that is, becauſe they are *bona vacantia*, or goods in which no one elſe can claim a property. And therefore, by the law of nature, they belonged to the firſt occupant or finder; and ſo continued under the imperial law. But, in ſettling the modern conſtitutions of moſt of the governments in Europe, it was thought proper (to prevent that ſtrife and contention which the mere title of occupancy is apt to create and continue, and to provide for the ſupport of public authority in a manner the leaſt burdenſome to individuals) that theſe rights ſhould be annexed to the ſupreme power by the poſitive laws of the ſtate. And ſo it came to paſs, that, as Bracton expreſſes it, "hæc, quæ nullius in bonis "ſunt, et olim fuerunt inventoris de jure naturali, jam efficiuntur "principis de jure gentium."

16. The next branch of the king's ordinary revenue conſiſts in forfeitures of lands and goods for offences; *bona confiſcata*, as they are called by the civilians, becauſe they belonged to the *fiſcus* or imperial treaſury; or, as our lawyers term them, *foris facta*, that is, ſuch whereof the property is gone away or departed from the owner. The true reaſon and only ſubſtantial ground of any forfeiture for crimes conſiſt in this; that all property is derived from ſociety, being one of thoſe civil rights which are conferred upon individuals, in exchange for that degree of natural freedom which every man muſt ſacrifice when he enters into ſocial communities. If, therefore, a member of any national community violates the fundamental contract of his aſſociation, by tranſgreſſing the municipal law, he forfeits his right to ſuch privileges as he claims by that contract; and the ſtate may very juſtly reſume that portion of property, or any part of it, which the laws have before aſſigned him. Hence, in every offence of an atrocious kind, the laws of England have exacted a total confiſcation of the moveables or perſonal eſtate; and, in many

cafes, a perpetual, in others only a temporary, lofs of the offender's immoveables or landed property; and have vefted them both in the king, who is the perfon fuppofed to be offended, being the one vifible magiftrate in whom the majefty of the public refides. See FORFEITURE and DEODAND.

17. Another branch of the king's ordinary revenue arifes from efcheats of lands, which happen upon the defect of heirs to fucceed to the inheritance; whereupon they in general revert to and veft in the king, who is efteemed, in the eye of the law, the original proprietor of all lands in the kingdom.

18. The laft branch of the king's ordinary revenue confifts in the cuftody of idiots, from whence we fhall be naturally led to confider alfo the cuftody of lunatics. See IDIOT and LUNATIC.

This may fuffice for a fhort view of the king's *ordinary* revenue, or the proper patrimony of the crown; which was very large formerly, and capable of being increafed to a magnitude truly formidable: for there are very few eftates in the kingdom that have not, at fome period or other fince the Norman conqueft, been vefted in the hands of the king, by forfeiture, efcheat, or otherwife. But, fortunately for the liberty of the fubject, this hereditary landed revenue, by a feries of improvident management, is funk almoft to nothing; and the cafual profits, arifing from the other branches of the *cenfus regalis*, are likewife almoft all of them alienated from the crown. In order to fupply the deficiencies of which, we are now obliged to have recourfe to new methods of raifing money, unknown to our early anceftors; which methods conftitute,

II. The king's *extraordinary* revenue. For, the public patrimony being got into the hands of private fubjects, it is but reafonable that private contributions fhould fupply the public fervice. Which though it may perhaps fall harder upon fome individuals, whofe anceftors have had no fhare in the general plunder, than upon others, yet, taking the nation throughout, it amounts to nearly the fame; provided the gain by the extraordinary fhould appear to be no greater than the lofs by the ordinary revenue. And perhaps, if every gentleman in the kingdom was to be ftripped of fuch of his lands as were formerly the property of the crown, was to be again fubject to the inconveniences of purveyance and pre-emption, the oppreffion of foreft-laws, and the flavery of feodal tenures; and was to refign into the king's hands all his royal franchifes of waifs, wrecks, eftrays, treafure-trove, mines, deodands, forfeitures, and the like; he would find himfelf a greater lofer than by paying his *quota* to fuch taxes as are neceffary to the fupport of government. The thing, therefore, to be wifhed and aimed at in a land of liberty, is by no means the total abolition of taxes, which would draw after it very pernicious confequences, and the very fuppofition of which is the height of political abfurdity. For, as the true idea of government and magiftracy will be found to confift in this, that fome few men are deputed by many others to prefide over public affairs, fo that individuals may the better be enabled to attend their private concerns; it is neceffary that thofe individuals fhould be bound to contribute a portion of their private gains, in order to fupport that government, and reward that magiftracy, which protects them in the enjoyment of their refpective properties. But the things to be aimed at are wifdom and moderation, not only in granting, but alfo in the method of raifing, the neceffary fupplies; by contriving to do both in fuch a manner as may be moft conducive to the national welfare, and at the fame time moft confiftent with œconomy and the liberty of the fubject; who, when properly taxed, contributes only, as was before obferved, fome part of his property in order to enjoy the reft.

Thefe extraordinary grants are ufually called by the fynonymous names of *aids*, *fubfidies*, and *fupplies*; and are granted by the commons of Great Britain, in parliament affembled. See PARLIAMENT and TAX.

The clear nett produce of the feveral branches of the revenue, after all charges of collecting and management paid, amounted in the year 1786 to about 15,397,000l. fterling, while the expenditure was found to be about 14,477,000l. How thefe immenfe fums are appropriated, is next to be confidered. And this is, firft and principally, to the payment of the intereft of the national debt. See NATIONAL *Debt* and FUNDS.

The refpective produces of the feveral taxes were originally feparate and diftinct funds; being fecurities for the fums advanced on each feveral tax, and for them only. But at laft it became neceffary, in order to avoid confufion, as they multiplied yearly, to reduce the number of thefe feparate funds, by uniting and blending them together; fuperadding the faith of parliament for the general fecurity of the whole. So that there are now only three capital funds of any account, the *aggregate* fund, and the *general* fund, fo called from fuch union and addition; and the *South-fea* fund, being the produce of the taxes appropriated to pay the intereft of fuch part of the national debt as was advanced by that company and its annuitants. Whereby the feparate funds, which were thus united, are become mutual fecurities for each other; and the whole produce of them, thus aggregated, liable to pay fuch intereft or annuities as were formerly charged upon each diftinct fund: the faith of the legiflature being moreover engaged to fupply any cafual deficiencies.

The cuftoms, excifes, and other taxes, which are to fupport thefe funds, depending on contingencies, upon exports, imports, and confumptions, muft neceffarily be of a very uncertain amount; but they have always been confiderably more than was fufficient to anfwer the charge upon them. The furpluffes, therefore, of the three great national funds, the aggregate, general, and South-Sea funds, over and above the intereft and annuities charged upon them, are directed by ftatute 3 Geo. I. c. 7. to be carried together, and to attend the difpofition of parliament; and are ufually denominated the *finking fund*, becaufe originally deftined to fink and lower the national debt. To this have been fince added many other entire duties, granted in fubfequent years; and the annual intereft of the fums borrowed on their refpective credits is charged on, and payable out of, the produce of the finking fund. However, the nett furpluffes and favings, after all deductions paid, amount annually to a very confiderable fum. For, as the intereft on the national debt has been at feveral times reduced (by the confent of the proprietors, who had their option either to lower their intereft or be paid their principal), the favings from the appropriated revenues muft needs be extremely large.

But, before any part of the aggregate fund (the furpluffes whereof are one of the chief ingredients that form the finking fund) can be applied to diminifh the principal of the public debt, it ftands mortgaged by parliament to raife an annual fum for the maintenance of the king's houfehold and the civil lift. For this purpofe, in the late reigns, the produce of certain branches of the excife and cuftoms, the poft-office, the duty on wine-licences, the revenues of the remaining crown-lands, the profits arifing from courts of juftice, (which articles include all the hereditary revenues of the crown), and alfo a clear annuity of 120,000l. in money, were fettled on the king for life, for the fupport of his majefty's houfehold, and the honour and dignity of the crown. And, as the amount of thefe feveral branches was uncertain, (though in the laft reign they were computed to have fometimes raifed almoft a million,) if they did not arife annually to 800,000l., the parliament engaged to make up the deficiency. But his prefent majefty having, foon after his acceffion, fpontaneoufly fignified his confent that his own hereditary revenues might be fo difpofed of as might beft conduce to the utility and fatisfaction of the

public, and having graciously accepted a limited sum, the said hereditary and other revenues are now carried into, and made a part of, the aggregate fund; and the aggregate fund is charged with the payment of the whole annuity to the crown. The limited annuity accepted by his present majesty was at first 800,000 l., but it has been since augmented to 900,000 l. The expenses themselves, being put under the same care and management as the other branches of the public patrimony, produce more, and are better collected than heretofore; and the public is a gainer of upwards of 100,000 l. *per annum* by this disinterested bounty of his majesty.

The sinking fund, though long talked of as the last resource of the nation, proved very inadequate to the purpose for which it was established. Ministers found pretences for diverting it into other channels; and the diminution of the national debt proceeded slowly during the intervals of peace, whilst each succeeding war increased it with great rapidity. To remedy this evil, and restore the public credit, to which the late war had given a considerable shock, Mr. Pitt conceived a plan for diminishing the debt by a fund, which should be rendered unalienable to any other purpose. In the session 1786, he moved that the annual surplus of the revenue above the expenditure should be raised, by additional taxes, from 900,000l. to one million sterling, and that certain commissioners should be vested with the full power of disposing of this sum in the purchase of stock (see FUNDS), for the public, in their own names. These commissioners should receive the annual million by quarterly payments of 250,000l., to be issued out of the exchequer before any other money, except the interest of the national debt itself; by these provisions, the fund would be secured, and no deficiencies in the national revenues could affect it, but such must be separately provided for by parliament.

The accumulated compound interest on a million yearly, together with the annuities that would fall into that fund, would, he said, in 28 years amount to such a sum as would leave a surplus of four millions annually, to be applied, if necessary, to the exigencies of the state. In appointing the commissioners, he should, he said, endeavour to choose persons of such weight and character as corresponded with the importance of the commission they were to execute. The speaker of the house of commons, the chancellor of the exchequer, the master of the rolls, the governor and deputy governor of the bank of England, and the accountant-general of the high court of chancery, were persons who, from their several situations, he should think highly proper to be of the number.

To the principle of this bill no objection was made, though several specious but ill-founded ones were urged against the sufficiency of the mode which the chancellor of the exchequer had adopted for the accomplishment of so great and so desirable an end. He had made it a clause in his bill, that the accumulating million should never be applied but to the purchase of stock. To this clause Mr. Fox objected, and moved that the commissioners therein named should be impowered to accept so much of any future loan as they should have cash belonging to the public to pay for. This, he said, would relieve that distress the country would otherwise be under, when, on account of a war, it might be necessary to raise a new loan: whenever that should be the case, his opinion was, that the minister should not only raise taxes sufficiently productive to pay the interest of the loan, but also sufficient to make good to the sinking fund whatsoever had been taken from it.

If, therefore, for instance, at any future period a loan of six millions was proposed, and there was at that time one million in the hands of the commissioners, in such case they should take a million of the loan, and the *bonus* or *douceur* thereupon should be received by them for the public. Thus government would only have five millions to borrow instead of six; and from such a mode of proceeding, he said, it was evident great benefit would arise to the public.

This clause was received by Mr. Pitt with the strongest marks of approbation, as was likewise another, moved by Mr. Pulteney, enabling the commissioners named in the bill to continue purchasing stock for the public when it is above par, unless otherwise directed by parliament. With these additional clauses the bill was read a third time on the 15th of May, and carried up to the Lords, where it also passed without meeting with any material opposition, and afterwards received the royal assent.

The operation of this bill surpassed perhaps the minister's most sanguine expectation. The fund was ably managed, and judiciously applied; and in 1793 the commissioners had extinguished some millions of the public debt. The war, however, into which the nation was that year involved, and of which there is yet no certain prospect of a near end, has made it necessary to borrow additional sums, so large, that many years of peace must elapse before the operation of the fund can contribute sensibly to the relief of the people. The clear produce of the taxes raised on the people of this country was, in the year 1792, very near 17,000,000l.; and it must henceforth, from the accumulation of the debt, and the enormous expense of the present war, be necessarily rendered greater.

REVENUE, in hunting, a fleshy lump formed chiefly by a cluster of whitish worms on the head of the deer, supposed to occasion the casting of their horns by gnawing them at the root.

REVERBERATION, in physics, the act of a body repelling or reflecting another after its impinging thereon.

REVERBERATION, in chemistry, denotes a kind of circulation of the flame by means of a reverberatory furnace.

REVERBERATORY, or REVERBERATING *Furnace*. See CHEMISTRY, and FURNACE.

REVEREND, a title of respect given to ecclesiastics.—The religious abroad are called *reverend fathers*, and abbesses, prioresses, &c. *reverend mothers*. In England, bishops are *right reverend*, and archbishops *most reverend*. In France, before the Revolution, their bishops, archbishops, and abbots, were all alike *most reverend*. In Scotland the clergy individually are *reverend*, a synod is *very reverend*, and the general assembly is *venerable*.

REVERIE, the same with delirium, raving, or distraction. It is used also for any ridiculous, extravagant imagination, action, or proposition, a chimæra, or vision. But the most ordinary use of the word among English writers, is for a deep disorderly musing or meditation.

REVERSAL *of* JUDGMENT, in law. A judgment may be falsified, reversed, or avoided, in the first place, *without a writ of error*, for matters foreign to or *dehors* the record, that is, not apparent upon the face of it; so that they cannot be assigned for error in the superior court, which can only judge from what appears in the record itself; and therefore, if the whole record be not certified, or not truly certified, by the inferior court the party injured thereby (in both civil and criminal cases) may allege a diminution of the record, and cause it to be rectified. Thus, if any judgment whatever be given by persons who had no good commission to proceed against the person condemned, it is void; and may be falsified by showing the special matter, without writ of error. As, where a commission issues to A and B, and twelve others, or any two of them, of which A or B shall be one, to take and try indictments; and any of the other twelve proceed without the interposition or presence of either A or B: in this case all proceedings, trials, convictions, and judgments, are void for want of a proper authority in the commissioners, and may be falsified upon bare inspection, without the trouble of a writ of error; it being a high misdemeanour in the judges so proceeding,

and little (if any thing) short of murder in them all, in case the person so attainted be executed and suffer death. So likewise if a man purchases land of another; and afterwards the vender is, either by outlawry or his own confession, convicted and attainted of treason or felony previous to the sale or alienation; whereby such land becomes liable to forfeiture or escheat: now, upon any trial, the purchaser is at liberty, without bringing any writ of error, to falsify not only the time of the felony or treason supposed, but the very point of the felony or treason itself; and is not concluded by the confession or the outlawry of the vender, though the vender himself is concluded, and not suffered now to deny the fact, which he has by confession or flight acknowledged. But if such attainder of the vender was by verdict, on the oath of his peers, the alienee cannot be received to falsify or contradict the *fact* of the crime committed; though he is at liberty to prove a mistaken *time*, or that the offence was committed after the alienation, and not before.

Secondly, a judgment may be reversed, *by writ of error*, which lies from all inferior criminal jurisdictions to the court of king's-bench, and from the king's-bench to the house of peers; and may be brought for notorious mistakes in the judgment or other parts of the record: as where a man is found guilty of perjury and receives the judgment of felony, or for other less palpable errors; such as any irregularity, omission, or want of form in the process of outlawry, or proclamations; the want of a proper addition to the defendant's name according to the statute of additions; for not properly naming the sheriff or other officer of the court, or not duly describing where his county-court was held: for laying an offence, committed in the time of the late king, to be done against the peace of the present; and for many other similar causes, which (though allowed out of tenderness to life and liberty) are not much to the credit or advancement of the national justice.—These writs of error, to reverse judgments in case of misdemeanours, are not to be allowed of course, but on sufficient probable cause shown to the attorney-general; and then they are understood to be grantable of common right, and *ex debito justitiæ*. But writs of error to reverse attainders in capital cases are only allowed *ex gratia*; and not without express warrant under the king's sign-manual, or at least by the consent of the attorney-general. These therefore can rarely be brought by the party himself, especially where he is attainted for an offence against the state: but they may be brought by his heir or executor after his death, in more favourable times; which may be some consolation to his family. But the easier and more effectual way is,

Lastly, to reverse the attainder by act of parliament. This may be and hath been frequently done upon motives of compassion, or perhaps the zeal of the times, after a sudden revolution in the government, without examining too closely into the truth or validity of the errors assigned. And sometimes, though the crime be universally acknowledged and confessed, yet the merits of the criminal's family shall after his death obtain a restitution in blood, honours, and estate, or some or one of them, by act of parliament; which (so far as it extends) has all the effect of reversing the attainder, without casting any reflections upon the justice of the preceding sentence. See ATTAINDER.

The effect of falsifying or reversing an outlawry is, that the party shall be in the same plight as if he had appeared upon the *capias*: and, if it be before plea pleaded, he shall be put to plead to the indictment; if after conviction, he shall receive the sentence of the law; for all the other proceedings, except only the process of outlawry for his non-appearance, remain good and effectual as before. But when judgment, pronounced upon conviction, is falsified or reversed, all former proceedings are absolutely set aside, and the party stands as if he had never been at all accused; restored in his credit, his capacity, his blood, and his estates: with regard to which last, though they be granted away by the crown, yet the owner may enter upon the grantee, with as little ceremony as he might enter upon a disseisor.—But he still remains liable to another prosecution for the same offence: for, the first being erroneous, he never was in jeopardy thereby.

REVERSE of a medal, coin, &c. denotes the second or back side, in opposition to the head or principal figure.

REVERSION, in the law of England, has two significations; the one of which is an estate left, which continues during a particular estate in being; and the other is the returning of the land, &c. after the particular estate is ended; and it is further said to be an interest in lands, when the possession of it fails, or where the estate which was for a time parted with, returns to the granters, or their heirs. But, according to the usual definition of a reversion, it is the residue of an estate left in the granter, after a particular estate granted away ceases, continuing in the granter of such an estate. The difference between a remainder and a reversion consists in this, that the remainder may belong to any man except the granter; whereas the reversion returns to him who conveyed the lands, &c.

In order to render the doctrine of reversions easy, we shall give the following table; which shows the present value of one pound, to be received at the end of any number of years not exceeding 40; discounting at the rate of 5, 4, and 3 *per cent.* compound interest.

Years	Value at 5 per ct.	Value at 4 per ct.	Value at 3 per ct.	Years	Value at 5 per ct.	Value at 4 per ct.	Value at 3 per ct.
1	.9524	.9615	.9709	21	.3589	.4388	.5375
2	.9070	.9245	9426	22	.3418	.4219	.5219
3	.8638	.8898	.9151	23	.3255	.4057	.5067
4	.8227	.8548	.8885	24	.3100	.3901	.4919
5	.7835	.8219	.8626	25	.2953	.3757	.4776
6	.7462	.7903	.8375	26	.2812	.3607	.4637
7	.7107	.7599	.8131	27	.2678	.3468	.4502
8	.6768	.7307	.7894	28	.2551	.3335	.4371
9	.6446	.7026	.7664	29	.2429	.3206	.4243
10	.6139	.6756	.7441	30	.2314	.3003	.4120
11	.5847	.6496	.7224	31	.2204	.2965	.4000
12	.5568	.6246	.7014	32	.2099	.2851	.3883
13	.5303	.6006	.6809	33	.1999	.2741	.3770
14	.5051	.5775	.6611	34	.1903	.2636	.3660
15	.4810	.5553	.6419	35	.1813	.2534	.3554
16	.4581	.5339	.6232	36	.1726	.2437	.3450
17	.4363	.5134	.6050	37	.1644	.2343	.3350
18	.4155	.4936	.5874	38	.1566	.2253	.3252
19	.3957	.4746	.5703	39	.1491	.2166	.3158
20	.3769	.4564	.5537	40	.1420	.2083	.3066

The use of the preceding table.—To find the present value of any sum to be received at the end of a given term of years, discounting at the rate of 3, 4, or 5 *per cent.* compound interest. Find by the above table the present value of 1l. to be received at the end of the given term; which multiply by the number of pounds proposed, (cutting off four figures from the product on account of the decimals), then the result will be the value sought: For example, the present value of 10,000l. to be received 10 years hence, and the rate of interest 5 *per cent.* is equal to .6139 × 10,000 = 6139.0000l. or 6139l. Again, the present value of 10,000l. due in ten years, the rate of interest being 3 *per cent.* is .7441 × 10,000 = 7441.

REVERSION *of Series*, in algebra, a kind of reversed operation of an infinite series. See SERIES.

REVIVIFICATION, in chemiftry, a term generally applied to the diftillation of quickfilver from cinnabar.

Commission of REVIEW, is a commiffion fometimes granted, in extraordinary cafes, to revife the fentence of the court of delegates, when it is apprehended they have been led into a material error. This commiffion the king may grant, although the ftatutes 24 and 25 Hen. VIII. declare the fentence of the delegates definitive: becaufe the pope, as fupreme head by the canon law, ufed to grant fuch commiffion of review; and fuch authority as the pope heretofore exerted is now annexed to the crown by ftatutes 26 Hen. VIII. c. 1 and 1 Eliz. c. 1. But it is not matter of right, which the fubject may demand *ex debito juftitiæ*; but merely a matter of favour, and which therefore is often denied.

Review, is the drawing out all or part of the army in line of battle, to be viewed by the king, or a general, that they may know the condition of the troops. At all reviews, the officers fhould be properly armed, ready in their exercife, falute well, in good time, and with a good air; their uniform genteel, &c. The men fhould be clean and well dreffed; their accoutrements well put on; very well fized in their ranks; the ferjeants expert in their duty, drummers perfect in their beatings, and the fifers play correct. The manual exercife muft be performed in good time, and with life; and the men carry their arms well; march, wheel, and form with exactnefs. All manœuvres muft be performed with the utmoft regularity, both in quick and flow time. The firings are generally 36 rounds; viz by companies; by grand divifions; by fub-divifions; obliquely, advancing, retreating; by files; in the fquare; ftreet firings, advancing and retreating; and laftly, a volley. The intention of a review is, to know the condition of the troops, fee that they are complete and perform their exercife and evolutions well.

Review, is alfo applied to literary journals, which give a periodical view of the ftate of literature;—as the Monthly Review, the Critical Review, the Britifh Critic, and London Review, &c.

RE-UNION island, an ifland in the South Sea, difcovered by the French on the 16th December 1773; lying, according to M. de Pages, in latitude 48° 21″, and longitude 66° 47″, the variation of the needle being 30° always towards north-weft. The road and harbour are extremely good, and the latter from 16 to 8 fathoms deep at the very fhore. The coaft on each fide is lofty, but green, with an abrupt defcent, and fwarms with a fpecies of buftards. The penguins and fea-lions, which fwam med on the fands, were nowife alarmed at the approach of thofe who landed; from whence M. de Pages concluded that the country was wholly uninhabited. The foil produces a kind of grafs about five inches long, with a broad black leaf, and feemingly of a rich quality—but there was no veftige of a tree or human habitation. See *Travels round the World* by M. de Pages, Vol. III. chap. viii. and ix.

REVOLUTION, in politics, fignifies a change in the conftitution of a ftate: and is a word of different import from *revolt*, with which it is fometimes confounded. When a people withdraw their obedience from their governors for any particular reafon, without overturning the government, or waging an offenfive war againft it, they are in a ftate of revolt; when they overturn the government and form a new one for themfelves, they effect a *revolution*. That which is termed *the revolution* in Britain is the change which, in 1688, took place in confequence of the forced abdication of king James II. when the Proteftant fucceffion was eftablifhed, and the conftitution reftored to its primitive purity. Of this important tranfaction, which confirmed the rights and liberties of Britons, we have in our hiftories of England a full account. The rife and progrefs of the American revolution, is ftill frefh in the memory of our readers. The Polifh revolution, in all its circumftances, was perhaps the leaft exceptionable of any in the records of hiftory; but with its termination and the lamentable events which have fince annihilated Poland as an independent nation we are all acquainted, as well as with the confequences which have marked the revolution in France.

If the horrible deeds of darknefs which have been acted on the theatre of that devoted country cannot make us contented with the government under which we live, and which has been brought to its prefent ftate of perfection, not by the metaphyfical fpeculations of reclufe philofophers, but by obobfervation and the practical experience of ages, we fhall be confidered by pofterity as a people incapable of inftruction, and deferving of the greateft miferies in which we may be involved.

REVULSION, in medicine, turning a flux of humours from one part to another by bleeding, cupping, friction, finapifms, blifters, fomentations, bathings, iffues, fetons, ftrong purging of the bowels, &c.

REYN (Jan de), an eminent hiftory and portrait painter, born at Dunkirk in 1610. He had the good fortune to be a difciple of Vandyke, was the firft performer in his fchool, and was fo attached to his mafter that he followed him to London, where it is thought he continued as long as he lived. In thefe kingdoms he is moftly known by the name of *Lang Jan*. He died in 1678: and it is imagined that the fcarcity of his works is occafioned by fo many of them being imputed to Vandyke; a circumftance which, if true, is beyond any thing that could be faid in his praife.

REYNOLDS (Sir Joshua), the celebrated painter, was, on July the 16th 1723, born at Plympton, a fmall town in Devonfhire. His father was minifter of the parifh, and alfo mafter of the grammar fchool; and being a man of learning and philanthropy, he was beloved and refpected by all to whom he was known.—Such a man, it will naturally be fuppofed, was affiduous in the cultivation of the minds of his children, among whom his fon Jofhua fhone confpicuous, by difplaying at a very early period a fuperiority of genius, and the rudiments of a correct tafte. Unlike other boys, who generally content themfelves with giving a literal explanation of their author, regardlefs of his beauties or his faults, young Reynolds attended to both thefe, difplaying a happy knowledge of what he read, and entering with ardour into the fpirit of his author. He difcovered likewife talents for compofition, and a natural propenfity to drawing, in which his friends and intimates thought him qualified to excel. Emulation was a diftinguifhing feature in his mind, which his father perceived with the delight natural to a parent; and defigning him for the church, in which he hoped that his talents might raife him to eminence, he fent him to one of the univerfities.

Soon after this period he grew paffionately fond of painting: and, by the perufal of Richardfon's theory of that art, was determined to make it his profeffion through life. At his own earneft requeft, therefore, he was removed to London; and about the year 1742 became a pupil to Mr. Hudfon, who, though not himfelf an eminent painter, was preceptor to feveral who afterwards excelled in the art. One of the firft advices which he gave to Mr. Reynolds was to copy carefully Guercino's drawings. This was done with fuch fkill, that many of the copies are faid to be now preferved in the cabinets of the curious as the originals of that very great mafter.

About the year 1749, Mr. Reynolds went to Italy under the aufpices, and in the company, of the late Lord (then Commodore) Keppel, who was appointed to the command of the Britifh fquadron in the Mediterranean. In this garden of the world, this magic feat of the arts, he failed not to vifit the fchools of the great mafters, to ftudy the productions of dif-

ferent ages, and to contemplate with unwearied attention the various beauties which are characteriftic of each. His labour here, as has been obferved of another painter, was "the labour of love, not the tafk of the hireling;" and how much he profited by it is known to all Europe.

Having remained about two years in Italy, and ftudied the language as well as the arts of the country with great fuccefs, he returned to England, improved by travel and refined by education. On the road to London from the port where he landed, he accidentally found in the inn where he lodged Johnfon's life of Savage; and was fo taken with the charms of compofition, and the mafterly delineation of character difplayed in that performance, that, having begun to read it while leaning with his arm on the chimney-piece, he continued in that attitude infenfible of pain till he was hardly able to raife his hand to his head. The admiration of the work naturally led him to feek the acquaintance of its author, who continued one of his fincereft admirers and warmeft friends till 1784, when they were feparated by the ftroke of death.

The firft thing that diftinguifhed him after his return to his native country, was a full length portrait of Commodore Keppel; which in the polite circles was fpoken of in terms of the higheft encomium, and teftified to what a degree of eminence he had arrived in his profeffion. This was followed by a portrait of Lord Edgecombe, and a few others, which at once introduced him to the firft bufinefs in portrait painting; and that branch of the art he cultivated with fuch fuccefs as will for ever eftablifh his fame with all defcriptions of refined fociety. Having painted fome of the firft-rate beauties of the age, the polite world flocked to fee the graces and the charms of his pencil; and he foon became the moft fafhionable painter, not only in England, but in all Europe. He has indeed preferved the refemblance of fo many illuftrious characters, that we feel the lefs regret for his having left behind him fo few hiftorical paintings; though what he has done in that way fhows him to have been qualified to excel in both departments. The only landfcape, perhaps, which he ever painted, except thofe beautiful and chafte ones which compofe the back grounds of many of his portraits, is "A View on the Thames from Richmond," which in 1784 was exhibited by the Society for Promoting Painting and Defign in Liverpool.

In 1764 Mr. Reynolds had the merit of being the firft promoter of that club, which having long exifted without a name, became at laft diftinguifhed by the appellation of the *Literary Club*. Upon the foundation of the Royal Academy of Painting, Sculpture, and Architecture, he was appointed prefident; and his acknowledged excellence in his profeffion made the appointment acceptable to all the lovers of art. To add to the dignity of this new inftitution, his majefty conferred on the prefident the honour of knighthood; and Sir Jofhua delivered his firft difcourfe at the opening of the Academy on January 2, 1769. The merit of that difcourfe has been univerfally admitted among painters; but it contains fome directions refpecting the proper mode of profecuting their ftudies, to which every ftudent of every art would do well to pay attention. "I would chiefly recommend (fays he), that an implicit obedience to the *rules of art*, as eftablifhed by the practice of the great mafters, fhould be exacted from the young ftudents. That thofe models, which have paffed through the approbation of ages fhould be confidered by them as perfect and infallible guides; as fubjects for their imitation, not their criticifm. I am confident, that this is the only efficacious method of making a progrefs in the arts: and that he who fets out with doubting, will find life finifhed before he becomes mafter of the rudiments. For it may be laid down as a maxim, that he who begins by prefuming on his own fenfe, has ended his ftudies as foon as he has commenced them. Every opportunity, therefore, fhould be taken to difcountenance that falfe and vulgar opinion, that rules are the fetters of genius. They are fetters only to men of no genius; as that armour which, upon the ftrong, becomes an ornament and a defence, upon the weak and misfhapen turns into a load, and cripples the body which it was made to protect."

Each fucceeding year, on the diftribution of the prizes, Sir Jofhua delivered to the ftudents a difcourfe of equal merit with this: and perhaps we do not hazard too much when we fay, that, from the whole collected, the lover of belles lettres and the fine arts will acquire jufter notions of what is meant by tafte in general, and better rules for acquiring a correct tafte, than from multitudes of thofe volumes which have been profeffedly written on the fubject.

In the autumn of 1785 he went to Bruffels, where he expended about 1000l. on the purchafe of paintings, which, having been taken from the different monafteries and religious houfes in Flanders and Germany, were then expofed to fale by the command of the Emperor Jofeph! Gainfborough and he had engaged to paint each other's portrait; and the canvas for both being actually ftretched, Sir Jofhua gave one fitting to his diftinguifhed rival; but, to the regret of every admirer of the art, the unexpected death of the latter prevented all further progrefs.

In 1790 he was anxioufly defirous to procure the vacant profefforfhip of perfpective in the academy for Mr. Bonomi, an Italian architect; but that artift not having been yet elected an affociate, was of courfe no academician, and it became neceffary to raife him to thofe fituations, in order to qualify him for being a profeffor. Mr. Gilpin being his competitor for the affociatefhip, the numbers on the ballot proved equal, when the prefident, by his cafting vote, decided the election in favour of his friend, who was thereby advanced fo far towards the profefforfhip. Soon after this, an academic feat being vacant, Sir Jofhua exerted all his influence to obtain it for Mr. Bonomi; but finding himfelf outvoted by a majority of two to one, he quitted the chair with great diffatisfaction, and next day fent to the fecretary of the academy a formal refignation of the office, which for twenty-one years he had filled with honour to himfelf and his country. His indignation, however, fubfiding, he fuffered himfelf to be prevailed upon to return to the chair, which within a year and a half he was again defirous to quit for a better reafon.

Finding a difeafe of languor, occafioned by an enlargement of the liver, to which he had for fome time been fubject, increafe upon him, and daily expecting the total lofs of fight, he wrote a letter to the academy, intimating his intention to refign the office of prefident on account of bodily infirmities, which difabled him from executing the duties of it to his own fatisfaction. The academicians received this intelligence with the refpectful concern due to the talents and virtues of their prefident; and either then did enter, or defigned to enter, into a refolution honourable to all parties, namely, that a deputation from the whole body of the academy fhould wait upon him, and inform him of their wifh, that the authority and privileges of the office of prefident might be his during his life; declaring their willingnefs to permit the performance of any of its duties which might be irkfome to him by a deputy.

From this period Sir Jofhua never painted more. The laft effort of his pencil was the portrait of the Honourable Charles James Fox, which was executed in his beft ftyle, and fhows that his fancy, his imagination, and his other great powers in the art which he profeffed, remained unabated to the end of his life. When the laft touches were given to this picture, "*The hand of Reynolds fell, to rife no more.*"—On Thurfday, February the 23d, 1792, the world was deprived

of this amiable man and excellent artift at the age of 68 years; a man than whom no one, according to Johnfon, had paffed through life with more obfervation of men and manners. The following character of him is faid to be the production of Mr. Burke:

" His illnefs was long, but borne with a mild and cheerful fortitude, without the leaft mixture of any thing irritable or querulous, agreeably to the placid and even tenor of his whole life. He had from the beginning of his malady a diftinct view of his diffolution, which he contemplated with that entire compofure which nothing but the innocence, integrity, and ufefulnefs of his life, and an unaffected fubmiffion to the will of Providence, could beftow. In this fituation he had every confolation from family tendernefs, which his tendernefs to his family had always merited.

" Sir Jofhua Reynolds was, on very many accounts, one of the moft memorable of men of his time: He was the firft Englifhman who added the praife of the elegant arts to the other glories of his country. In tafte, in grace, in facility, in happy invention, and in the richnefs and harmony of colouring, he was equal to the great mafters of the renowned ages. In portrait he went beyond them; for he communicated to that defcription of the art in which Englifh artifts are the moft engaged, a variety, a fancy, and a dignity, derived from the higher branches, which even thofe who profeffed them in a fuperior manner did not always preferve when they delineated individual nature. His portraits remind the fpectator of the invention of hiftory and the amenity of landfcape. In painting portraits, he appears not to be raifed upon that platform, but to defcend to it from a higher fphere. His paintings illuftrate his leffons, and his leffons feem to be derived from his paintings.

" He poffeffed the theory as perfectly as the practice of his art. To be fuch a painter, he was a profound and penetrating philofopher.

" In full happinefs of foreign and domeftic fame, admired by the expert in the art, and by the learned in fcience, courted by the great, careffed by fovereign powers, and celebrated by diftinguifhed poets, his native humility, modefty, and candour, never forfook him, even on furprife or provocation; nor was the leaft degree of arrogance or affumption vifible to the moft fcrutinizing eye in any part of his conduct or difcourfe.

" His talents of every kind—powerful from nature, and not meanly cultivated in letters—his focial virtues in all the relations and all the habitudes of life, rendered him the centre of a very great and unparalleled variety of agreeable focieties, which will be diffipated by his death. He had too much merit not to excite fome jealoufy, too much innocence to provoke any enmity. The lofs of no man of his time can be felt with more fincere, general, and unmixed forrow."

REZAN, or Rezanskoi, an ancient town of Ruffia, and capital of a duchy of the fame name, with an archbifhop's fee. It was formerly confiderable for its extent and riches: but it was almoft ruined by the Tartars in 1568. The country is populous, and was formerly governed by its own princes. E. lon. 42. 37. N. lat. 54. 54.

RHADAMANTHUS, a fevere judge, and king of Lydia; the poets make him one of the three judges of hell.

RHAGADES, in medicine, denotes chaps or clefts in any part of the body. If feated in the anus, and recent, the patient muft fit ftill, and fit over the fteam of warm water. The epulotic cerate may alfo be applied. If the lips of thefe fiffures are callous, they muft be cut or otherwife treated as to become new ulcerations.

RHAMA, or Rama, an incarnate deity of the firft rank, in Indian mythology. Sir William Jones believes he was the Dionyfos * of the Greeks, whom they named *Bromius*, without knowing why; and *Bugenes*, when they reprefented him *horned*, as well as *Lyaios* and *Eleutherios* the deliverer, and *Triambos* or *Dithyrambos* the triumphant. " Moft of thofe titles (fays Sir William) were adopted by the Romans, by whom he was called *Bruma*, *Tauriformis*, *Liber*, and *Triumphus*; and both nations had records or traditionary accounts of his giving laws to men, and deciding their contefts, of his improving navigation and commerce, and, what may appear yet more obfervable, of his conquering India and other countries with an army of fatyrs, commanded by no lefs a perfonage than Pan; whom Lillius Giraldus, on what authority I know not, afferts to have refided in Iberia 'when he had returned,' fays the learned mythologift, 'from the Indian war, in which he accompanied Bacchus.' It were fuperfluous in a mere effay to run any length in the parallel between this European god and the fovereign of Ayodhya, whom the Hindoos believe to have been an appearance on earth of the preferving power; to have been a conqueror of the higheft renown, and the deliverer of nations from tyrants, as well as of his confort Sita from the giant Ravan king of Lanca; and to have commanded in chief a numerous and intrepid race of thofe large monkeys, which our naturalifts, or fome of them, have denominated Indian fatyrs: his general, the prince of fatyrs, was named *Hanumat*, or "with high cheek bones;" and, with workmen of fuch agility, he foon raifed a bridge of rocks over the fea, part of which, fay the Hindoos, yet remains; and it is probably the feries of rocks to which the Muffulmans or the Portuguefe have given the foolifh name of *Adam's* (it fhould be called *Rama's*) bridge. Might not this army of fatyrs have been only a race of mountaineers, who Rama, if fuch a monarch ever exifted, had civilized? However that may be, the large breed of Indian apes is at this moment held in high veneration by the Hindoos, and fed with devotion by thé Brahmans, who feem in two or three places on the banks of the Ganges to have a regular endowment for the fupport of them: they live in tribes of three or four hundred, are wonderfully gentle (I fpeak as an eye-witnefs), and appear to have fome kind of order and fubordination in their little fylvan polity." The feftival of Rhama is held on the 9th day of the new moon of Chaitra, on which the war of Lanca is dramatically reprefented, concluding with an exhibition of the fire ordeal, by which the victor's wife Sita gave proof of her connubial fidelity. Among the Hindoos there are a variety of very fine dramas of great antiquity on the ftory of Rhama.

There are three Rhamas mentioned in the Indian mythology, who together with Crifhna, the darling god of the Indian women, are defcribed as youths of perfect beauty. The third Rhama is Crifhna's elder brother, and is confidered as the eighth Avatar†, invefted with an emanation of his divine radiance. Like all the Avatars, Rhama is painted

* The learned prefident, whofe death will be lamented by every fcholar, by the orientalift and the divine efpecially, imagines that this would fully appear from comparing together the *Dionyfiaca* of Nonnus and the *Ramayan* of Valmic, the firft poet of the Hindoos. He adds that, in his opinion, Rhama was the fon of Cufh, and that he might have eftablifhed the firft regular government in that part of Afia, in which his exploits are faid to have been performed.

† *Avatar* means the defcent of the deity in his capacity of preferver. The three firft of thefe defcents relate to fome ftupendous convulfion of our globe from the fountains of the deep, and the fourth exhibits the miraculous punifhment of pride and impiety, appearing to refer to the deluge. Three of the others were ordained for the overthrow of tyrants or giants. Of

with gemmed Ethiopian or Parthian coronets; with rays encircling his head, jewels in his ears, two necklaces, one ſtraight and one pendant on his boſom, with dropping gems; garlands of well-diſpoſed many-coloured flowers, or collars of pearls, hanging down below his waiſt; looſe mantles of golden tiſſue or dyed ſilk, embroidered on the hems with flowers, elegantly thrown over one ſhoulder, and folded like ribbands acroſs the breaſt; with bracelets, two on one arm and on each wriſt: all the Avatars are naked to the waiſts, and uniformly with dark azure fleſh, in alluſion probably to the tint of that primordial fluid on which Narayan moved in the beginning of time; but their ſkirts are bright yellow, the colour of the curious pericarpium in the centre of the water-lily.

RHAMNUS, the BUCKTHORN, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 43d order, *Dumoſæ.* The calyx is tubulous, with five minute ſcales ſurrounding the ſtamina; there is no corolla; the fruit is a berry. There are 27 ſpecies; of which the moſt remarkable are, 1. The *catharticus*, or common purging buckthorn, growing naturally in ſome parts of Britain. This grows to the height of 12 or 14 feet, with many irregular branches at the extremities. The leaves are oval-lanceolate, finely ſerrated on the edges, their nerves converging together. The flowers grow in cluſters, one on each footſtalk, white, and in this ſpecies divided into four ſegments; the fruit is a round black berry, containing four ſeeds. The juice of the berries is a ſtrong purgative, and is made uſe of for making the common ſyrup of buckthorn kept in the ſhops. The bark is emetic: the juice of the unripe berries with alum dyes yellow, of the ripe ones a fine green; the bark alſo dyes yellow. The green colour yielded by the berries, called by the French *verde-veſſie*, is much eſteemed by miniature painters. Of this ſpecies there are two varieties, *viz.* the dwarf buckthorn, a ſhrub of about a yard high, of a greeniſh colour, but little ſhow; and the long-leaved dwarf buckthorn, which is a larger ſhrub, with leaves ſomewhat larger, but in other reſpects very ſimilar to the dwarf buckthorn. 2. The *zizyphus* is the ſpecies in which the lac inſect forms its cells, and produces the wax called *gum-lac.* See LACCA. 3. The *lotus* has the leaves, prickles, flowers, and fruit, of the zizyphus or jubeb; only with this difference, that the fruit is here round, ſmaller, and more luſcious, and at the ſame time the branches, like thoſe of the paliurus, are neither ſo much jointed nor crooked. The fruit is in great repute, taſtes ſomething like gingerbread, and is ſold in the markets all over the ſouthern diſtricts of theſe kingdoms. The Arabs call it *aneb enta el ſeedra*, or *the jubeb of the ſeedra;* which Olavus Celſius had ſo high an opinion of, that he has deſcribed it as the dudaim of the ſcriptures. This ſpecies is very common in the Jereede and other parts of Bombay; and has been ſuppoſed by ſome to be the ſame plant with that celebrated by Homer for its enchanting property; though the latter is more generally ſuppoſed to have been a ſpecies of DIOSPYROS (which ſee). It is proper, however, to diſtinguiſh between both theſe ſhrubs and a herb often mentioned by the ancients under the name of *lotus*, which Homer mentions as being fed upon by the horſes of Achilles, and Virgil as proper to increaſe the milk of ſheep (ſee LOTUS). They are alſo different from the Egyptian lotus deſcribed by Herodotus; for which ſee NYMPHÆA. 4. The *frangula*, or berry-bearing alder, is a deciduous ſhrub, a native of England and moſt of the northern parts of Europe, and affords ſeveral varieties. 5. The *Alpine*, rough-leaved frangula, or berry-bearing alder, is alſo a deciduous ſhrub, and native of the Alps. It differs in no reſpect from the common ſort, except that it has no thorns, and that it will grow to be rather taller, with tough, large, and doubly laciniated leaves. The ſmooth-leaved Alpine frangula is a variety of this ſpecies, with ſmooth leaves and of a lower growth. 6. The *paliurus*, or thorn of Chriſt, is a deciduous ſhrub or tree, a native of Paleſtine, Spain, Portugal, and Italy. It will grow to nearly the height of 14 feet, and is armed with ſharp thorns, two of which are at each joint, one of which is about half an inch long, ſtraight, and upright; the other is ſcarcely half that length, and bent backward; and between them is the bud for next year's ſhoot. June is the time of flowering and the flowers are ſucceeded by a ſmall fruit, ſurrounded by a membrane. "This plant (ſays Hanbury) is undoubtedly the ſort of which the crown of thorns for our Bleſſed Saviour was compoſed. The branches are very pliant, and the ſpines of it are at every joint ſtrong and ſharp. It grows naturally about Jeruſalem, as well as in many parts of Judæa; and there is no doubt that the barbarous Jews would make choice of it for their cruel purpoſe. But what further confirms the truth of theſe thorns being then uſed, are the ancient pictures of our Bleſſed Saviour's crucifixion. The thorns of the crown on his head exactly anſwer to thoſe of this tree; and there is great reaſon to ſuppoſe theſe were taken from the earlieſt paintings of the Lord of Life: and even now our modern painters copy from them, and repreſent the crown as compoſed of theſe thorns. Theſe plants, therefore ſhould principally have a ſhare in thoſe parts of the plantation that are more peculiarly deſigned for religious retirement; for they will prove excellent monitors, and conduce to due reflection on and gratitude to "him who hath loved us, and hath waſhed us from our ſins," &c. 7. The *common alaternus* is an evergreen tree, and native of the ſouth of Europe. There are ſeveral varieties of this ſpecies; the moſt remarkable of which are the broad-leaved and the jagged-leaved alaternus, which have all been confounded with the phillyrea. 8. The *infectorius*, or narrow-leaved buckthorn, is an evergreen ſhrub or tree, and native of Spain. It grows to the height of 10 or 12 feet, and ſends forth ſeveral branches from the bottom to the top. They are covered with a blackiſh or dark-coloured bark, and each of them is terminated by a long ſharp thorn. The fruit continues on the trees all winter, making a beautiful appearance among the narrow-cluſtered leaves at that ſeaſon. 9. The *oleoides*, or olive-leaved buckthorn, is an evergreen ſhrub, and native of Spain, and grows to the height of 8 or 10 feet. It ſends forth numerous branches, each of which is terminated by a long ſharp ſpine. The flowers are ſmall, of a whitiſh green colour, and are ſucceeded by round black berries.

RHAMPHASTOS, in ornithology, a genus belonging to the order of picæ. The bill is very large, and ſerrated outwardly. The noſtrils are ſituated behind the baſe of the beak; and in moſt of the ſpecies the feet are toed, and placed two forwards and two backwards. The tongue is long, narrow, and feathered on the edges. Mr. Latham enumerates 15 different ſpecies; of which the toucans are the moſt remarkable, and were formerly divided into four or five varieties, though Mr. Latham makes them diſtinct ſpecies, of which we ſhall only deſcribe that called the red-beaked toucan. See pl. 39. Vol. VIII.

This bird is about the ſize of a jack-daw, and of a ſimilar ſhape, with a large head to ſupport its monſtrous bill: this bill, from

theſe Avatars we have mentioned in the text that Rhama is the eighth; Budha, who appears to have been a reformer of the doctrines contained in Vedas, is the ninth: the tenth Avatar, we are told, is yet to come, and is expected to appear mounted (like the crowned conqueror in the Apocalypſe) on a white horſe, with a ſcimeter blazing like a comet to mow down all incorrigible and impenitent offenders who ſhall then be on the earth.

the angles of the mouth to its point, is ſix inches and a half; and its breadth in the thickeſt part is a little more than two. Its thickneſs near the head is one inch and a quarter; and it is a little rounded along the top of the upper chap, the under ſide being round alſo; the whole of the bill extremely ſlight, and a little thicker than parchment. The upper chap is of a bright yellow, except on each ſide, which is of a fine ſcarlet colour; as is alſo the lower chap, except at the baſe, which is purple. Between the head and the bill there is a black line of ſeparation all round the baſe of the bill; in the upper part of which the noſtrils are placed, and are almoſt covered with feathers; which has occaſioned ſome writers to ſay that the toucan has no noſtrils. Round the eyes, on each ſide of the head, is a ſpace of blueiſh ſkin, void of feathers; above which the head is black, except a white ſpot on each ſide joining to the baſe of the upper chap. The hinder part of the neck, the back, wings, tail, belly, and thighs, are black. The under ſide of the head, throat, and the beginning of the breaſt, are white. Between the white on the breaſt, and the black on the belly, is a ſpace of red feathers, in the form of a new moon, with its horns upwards. The legs, feet, and claws are of an aſh colour; and the toes ſtand like thoſe of parrots, two before and two behind.

It is reported by travellers, that this bird, though furniſhed with ſo formidable a beak, is harmleſs and gentle, being ſo eaſily made tame as to ſit and hatch its young in houſes. It feeds chiefly upon pepper, which it devours very greedily, gorging itſelf in ſuch a manner that it voids it crude and unconcocted. This, however, is no objection to the natives from uſing it again: they even prefer it before that pepper which is freſh gathered from the tree; and ſeem perſuaded that the ſtrength and heat of the pepper is qualified by the bird, and that all its noxious qualities are thus exhauſted.

Whatever be the truth of this report, nothing is more certain than that the toucan lives only upon a vegetable diet; and, in a domeſtic ſtate, to which it is frequently brought in the warm countries where it is bred, it is ſeen to prefer ſuch food to all other. Pozzo, who bred one tame, aſſerts that it leaped up and down, and wagged the tail, and cried with a voice reſembling that of a magpie. It fed upon the ſame things that parrots do; but was moſt greedy of grapes, which being plucked off one by one, and thrown in the air, it would moſt dexterouſly catch before they fell to the ground. Its bill, he adds, was hollow, and upon that account very light, ſo that it had but little ſtrength in ſo apparently formidable a weapon; nor could it peck or ſtrike ſmartly therewith. But its tongue ſeemed to aſſiſt the efforts of this unwieldy machine: it was long, thin, and flat, not unlike one of the feathers on the neck of a dunghill cock; this it moved up and down, and often extended five or ſix inches from the bill. It was of a fleſh colour, and remarkably fringed on each ſide with very ſmall filaments, exactly reſembling a feather.

It is probable that this long tongue has greater ſtrength than the thin hollow beak that contains it. It is likely that the beak is only a kind of ſheath for this peculiar inſtrument, uſed by the toucan, not only in making itſelf a neſt, but alſo in obtaining its proviſion. Nothing is more certain, than that this bird builds its neſt in holes of trees, which have been previouſly ſcooped out for this purpoſe: and it is not very likely that ſo feeble a bill could be very ſerviceable in working upon ſuch hard materials.

Be this as it will, there is no bird ſecures its young better from external injury than the toucan. It has not only birds, men, and ſerpents to guard againſt; but a numerous tribe of monkeys, ſtill more prying, miſchievous, and hungry, than all the reſt. The toucan, however, ſcoops out its neſt into the hollow of ſome tree, leaving only a hole large enough to go in and out at. There it ſits, with its great beak, guarding the entrance; and, if the monkey ventures to offer a viſit of curioſity, the toucan gives him ſuch a welcome, that he preſently thinks proper to pack off, and is glad to eſcape with ſafety.

This bird is only found in the warm climates of South America, where it is in great requeſt, both for the delicacy of its fleſh, which is tender and nouriſhing, and for the beauty of its plumage, particularly the feathers of the breaſt. The ſkin of this part the Indians pluck off, and when dry glue to their cheeks; and this they conſider as an irreſiſtible addition to their beauty.

RHAPIS, in botany: a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the firſt order, *Palmæ*. The calyx is a monophyllous trifid ſpatha; the corolla monopetalous and trifid. There are two ſpecies, *viz.* 1. *Flabelliformis*, or groundratan, a native of China; 2. *Arundinacea*, ſimple-leaved rhapis, a native of Carolina.

RHAPSODI, Rhapsodists, in antiquity, perſons who made a buſineſs of ſinging pieces of Homer's poems. Cuper informs us, that the Rhapſodi were clothed in red when they ſung the Iliad, and in blue when they ſung the Odyſſey. They performed on the theatres, and ſometimes ſtrove for prizes in conteſts of poetry, ſinging, &c. After the two antagoniſts had finiſhed their parts, the two pieces or papers they were written in were joined together again: whence the name *viz.* from ῥαπτω, *ſuo*, and ωδη *canticum*: but there ſeem to have been other Rhapſodi of more antiquity than theſe people, who compoſed heroic poems or ſongs in praiſe of heroes and great men, and ſung their own compoſitions from town to town for a livelihood; of which profeſſion Homer himſelf is ſaid to have been. See Bard.

RHAPSODOMANCY, an ancient kind of divination performed by pitching on a paſſage of a poet at hazard, and reckoning on it as a prediction of what was to come to paſs. There were various ways of practiſing this rhapſodomancy. Sometimes they wrote ſeveral papers or ſentences of a poet on ſo many pieces of wood, paper, or the like, ſhook them together in an urn, and drew out one which was accounted the lot: ſometimes they caſt dice on a table whereon verſes were written, and that whereon the die lodged contained the prediction. A third manner was by opening a book, and pitching on ſome verſe at firſt ſight. This method they particularly called the *ſortes Præneſtinæ*; and afterwards, according to the poet made uſe of, *ſortes Homericæ*, *ſortes Virgilianæ*, &c. See Sortes.

RHAPSODY, in antiquity, a diſcourſe in verſe ſung or rehearſed by a rhapſodiſt. Others will have rhapſody to ſignify a collection of verſes, eſpecially thoſe of Homer, which having been a long time diſperſed in pieces and fragments, were at length by Piſiſtratus's order digeſted into books called *rhapſodies*, from ῥαπτω *ſuo*, and ωδη *canticum*. Hence, among moderns, *rhapſody* is alſo uſed for an aſſemblage of paſſages, thoughts, and authorities, raked together from divers authors, to compoſe ſome new piece.

RHE, or Ree, a little iſland in the Bay of Biſcay, near the coaſt of Aunis in France. It was taken during the war with France which ended in 1763, in the expedition commanded by Hawke and Mordaunt.

RHEA americana. The American oſtrich of authors has been frequently mentioned, but till of late years very imperfectly known; being blended by ſome with other genera, although forming of itſelf a diſtinct one, differing in many things from all others. The older writers, however, have kept it ſeparate. It does not occur to us whether any author has

figured this bird except *Nieremberg*, whose representation conveys no just idea, which is wonderful, as it is to be met with in sufficient plenty in various parts of South America; nor has the bird itself made its appearance in the cabinets of collectors, until the one now in the Leverian musæum.

M. Bajon, in his *Mem. sur Cayenne*, gives a figure and description of the jabirus, and seems clear that this bird is no other than the ostrich of America. From this assertion, Mr. Latham, in his *Synopsis*, leaves the matter undecided; but this author, in his *Index Ornithol.* from having met with the specimen above alluded to, and supported in an account of its manners given by Molina in his *Hist. Nat. du Chili*, treats this matter on more certain grounds, so as to enable us to give the following description.

In size the American ostrich is very little inferior to the common one: the bill is sloped not unlike that of a goose, being flat on the top and rounded at the end; the eyes are black, and the lids furnished with hairs; the head is rounded, and covered with downy feathers; the neck is two feet eight inches long, and feathered also; from the tip of one wing to that of the other extended, the length is eight feet; but from the want of continuity of the webs of the feathers, and their laxity of texture, the bird is unable to raise itself from the ground; it is, however, capable of greatly assisting itself by their motion in running, which it does very swiftly; the legs are stout, bare of feathers above the knees, and furnished with three toes, all placed forwards, each having a straight and stout claw as in the cassowary; on the heel is a callous knob, serving in place of a back toe; the general colour of plumage is dull gray mixed with white, inclining to the latter on the under parts; the tail is very short, and not conspicuous, being entirely covered with long loose and floating feathers, having origin from the lower part of the back and rump, and entirely covering it; the bill and legs are brown.

Molina observes that this bird varies; the body in some being white, in others black. In respect to manners, it is said to be a general feeder, but more fond of flies, which it catches with great dexterity, and will also, like the common ostrich, swallow bits of iron and any other trash offered to it. In common with the ostrich of the old world, it lays a number of eggs, from 40 to 60, in the sand, each of them holding a quart; but it differs from that bird in many particulars, especially in wanting the callosity on the sternum, and spars on the wing. With these last the common ostrich is known to defend itself: in defect of them, the one here treated of uses the feet with such address as to become at once a furious and dangerous antagonist. The female calls its young ones together with a kind of whistling note somewhat similar to that of a man: when young it is very tame, frequently following the first creature it meets with. The flesh of this bird is said to be very unpalatable. It is found in various parts of South America, from Patagonia to Guiana, and is known by the name of *Choique*. We are happy to be able to present our readers with an accurate drawing of the bird. See plate 1.

RHEEDIA, in botany: a genus of the monogynia order, belonging to the polyandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is tetrapetalous; there is no calyx; and the fruit is a trispermous berry.

RHEGIUM (anc. geog.), so very ancient a city as to be supposed to take its name from the violent bursting of the coast of Italy from Sicily; thought to have been formerly conjoined (Mela, Virgil). A city of the Bruttii, a colony of Chalcidians from Eubœa: a strong barrier opposed to Sicily (Strabo); mentioned by Luke; surnamed *Julium* (Ptolemy) from a fresh supply of inhabitants sent thither by Augustus, after driving Sextus Pompeius out of Sicily (Strabo); and thus was in part a colony, retaining still the right of a municipium (Inscription). The city is called *Reggio*, in the Further Calabria.

RHEIMS, an ancient city of France, in the department of Marne and late province of Champagne, with an archbishop's see. The inhabitants are computed to be 30,000. The principal church, built before the year 406, is a very beautiful Gothic structure. That of St. Nicaise, is remarkable for its fine architecture. Behind the high altar of the church of St. Remy, the corpse of that archbishop is preserved in a magnificent shrine. In this church was lately La Sainte Ampoule, which is a small vial filled with a reddish and congealed liquor, which the French of former ages thought to have been brought from heaven; and this holy liquor was used in the coronation of the kings of France, who have been successively crowned at Rheims; probably, because Clovis, the founder of the French monarchy, when converted from paganism, was baptized in the cathedral here, in the year 496. The remains of an amphitheatre, a castle, and a triumphal arch, are among the ancient monuments of the Romans. Rheims is long and narrow, and the houses are low. Here are manufactures of flannel, coverlets, and other woollen stuffs; and the gingerbread is famous. Rheims is seated in a plain, surrounded by hills that produce excellent wine, on the river Vesle, 62 miles north of Troyes, and 75 north-east of Paris. E. lon. 4. 8. N. lat. 49. 15.

RHENISH WINE, that produced on the hills about Rheims. This wine is much used in medicine as a solvent of iron, for which it is well calculated on account of its acidity. Dr. Percival observes that it is the best solvent of the Peruvian bark; in which, however, he thinks its acidity has no share, because an addition of vinegar to water does not augment its solvent power.

RHETORES, amongst the Athenians, were ten in number, elected by lot to plead public causes in the senate-house or assembly. For every cause in which they were retained, they received a drachm out of the public money. They were sometimes called Συνήγοροι, and their fee το Συνηγορικον. No man was admitted to this office before he was 40 years of age, though others say 30. Valour in war, piety to their parents, prudence in their affairs, frugality, and temperance, were necessary qualifications for this office, and every candidate underwent an examination concerning these virtues previous to the election. The orators at Rome were not unlike the Athenian rhetores. See ORATOR.

RHETORIANS, a sect of heretics in Egypt, so denominated from Rhetorius their leader. The distinguishing tenet of this heresiarch, as represented by Philastrius, was, that he approved of all the heresies before him, and taught that they were all in the right.

RHETORIC, the art of speaking copiously on any subject, with all the advantages of beauty and force. See ORATORY.

RHEUM, a thin serous humour, occasionally oozing out of the glands about the mouth and throat.

RHEUM, *Rhubarb*: a genus of the monogynia order, belonging to the enneandria class of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. There is no calyx; the corolla is sexfid and persistent; and there is one triquetrous seed. There are five species, viz. 1. The *rhaponticum*, or common rhubarb, has a large, thick, fleshy, branching, deeply-striking root, yellowish within; crowned by very large, roundish, heart-shaped smooth leaves, on thick, slightly-furrowed, foot-stalks: and an upright strong stem, two or three feet high, adorned with leaves singly, and terminated by thick close spikes of white flowers. It grows in Thrace and

Scythia, but has been long in the Engliſh gardens. Its root affords a gentle purge. It is however of inferior quality to ſome of the following ſorts; but the plant being aſtringent, its young ſtalks in ſpring, being cut and peeled, are uſed for tarts. 2. The *palmatum*, palmated-leaved true Chineſe rhubarb, has a thick fleſhy root, yellow within; crowned with very large palmated leaves, being deeply divided into acuminated ſegments, expanded like an open hand; upright ſtems, five or ſix feet high or more, terminated by large ſpikes of flowers (See plate 56. vol. II.). This is now proved to be the true foreign rhubarb, the purgative quality of which is well known. 3. The *compactum*, or Tartarian rhubarb, has a large, fleſhy, branched root, yellow within; crowned by very large, heart-ſhaped ſomewhat lobated, ſharply indented, ſmooth leaves, and an upright large ſtem, five or ſix feet high, garniſhed with leaves ſingly, and branching above; having all the branches terminated by nodding panicles of white flowers. This has been ſuppoſed to be the true rhubarb; which, however, though of ſuperior quality to ſome ſorts, is accounted inferior to the rheum palmatum. 4. The *undulatum*, undulated, or waved-leaved Chineſe rhubarb, has a thick, branchy, deep-ſtriking root, yellow within; crowned with large, oblong, undulate, ſomewhat hairy leaves, having equal foot-ſtalks, and an upright firm ſtem, four feet high; garniſhed with leaves ſingly, and terminated by long looſe ſpikes of white flowers. 5. The *Arabian ribes*, or currant rhubarb of Mount Libanus, has a thick fleſhy root, very broad leaves, full of granulated protuberances, and with equal foot-ſtalks, and upright firm ſtems, three or four feet high, terminated by ſpikes of flowers, ſucceeded by berry-like ſeeds, being ſurrounded by a purple pulp. All theſe plants are perennial in root, and the leaves and ſtalks are annual. The roots being thick, fleſhy, generally divided, ſtrike deep into the ground; of a browniſh colour without and yellow within: the leaves riſe in the ſpring, generally come up in a large head folded together, gradually expanding themſelves, having thick foot-ſtalks; and grow from one to two feet high, or more, in length and breadth, ſpreading all round: amidſt them riſe the flower-ſtems, which are garniſhed at each joint by one leaf, and are of ſtrong and expeditious growth, attaining their full height in June, when they flower; and are ſucceeded by large triangular ſeeds, ripening in Auguſt. Some plants of each ſort merit culture in gardens for variety; they will effect a ſingularity with their luxuriant foliage, ſpikes, and flowers: and, as medical plants, they demand culture both for private and public uſe.

They are generally propagated by ſeeds ſown in autumn ſoon after they are ripe, or early in the ſpring, in any open bed of light deep earth; remarking, thoſe intended for medical uſe ſhould generally be ſown where they are to remain, that the roots, being not diſturbed by removal, may grow large. Scatter the ſeeds thinly, either by broad-caſt all over the ſurface, and raked well in; or in ſhallow drills a foot and half diſtance, covering them near an inch deep. The plants will riſe in the ſpring, but not flower till the ſecond or third year: when they, however, are come up two or three inches high, thin them to eight or ten inches, and clear out all weeds; though thoſe deſigned always to ſtand ſhould afterwards be hoed out to a foot and a half or two feet diſtance: obſerving, if any are required for the pleaſure-ground, &c. for variety, they ſhould be tranſplanted where they are to remain in autumn, when their leaves decay, or early in ſpring, before they ſhoot: the others remaining where ſown, muſt have the ground kept clean between them; and in autumn, when the leaves and ſtalks decay, cut them down, and ſlightly dig the ground between the rows of plants, repeating the ſame work every year. The roots remaining, they increaſe in ſize annually: and in the ſecond or third year many of them will ſhoot up ſtalks, flower, and perfect ſeeds; and in three or four years the roots will be arrived to a large ſize; though older roots are generally preferable for medical uſe.

In Mr. Bell's Travels we have an account of ſome curious particulars relating to the culture of rhubarb. He tells us that the beſt rhubarb grows in that part of Eaſtern Tartary called *Mongalia*, which now ſerves as a boundary between Ruſſia and China. The marmots contribute greatly to the culture of the rhubarb. Wherever you ſee 10 or 20 plants growing, you are ſure of finding ſeveral burrows under the ſhades of their broad-ſpreading leaves. Perhaps they may ſometimes eat the leaves and roots of this plant; however, it is probable the manure they leave about the roots contributes not a little to its increaſe; and their caſting up the earth, makes it ſhoot out young buds and multiply. This plant does not run, and ſpread itſelf, like docks and others of the ſame kind; but grows in tufts, at uncertain diſtances, as if the ſeeds had been dropped with deſign. It appears that the Mongals never accounted it worth cultivating; but that the world is obliged to the marmots for the quantities ſcattered, at random, in many parts of this country: for whatever part of the ripe ſeed happens to be blown among the thick graſs, can very ſeldom reach the ground, but muſt there wither and die; whereas, ſhould it fall among the looſe earth thrown up by the marmots, it immediately takes root, and produces a new plant.

After digging and gathering the rhubarb, the Mongals cut the large roots into ſmall pieces, in order to make them dry more readily. In the middle of every piece they ſcoop a hole, through which a cord is drawn, in order to ſuſpend them in any convenient place. They hang them for the moſt part about their tents, and ſometimes on the horns of their ſheep. This is a moſt pernicious cuſtom, as it deſtroys ſome of the beſt part of the root: for all about the hole is rotten and uſeleſs; whereas, were people rightly informed how to dig and dry this plant, there would not be one pound of refuſe in a hundred; which would ſave a great deal of trouble and expenſe, that much diminiſh the profits on this commodity. At preſent, the dealers in this article think theſe improvements not worthy of their attention, as their gains are more conſiderable on this than on any other branch of trade. Perhaps the government may hereafter think it proper to make ſome regulations with regard to this matter.

Two ſorts of rhubarb are met with in the ſhops. The firſt is imported from Turkey and Ruſſia, in roundiſh pieces freed from the bark, with a hole through the middle of each: they are externally of a yellowiſh colour, and on cutting appear variegated with lively reddiſh ſtreaks. The other, which is leſs eſteemed, comes immediately from the Eaſt Indies, in longiſh pieces, harder, heavier, and more compact than the foregoing. The firſt ſort, unleſs kept very dry, is apt to grow mouldy and worm-eaten; the ſecond is leſs ſubject to theſe inconveniences. Some of the more induſtrious artiſts are ſaid to fill up the worm-holes with certain mixtures, and to colour the outſide of the damaged pieces with powder of the finer ſorts of rhubarb, and ſometimes with cheaper materials: this is often ſo nicely done, as effectually to impoſe upon the buyer, unleſs he very carefully examines each piece. The marks of good rhubarb are, that it be firm and ſolid, but not flinty; that it be eaſily pulverable, and appear, when powdered, of a fine bright yellow colour; that, upon being chewed, it impart to the ſpittle a ſaffron tinge, without proving ſlimy or mucilaginous in the mouth. Its taſte is ſubacrid, bitteriſh, and ſomewhat aſtringent; the ſmell lightly aromatic.

Rhubarb is a mild cathartic, which operates without violence or irritation, and may be given with ſafety even to pregnant women and children. Beſides its purgative quality, it is

celebrated for an aſtringent one, by which it ſtrengthens the tone of the ſtomach and inteſtines, and proves uſeful in diarhœas and diſorders proceeding from a laxity of the fibres. Rhubarb in ſubſtance operates more powerfully as a cathartic than any of the preparations of it. Watery tinctures purge more than the ſpirituous ones; whilſt the latter contain in greater perfection the aromatic, aſtringent, and corroborating virtues of the rhubarb. The doſe, when intended as a purgative, is from a ſcruple to a drachm or more.

The Turkey rhubarb is, among us, univerſally preferred to the Eaſt India ſort, though this laſt is for ſome purpoſes at leaſt equal to the other; it is manifeſtly more aſtringent, but has ſomewhat leſs of an aromatic flavour. Tinctures drawn from both with rectified ſpirit have nearly the ſame taſte: on diſtilling off the menſtruum, the extract left from the tincture of the Eaſt India rhubarb proved conſiderably the ſtrongeſt.

Rhubarb has been cultivated of late in this country with conſiderable ſucceſs, and for medical purpoſes is found to equal that of foreign growth, as is proved by the Tranſactions of the London Society for encouraging Arts, Manufactures, and Commerce, which has rewarded ſeveral perſons both for cultivating and curing it. In the Tranſactions for 1792, the gold medal was adjudged to Sir William Fordyce, for raiſing from ſeed in the year 1791 upwards of 300 plants of the true rhubarb, or rheum palmatum of the London Pharmacopœia 1788, which in the ſecond and third weeks of October were tranſplanted into a deep loam, four feet diſtant from each other, according to rules laid down by the ſociety. In 1793 it was adjudged to Mr. Thomas Jones, from whoſe papers we derive the following information.

After giving an accurate account of his experiments and obſervations, he concludes, that the ſeaſon for ſowing is the ſpring about March or April, or in autumn about Auguſt and September; that thoſe plants which are raiſed in the ſpring ſhould be tranſplanted in autumn, and *vice verſa*; that they cannot have too much room; that room and time are eſſentially neceſſary to their being large, of a good appearance, and perhaps to the increaſe of their purgative qualities; that to effect theſe purpoſes, the ſoil muſt be light, loamy, and rich, but not too much ſo, leſt the roots ſhould be too fibrous; that their ſituation can ſcarcely be too dry, as more evils are to be expected from a ſuperabundancy of moiſture than any actual want of it: and, laſtly, we may conclude that in particular the injuries which they are ſubject to are principally during their infancy, and to be imputed to inſects and inattention to the planting ſeaſon; afterwards, from too great an expoſure to froſt: but that none can be dreaded from heat; and that in general they are hardy and eaſy of cultivation, when arrived beyond a certain term.

The method of curing rhubarb, as propoſed by Dr. Tirruogel of Stockholm, is as follows: "No roots ſhould be taken up till they have been planted ten years: they ſhould be taken out of the ground either in winter, before the froſt ſets in, or in the beginning of ſpring, and immediately cut into pieces, and carefully barked; let them be ſpread upon a table for three or four days, and be frequently turned, that the juices may thicken or condenſe within the roots. After this proceſs, make a hole in each piece, and put a thread through it; by which let them hang ſeparately, either within doors, or in ſome ſheltered ſhady ſhed. Some perſons dry them in a different way: they incloſe the roots in clay, and make a hole in the clay, about the thickneſs of a gooſe-quill, and in this manner hang up each piece to dry ſeparately, that the moiſture may not evaporate, nor the ſtrength of the root be weakened. But the method which the Tartars follow is a bad one: they dig the roots out of the deſerts where they grow, bark them, and immediately ſtring them, and hang them round the necks of their camels, that they may dry as they travel; but this greatly leſſens the medical virtue of the root."

Mr. Thomas Halley of Pontefract in Yorkſhire, to whom the London Society voted the ſilver medal in 1793, informs us that his father tried various experiments for curing rhubarb, as waſhing, bruſhing, barking, and peeling, and he dried them in the ſun, on a kiln, in a ſtove, or in a warm kitchen. But of the ſucceſs of all or either of theſe methods we have no account, owing to the death of Mr. Halley's father. He ſent, however, to them five different ſpecimens, which the Society acknowledges to be ſuperior to any rhubarb hitherto cured in England, and produced to them. The roots ſent, Mr. Halley ſays, were planted about the year 1781 in a light ſandyiſh ſoil, but were much neglected. They were taken up in the ſpring of 1792, and, being thoroughly diveſted of the adhering earth, were placed for ſome weeks on the floor of a cool warehouſe: the fibres were then taken off, cut up, and dried on the flue of a green-houſe; but, from miſmanagement, were entirely ſpoiled. The prime roots were ſevered in ſmall pieces, peeled clean, and thoroughly cleared of every particle of unſoundneſs. Part was ſeparately laid in ſieves, and the remainder perforated, ſtrung, and ſuſpended in feſtoons from the cieling of a warm kitchen. The manner of dreſſing conſiſts in paring off the external coat with a ſharp knife, as thin and clean as poſſible, and then finiſhing it off by a piece of fiſh-ſkin, with its own powder; which powder may be procured from the chips and ſmall pieces, either by grinding or pounding it in a large mortar.

In the year 1794 the Society adjudged the gold medal to Mr. William Hayward of Hanbury, Oxfordſhire, for propagating rhubarb by offsets taken from the crowns of large plants, inſtead of ſeeds, for the purpoſe of bringing it to perfection in a ſhorter time, which fully anſwered his expectations. Mr. Hayward was a candidate in the year 1789 for the gold medal; but having miſunderſtood their rules, he was not entitled to it, though with great propriety they voted to him the ſilver medal; in conſequence of which he ſent them his method of culture and cure. His method of cultivating Turkey rhubarb from ſeed is thus explained to the Society: "I have uſually ſown the ſeed about the beginning of February on a bed of good ſoil (if rather ſandy the better), expoſed to an eaſt or weſt aſpect, in preference to the ſouth; obſerving a full ſun to be prejudicial to the vegetation of the ſeeds, and to the plants whilſt young. The ſeeds are beſt ſown moderately thick (broad-caſt), treading them regularly in, as is uſual with parſneps, and other light ſeeds, and then raking the ground ſmooth. I have ſometimes, when the ſeaſon has been wet, made a bed for ſowing the rhubarb ſeeds upon, about two feet thick, with new dung from the ſtable, covering it near one foot thick with good ſoil. The intent of this bed is not for the ſake of warmth, but ſolely to prevent the riſing of earth worms, which, in a moiſt ſeaſon, will frequently deſtroy the young crop. If the feed is good, the plants often riſe too thick; if ſo, when they have attained ſix leaves they ſhould be taken carefully up (where too cloſe), leaving the ſtanding crop eight or ten inches apart: thoſe taken up may be planted at the ſame diſtance, in a freſh ſpot of ground, in order to furniſh other plantations. When the plants in general are grown to the ſize that cabbage-plants are uſually ſet out for a ſtanding crop, they are beſt planted where they are to remain, in beds four feet wide, one row along the middle of the bed, leaving two yards diſtance betwixt the plants, allowing an alley between the beds about a foot wide, for conveniency of weeding the plants. In the autumn, when the decayed leaves are removed, if the ſhoveling of the alleys are thrown over the crown of the plants, it will be found of ſervice."

His mode of cultivating the fame plant by offsets is thus given: "On taking up fome plants the laft fpring, I flipped off feveral offsets from the heads of large plants: thefe I fet with a dibble about a foot apart, in order, if I found them thrive, to remove them into other beds. On examining them in autumn I was furprifed to fee the progrefs they had made, and pleafed to be able to furnifh my beds with 40 plants in the moft thriving ftate. Though this was my firft experiment of its kind, I do not mean to arrogate the difcovery to myfelf, having known it recently tried by others, but without being informed of their fuccefs. I have reafon to think this valuable drug will, by this method, be brought much fooner to perfection than from feed."

His method of curing rhubarb is thus defcribed: "The plants may be taken up either early in the fpring, or in autumn, when the leaves are decayed, in dry weather if poffible, when the roots are to be cleared from dirt (without wafhing): let them be cut into pieces, and with a fharp knife freed from the outer coat, and expofed to the fun and air for a few days, to render the outfide a little dry. In order to accelerate the curing of the largeft pieces, a hole may be fcooped out with a penknife: thefe and the fmaller parts are then to be ftrung on packthread, and hung up in a warm room (I have always had the conveniency of fuch a one over a baker's oven), where it is to remain till perfectly dry. Each piece may be rendered more fightly by a common file, fixing it in a fmall vice during that operation: afterwards rub over it a very fine powder, which the fmall roots furnifh in beautiful perfection, for this and every other purpofe where rhubarb is required."

In the year 1794, too, the Society adjudged the gold medal to Mr. Ball for his method of curing the true rhubarb, which is as follows: I take the roots up when I find the ftalks withering or dying away, clean from the earth with a dry brufh, cut them in fmall pieces of about four or five inches in breadth, and about two in depth, taking away all the bark, and make a hole in the middle, and ftring them on packthread, keeping every piece apart; and every morning, if the weather is clear and fine, I place them in the open part of the garden, on ftages, erected by fixing fmall pofts about fix feet high in the ground, and fix feet afunder, into which I fix horizontal pegs, about a foot apart, beginning at the top; and the rhubarb being ftrung crofswife on fmall poles, I place them on thefe pegs; fo that, if it fhould rain, I could eafily remove each pole with the fufpended pieces, into any covered place. I never fuffer them to be out at night, as the damps at this feafon would be apt to mould them; and if at any time I perceive the leaft mark of mould, I rub it off with a dry cloth. In fome of the pieces of rhubarb which I have cured this year, I have made holes about half an inch diameter in the middle, for the free paffage of air, and have found that every one of thefe pieces dried better than the others where no fuch holes were made; and have likewife hung feveral ftrings in the kitchen, and never expofed them in the open air, and found them to dry exceedingly well, and much better than thofe in the open air. Some years fince I dried a quantity of rhubarb on a malt-kiln, keeping up the thermometer to 80 degrees, which anfwered well, but I think rather dried too quick: the roots which I have cured this year are a part of the plantation of 1789, and for which the Society was fo kind as to give me a medal.

RHEXIA, in botany: A genus of the monogynia order, belonging to the octandria clafs of plants; and in the natural method ranking with thofe of the 17th order *Calycanthemæ* The calyx is quadrifid with four petals inferted into it; the antheræ are declining; the capfule is quadrilocular, within the belly of the calyx.

RHINANTHUS, in botany: A genus of the angiofpermia order, belonging to the didynamia clafs of plants; and in the natural method ranking under the 40th order, *Perfonatæ.* The calyx is quadrifid, and ventricofe; the capfule bilocular, obtufe, and compreffed.

RHINE, a large river of Germany, famous both in ancient and modern hiftory. It rifes among the Alpes Lepontiæ, or Grifons; and, firft traverfing the Lacus Acronius, divides the Rhæti and Vindelici from the Helvetii, and then the Germans from the Gauls and Belgæ; and running from fouth to north for the greateft part of its way, and at length bending its courfe weft, it empties itfelf at feveral mouths (Cæfar); at three mouths into the German ocean (Pliny), viz. the weftern, or Helius; the northern or Fleuvus; and the middle between both thefe, which retains the original name, *Rhenus:* and in this Ptolemy agrees.—Mela and Tacitus mention two channels, and as many mouths, the right and left; the former running by Germany, and the latter by Gallia Belgica: and thus alfo Afinius Pollio, and Virgil; the cut or trench of Drufus not being made in their time, whereby the middle channel was much drained and reduced, and therefore overlooked by Tacitus and Mela; and which Pliny calls the *Scanty.* To account for Cæfar's feveral mouths, is a matter of no fmall difficulty with the commentators; and they do it no otherwife than by admitting that the Rhine naturally formed fmall drains or rivulets from itfelf; the cut of Drufus being long pofterior to him; in whofe time Afinius Pollio, quoted by Strabo, who agrees with him therein, affirmed that there were but two mouths, finding fault with thofe who made them more: and he muft mean the larger mouths, which emitted larger ftreams. The Romans, efpecially the poets, ufed the term *Rhenus* for *Germany,* (Martial).—At prefent the river, after entering the Netherlands at Schenkinhaus, is divided into feveral channels, the two largeft of which obtain the names of the *Lech* and the *Waal,* which running through the United Provinces, falls into the German ocean below Rotterdam.

Lower Circle of the RHINE, confifts of the palatinate of the Rhine, and the three ecclefiaftical electorates, viz. thofe of Cologne, Mentz, and Triers.

Upper Circle of the RHINE, confifted of the landgraviates of Alface and Heffe, comprehending the Weteraw; but now only Heffe can be accounted a part of Germany, Alface being long ago united to France.

RHINEBERG, a town of Germany, in the circle of the Lower Rhine, and diocefe of Cologne. It was in the poffeffion of the French, but reftored to the archbifhop of Cologne by the treaty of Utrecht. It is feated on the Rhine, in E. lon. 6. 39. N. lat. 51. 30.

RHINECK, a town of Germany, in the archbifhopric of Cologne, feated on the Rhine, E. long. 7. 53. N. lat. 50. 27.—There is another town of the fame name in Swifferland, capital of Rhinthal, feated on the Rhine, near the lake of Conftance, with a good caftle. E. lon. 9. 53. N. lat. 47. 38.

RHINFELD, a fmall but ftrong town of Germany, in the circle of Suabia, and the beft of the four foreft-towns belonging to the houfe of Auftria. It has been often taken and retaken in the German wars; and is feated on the Rhine, over which there is a handfome bridge. E. lon. 7. 53. N. lat. 47. 40.

RHINEGAU, a beautiful diftrict of the electorate of Mentz, is fituated on the Rhine, about three miles from the city of Mentz, and is fo populous that it looks like one entire town intermixed with gardens and vineyards. The Rhine here grows aftonifhingly wide, and forms a kind of fea, near a mile broad, in which are feveral well-wooded little iflands. The Rhinegau forms an amphitheatre, the beauties of which are beyond all defcription. See Riefbach's Travels through Germany, v. iii. p. 226.

RHINFELS, a caftle of Germany, in the circle of the

Lower Rhine, in a county of the fame name. It is looked upon as one of the moft important places feated on the Rhine, as well in regard to its ftrength as fituation. It is near St. Goar, and built on a craggy rock. This fortrefs commands the whole breadth of the Rhine, and thofe who pafs are always obliged to pay a confiderable toll. In the time of war it is of great importance to be mafters of this place. E. long. 7. 43. N. lat. 50. 3.

RHINLAND, a name given to a part of South Holland, which lies on both fides the Rhine, and of which Leyden is the capital town.

RHINOCEROS, in zoology, a genus of quadrupeds belonging to the order of belluæ, (fee the plate). The name is entirely Greek; but thefe animals were totally unknown to the ancient Greeks. Ariftotle takes no notice of them, nor any other Greek writer till Strabo, nor Roman till Pliny. It is probable they did not frequent that part of India into which Alexander had penetrated, fince it was near 300 years after that Pompey brought them to Europe. From this time till the days of Heliogabalus, the rhinoceros was frequently exhibited in the Roman fpectacles; and he has often been tranfported into Europe in more modern times; but they were long very ill reprefented, and very imperfectly defcribed, till fome that arrived in London in 1739 and 1741 were infpected, by which the errors and caprices of former writers were detected.

There are two fpecies of rhinoceros, the firft of which is the *unicornis*, the length of which, Buffon tells us, from the extremity of the muzzle to the origin of the tail, is at leaft 12 feet, and the circumference of the body is nearly the fame. "The rhinoceros which came to London in the year 1739 was fent from Bengal. Though not above two years of age, the expenfe of his food and journey amounted to near 1000l. fterling. He was fed with rice, fugar, and hay. He had daily feven pounds of rice, mixed with three pounds of fugar, and divided into three portions. He had likewife hay and green herbs, which laft he preferred to hay. His drink was water, of which he took large quanties at a time*. He was of a peaceable difpofition, and allowed all parts of his body to be touched. When hungry, or ftruck by any perfon, he became mifchievous, and in both cafes nothing appeafed him but food. When enraged, he fprung forward, and nimbly raifed himfelf to a great height, pufhing at the fame time his head furioufly againft the walls, which he performed with amazing quicknefs, notwithftanding his heavy afpect and unwieldy mafs. "I often obferved," fays Dr. Parfons, "thefe movements produced by rage or impatience, efpecially in the mornings before his rice and fugar were brought him. The vivacity and promptitude of his movements," Dr. Parfons adds, "led me to think that he is altogether unconquerable, and that he could eafily overtake any man who fhould offend him."

"This rhinoceros, at the age of two years, was not taller than a young cow that has never produced. But his body was very long and very thick. His head was difproportionally large. From the ears to the horn there is a concavity, the two extremities of which, namely the upper end of the muzzle, and the part near the ears, are confiderably raifed. The horn, which was not yet above an inch high, was black, fmooth at the top, but full of wrinkles directed backward at the bafe. The noftrils are fituated very low, being not above an inch diftant from the opening of the mouth. The under lip is pretty fimilar to that of the ox; but the upper lip has a greater refemblance to that of the horfe, with this advantageous difference, that the rhinoceros can lengthen this lip, move it from fide to fide, roll it about a ftaff, and feize with it any object he wifhes to carry to his mouth. The tongue of this young rhinoceros was foft, like that of a calf. His eyes had no vivacity: In figure they refembled thofe of the hog, and were fituated lower, or nearer the noftrils, than in any other quadruped. His ears are large, thin at the extremities, and contracted at their origin by a kind of annular rugofity. The neck is very fhort, and furrounded with two large folds of fkin. The fhoulders are very thick, and at their juncture there is another fold of fkin, which defcends upon the fore legs. The body of this young rhinoceros was very thick, and pretty much refembled that of a cow about to bring forth. Between the body and crupper there is another fold, which defcends upon the hind legs. Laftly, another fold tranfverfely furrounds the inferior part of the crupper, at fome diftance from the tail. The belly was large, and hung near the ground, particularly its middle part. The legs are round, thick, ftrong, and their joint bended backwards. This joint, which, when the animal lies, is covered with a remarkable fold of the fkin, appears when he ftands. The tail is thin, and proportionally fhort; that of the rhinoceros fo often mentioned, exceeded not 16 or 17 inches in length. It turns a little thicker at the extremity, which is garnifhed with fome fhort, thick, hard hairs. The form of the penis is very extraordinary. It is contained in a prepuce or fheath like that of the horfe; and the firft thing that appears in the time of erection is a fecond prepuce, of a flefh-colour, from which there iffues a hollow tube, in the form of a funnel cut and bordered fomewhat like a flower-de-luce, and conftitutes the glans and extremity of the penis. This anomalous glans is of a paler flefh-colour than the fecond prepuce. In the moft vigorous erection, the penis extends not above eight inches out of the body; and it is eafily procured by rubbing the animal with a handful of ftraw when he lies at his eafe. The direction of this organ is not ftraight, but bended backward. Hence he throws out his urine behind; and from this circumftance, it may be inferred that the male covers not the female, but that they unite with their cruppers to each other. The female organs are fituated like thofe of the cow; and fhe exactly refembles the male in figure and groffnefs of body. The fkin is fo thick and impenetrable, that when a man lays hold of any of the folds he would imagine he is touching a wooden plank of half an inch thick †. When tanned, Dr. Grew remarks, it is exceffively hard, and thicker than the hide of any other terreftrial animal. It is everywhere covered more or lefs with incruftations in the form of galls or tuberofities, which are pretty fmall on the top of the neck and back, but become larger on the fides. The largeft are on the fhoulders and crupper, are ftill pretty large on the thighs and legs, upon which they are fpread all round, and even on the feet. But between the folds the fkin is penetrable, delicate, and as foft to the touch as filk, while the external part of the fold is equally hard with the reft. This tender fkin between the folds is of a light flefh-colour; and the fkin of the belly is nearly of the fame colour and confiftence. Thefe galls or tuberofities fhould not be compared, as fome authors have done, to fcales. They are only fimple indurations of the fkin, without any regularity in their figure or fymmetry in their refpective pofitions. The flexibility of the fkin in the folds enables the rhinoceros to move with facility his head, neck, and members. The whole body, except at the joints, is inflexible, and refembles a coat of mail. Dr. Parfons remarks, that this animal liftened with a deep and long continued attention to any kind of noife; and that,

* "Their food in a ftate of nature is the groffeft herbs, as thiftles and thorny fhrubs, which they prefer to the foft pafture of the beft meadows; they are fond of the fugar cane, and eat all kinds of grain, but for flefh they have no appetite."

† This Mr. Bruce denies to be the cafe, and fufpects, where it does occur, that it is the effect of difeafe, or of a different habit acquired by keeping. In their natural ftate, he thinks they prevent this rigidity by wallowing in the mud.

though he was fleeping, eating, or obeying any other preffing demands of nature, he raifed his head, and liftened till the noife ceafed."

Thefe animals never affemble or march together in troops like elephants. Being of a more folitary and favage difpofition, they are more difficult to hunt and to overcome. They never attack men, however, except when they are provoked, when they are very furious and formidable; but as they fee only before them, and not very fharply, and as they turn with great difficulty, they may be eafily avoided. The fkin of thefe animals is fo extremely hard as to refift fabres, lances, javelins, and even mufket balls, the only penetrable parts being the belly, the eyes and about the ears. Hence the hunters generally attack them when they lie down to fleep.—Their flefh is confidered as excellent by the Indians and Africans, but efpecially by the Hottentots; and if they were trained when young, they might be rendered domeftic, in which cafe they would multiply more eafily than the elephant. They inhabit Bengal, Siam, Cochin-China, Quangfi in China, the ifles of Java and Sumatra, Congo, Angola, Ethiopia, and the country as low as the Cape. They love fhady forefts, the neighbourhood of rivers, and marfhy places. They wallow in the mire like hogs, and are faid by that means to give fhelter in the folds of their fkins to fcorpions, centipedes, and other infects. This is denied by Buffon and Edwards, though the furgeon of the Shaftefbury had obferved in a rhinoceros, newly taken after having weltered in the mud, feveral infects concealed under the ply of the fkin. This carries with it every appearance of probability; for as the creature welters in mud, it is impoffible for it to do fo without bringing up with it fome of the infects which live in that mud; and when this is the cafe, it furely cannot be unnatural to fuppofe that they would fhelter themfelves under the plaits of the fkin. Mr. Bruce had an opportunity of examining the fkin of a rhinoceros before his muddy covering had been fcraped off, and faw under it feveral very large worms, but not of the carnivorous kind. He faw likewife feveral fmaller animals refembling ear-wigs, which he took to be young fcolopendræ; and, though he fearched no further, we muft certainly confider this as a proof of what the furgeon of the Shaftefbury related. Mr. Bruce fuppofes, too, that they welter in mire, partly in order to fcreen themfelves by a cafe of mud from the attacks of that mifchievous fly which infefts the animals of Abyffinia to fuch a degree. "The time of the fly (fays he) being in the rainy feafon, the whole black earth turns into mire. In the night, when the fly is at reft, the rhinoceros choofes a convenient place, and there, rolling himfelf in the mud, he clothes himfelf with a kind of cafe, which defends him againft his enemy the following day. The wrinkles and plaits of his fkin ferve to keep this muddy plafter firm upon him, all but about his hips, fhoulders, and legs, where it cracks and falls off by motion, and leaves him expofed in thofe places to the attacks of the fly. The itching and pain which follow occafion him to rub himfelf in thofe parts againft the roughest trees, and this is at leaft one caufe of the puftules or tubercles which we fee upon thefe places, both on the elephant and rhinoceros." They bring forth only one young at a time, about which they are very folicitous. They are faid to confort with tygers; a ftory founded merely on their common attachment to the fides of rivers, by which means they are often found near each other. Their fkin, flefh, hoofs, teeth, and even dung, are ufed in India medicinally. The horn, efpecially that of a virgin rhinoceros, is confidered as an antidote againft poifon. Every horn, however, has not this property; fome of them felling very cheap, while others are extremely dear.

Some writers are of opinion, that the rhinoceros is the unicorn of holy writ and of the ancients, and that the oryx or Indian afs of Ariftotle, who fays it has but one horn, was the fame, his informers comparing the clumfy fhape of the rhinoceros to that of the afs.—It was alfo the *bos unicornis* and *fera monoceros* of Pliny, both of which were of India; and in his account of the monoceros he exactly defcribes the great black horn and hog-like tail. The unicorn of Scripture is confidered as having all the properties of the rhinoceros, as rage, untameablenefs, great fwiftnefs, and vaft ftrength. This opinion is moft ably fupported by Mr. Bruce. "The derivation of the Hebrew word *reem* (fays he), which in our verfion is tranflated *unicorn*, both in the Hebrew and the Ethiopic, feems to be from erectnefs, or ftanding ftraight. This is certainly no particular quality in the animal itfelf, who is not more or even fo much erect as many other quadrupeds, for in its knees it is rather crooked; but it is from the circumftance and manner in which its horn is placed. The horns of all other animals are inclined to fome degree of parallelifm with his nofe or os frontis. The horn of the rhinoceros is erect and perpendicular to this bone, on which it ftands at right angles, thereby poffeffing a greater purchafe or power, as a lever, than a horn could poffibly have in any other pofition. The fituation of the horn is very happily alluded to in Scripture; "My horn fhalt thou exalt like the horn of an unicorn." And the horn here alluded to is not wholly figurative, but was really an ornament worn by great men in the days of victory, preferment, or rejoicing, when they were anointed with new, fweet, or frefh oil; a circumftance which David joins with that of erecting the horn.

"Some authors, for what reafon I know not, have made the reem, or unicorn, to be of the deer or antilope kind; that is, of a genus whofe very character is fear and weaknefs, directly oppofite to the qualities by which the reem is defcribed in Scripture: befides, it is plain that the reem is not of the clafs of clean quadrupeds; and a late modern traveller very whimfically takes him for the leviathan, which certainly was a fifh. Balaam, a prieft of Midian, and fo in the neighbourhood of the haunts of the rhinoceros, and intimately connected with Ethiopia (for they themfelves were fhepherds of that country), in a tranfport, for contemplating the ftrength of Ifrael, whom he was brought to curfe, fays they had, as it were, the ftrength of the reem. Job makes frequent allufion to his great ftrength, ferocity, and indocility. He afks, 'Will the reem be willing to ferve thee, or abide by thy crib?' that is, Will he willingly come into thy ftable, and eat at thy manger? And again, 'Canft thou bind the reem with a band in the furrow; and will he harrow the valleys for thee?'—In other words, Canft thou make him go to the plough or harrows?

"The rhinoceros, in Geez, is called *Arwe Harich*, and in the Amharic *Auraris*; both which names fignify 'the large wild beaft with the horn.' This would feem as if applied to the fpecies with one horn. On the other hand, in the country of the Shangalla and in Nubia he is called *Girnamgirn*, or 'horn upon horn;' and this would feem to denote that he had two. The Ethiopic text renders the word *reem*, 'Arwe-Harich;' and this the Septuagint tranflates *monoceros*, or *unicorn*. The principal reafon of tranflating the word *unicorn* rather than *rhinoceros*, is from a prejudice that he muft have had but one horn. But this is by no means fo well founded as to be admitted the only argument for eftablifhing the exiftence of an animal, which never has appeared after the fearch of fo many ages. Scripture fpeaks of the horns of the unicorn; fo that even from this circumftance the reem may be the rhinoceros, as the Afiatic, and part of the African rhinoceros, may be the unicorn."

The rhinoceros bicornis was long known in Europe merely by the double horns which were preferved in various cabinets; and its exiftence, though now paft all doubt, has been frequently queftioned. Dr. Sparman, in his voyage to the Cape of

Good Hope, killed two of these animals, which he dissected, and very minutely describes. The horns, he says, in the live animals are so mobile and loose, that, when it walks carelessly along, one may see them waggle about, and hear them clash and clatter against each other. In the Phil. Transf. for 1793, we have a description of the double-horned rhinoceros of Sumatra, by Mr. Bell, surgeon in the service of the East India Company at Bencoolen; and this account, though it differs considerably from that of Sparman in some particulars, we shall insert here. "The animal (says Mr. Bell) herein described was shot with a leaden ball from a musket about ten miles from Fort Marlborough. I saw it the day after; it was then not in the least putrid, and I put it into the position from which the accompanying drawing was made. (See the plate.) It was a male; the height at the shoulder was 4 feet 4 inches; at the sacrum nearly the same; from the tip of the nose to the end of the tail 8 feet 5 inches. From the appearance of its teeth and bones it was but young, and probably not near its full size. The shape of the animal was much like that of the hog. The general colour was a brownish ash; under the belly, between the legs and folds of the skin, a dirty flesh colour. The head much resembled that of the single-horned rhinoceros; the eyes were small, of a brown colour; the *membrana nictitans* thick and strong; the skin surrounding the eyes was wrinkled; the nostrils were wide; the upper lip was pointed and hanging over the under.

"There were six *molares*, or grinders, on each side of the upper and lower jaw, becoming gradually larger backward, particularly in the upper; two teeth in the front of each jaw; the tongue was quite smooth; the ears were small and pointed, lined and edged with short black hair, and situated like those of the single-horned rhinoceros. The horns were black, the larger was placed immediately above the nose, pointing upwards, and was bent a little back; it was about nine inches long. The small horn was four inches long, of a pyramidal shape, flattened a little, and placed above the eyes rather a little more forward, standing in a line with the larger horn, immediately above it. They were both firmly attached to the skull, nor was there any appearance of joint or muscles to move them *. The neck was thick and short, the skin on the under side thrown into folds, and these folds again wrinkled. The body was bulky and round, and from the shoulder ran a line, or fold, as in the single-horned rhinoceros, though it was but faintly marked. There were several other folds and wrinkles on the body and legs; and the whole gave rather the appearance of softness: the legs were thick, short, and remarkably strong; the feet armed with three distinct hoofs, of a blackish colour, which surrounded half the foot, one in front, the others on each side. The soles of the feet were convex, of a light colour, and the cuticle on them not thicker than that on the foot of a man who is used to walking; the testicles hardly appeared externally; the penis was bent backward, and opened about 18 inches below the anus. At its origin it was as thick as a man's leg, and about two feet and a half long; the bend in it occasions the urine to be discharged backwards. The glans is very singular; the opening of the urethra is like the mouth of a cup with its brim bending over a little, and is about three quarters of an inch in diameter; the glans here is about half an inch in diameter, and continues that thickness for an inch and an half: it is then inserted into another cup like the first, but three times as large; the glans afterwards gradually becomes thicker, and at about nine inches from the opening of the urethra are placed two bodies on the upper part of the glans, very like the nipples of a milch-cow, and as large; these become turgid when the penis is erected; the whole of this is contained in the prepuce, and may be considered as glans. From the os pubis arises a strong muscle, which soon becomes tendinous: this tendon is continued along the back or upper part of the penis; it is flattened, is about the size of a man's little finger, and is inserted into the upper part of the glans, near the end. The use of this muscle is to straiten the penis. On the under side of the penis there are two muscles, antagonists to the above; they arise from the os ischium fleshy, run along the lower side of the penis, on each side of the corpus spongiosum, and are inserted fleshy into the lower side of the glans; the action of these muscles will draw in the penis, and bend it. The male has two nipples, like the female, situated between the hind legs; they are about half an inch in length, of a pyramidal form, rounded at the end.

"The whole skin of the animal is rough, and covered very thinly with short black hair. The skin was not more than one third of an inch in thickness at the strongest part; under the belly it was hardly a quarter of an inch; any part of it might be cut through with ease by a common dissecting knife. The animal had not that appearance of armour which is observed in the single-horned rhinoceros. Since I dissected the male, I have had an opportunity of examining a female, which was more of a lead colour: it was younger than the male, and had not so many folds or wrinkles in its skin; of course it had still less the appearance of armour. The only external mark which distinguishes it from the male is the vagina, which is close to the anus; whereas in the male the opening for the penis is 18 inches below the anus."

From the difference between this account and Sparman's, which in some particulars is considerable, and from the difference of shape, we are disposed to think them varieties. Mr. Bruce's drawing of the rhinoceros bicornis is unquestionably a deception; the body of the animal, as there represented, corresponds exactly with that of the unicornis except in its having two horns on its head. In the museum of the late Dr. William Hunter, the two-horned animal was preserved, agreeing exactly with the general accounts and figures we have of that animal, but differing essentially from Mr. Bruce's. For further particulars respecting these curious animals, we refer to Buffon, vol. vi. p. 92—117; Sparman's Voyage to the Cape, vol. ii. chap. 12; and Bruce's Travels, vol. iv. p. 296, &c. and Appendix, p. 85, &c.

RHINOCEROS-*Bird*. See BUCEROS.

RHITYMNA. See RETIMO.

RHIZOBALUS, in botany: a genus of the tetragynia order, belonging to the polyandria class of plants; and in the natural method ranking under the 23d order, *Tribilatæ*. The calyx monophyllous, fleshy, and downy; the corolla consists of five petals, which are round, concave, fleshy, and much larger than the calyx; the stamina are very numerous, filiform, and longer than the corolla; the styli are four, filiform, and of the length of the stamina; the pericarpium has four drupæ, kidney-shaped, compressed with a fleshy substance inside, and in the middle a flat large nut containing a kidney-shaped kernel. Of this there is only one species, viz. *Pekia*. The nut is sold in the shops as American nuts; they are flat, tuberculated, and kidney-shaped, containing a kernel of the same shape, which is sweet and agreeable. Clusius gives a good figure of the nut, and Aublet has one of the whole plant.

RHIZOPHORA, the MANGROVE, or *Mangle*, in botany: a genus of the monogynia order, belonging to the dodecandria

* Mr. Bruce, however, says that in the living animal the horns are extremely sensible. He informs us, that once at a hunting match he saw the point of a rhinoceros's horn broken off by a musket-shot; the consequence of which was, that the creature was for a moment deprived of all appearance of life.

clafs of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The calyx is quadripartite, the corolla partite; there is one feed, very long, and carnous at the bafe. Thefe plants are natives of the Eaft and Weft Indies, and often grow 40 or 50 feet high. They grow only in water and on the banks of rivers, where the tide flows up twice a-day. They preferve the verdure of their leaves throughout the year. From the loweft branches iffue long roots, which hang down to the water, and penetrate into the earth. In this pofition they refemble fo many arcades, from five to ten feet high, which ferve to fupport the body of the tree, and even to advance it daily into the bed of the water. Thefe arcades are fo clofely intertwifted one with another, that they form a kind of natural and tranfparent terrace, raifed with fuch folidity over the water, that one might walk upon them, were it not that the branches are too much incumbered with leaves. The moft natural way of propagating thefe trees, is to fuffer the feveral flender fmall filaments which iffue from the main branches to take root in the earth. The moft common method, however, is that of laying the fmall lower branches in bafkets of mould or earth till they have taken root.

The defcription juft given pertains chiefly to a particular fpecies of mangrove, termed by the Weft Indians *black mangles*, on account of the brown dufky colour of the wood. The bark is very brown, fmooth, pliant when green, and generally ufed in the Weft India iflands for tanning of leather. Below this bark lies a cuticle, or fkin, which is lighter, thinner, and more tender. The wood is nearly of the fame colour as the bark; hard, pliant, and very heavy. It is frequently ufed for fuel, for which purpofe it is faid to be remarkably proper: the fires which are made of this wood being both clearer, more ardent and durable than thofe made of any other materials whatever. The wood is compact; almoft incorruptible; never fplinters; is eafily worked; and were it not for its enormous weight, would be commodioufly employed in almoft all kinds of work, as it poffeffes every property of good timber. To the roots and branches of mangroves that are immerfed in the water, oyfters frequently attach themfelves; fo that wherever this curious plant is found growing on the fea-fhore, oyfter-fifhing is very eafy; as in fuch cafes thefe fhell-fifh may be literally faid to be gathered upon trees.

The red mangle or mangrove grows on the fea fhore, and at the mouth of large rivers; but does not advance, like the former, into the water. It generally rifes to the height of 20 or 30 feet, with crooked, knotty branches, which proceed from all parts of the trunk. The bark is flender, of a brown colour, and, when young, is fmooth, and adheres very clofely to the wood; but when old, appears quite cracked, and is eafily detached from it. Under this bark is a fkin as thick as parchment, red, and adhering clofely to the wood, from which it cannot be detached till the tree is felled and dry. The wood is hard, compact, heavy, of a deep red, with a very fine grain. The pith or heart of the wood being cut into fmall pieces, and boiled in water, imparts a very beautiful red to the liquid, which communicates the fame colour to wool and linen. The great weight and hardnefs of the wood prevents it from being generally ufed. From the fruit of this tree, which, when ripe, is of a violet colour, and refembles fome grapes in tafte, is prepared an agreeable liquor, much efteemed by the inhabitants of the Caribbee iflands.

White mangle, fo termed from the colour of its wood, grows like the two former, upon the banks of rivers, but is feldom found near the fea. The bark is gray; the wood, as we have faid, white, and when green, fupple; but dries as foon as cut down, and becomes very light and brittle. This fpecies is generally called *rope-mangrove*, from the ufe to which the bark is applied by the inhabitants of the Weft Indies. This bark, which, by reafon of the great abundance of fap, is eafily detached when green from the wood, is beaten or bruifed betwixt two ftones, until the hard and woody part is totally feparated from that which is foft and tender. This laft, which is the true cortical fubftance, is twifted into ropes of all fizes, which are exceedingly ftrong, and not apt to rot in the water.

RHODES, an ifland of the Mediterranean, on the fouth fide of Natolia, 40 miles long and 15 broad. The air is good, and the foil pretty fertile, but badly cultivated. The principal town, of the fame name, is an archbifhop's fee, and has a good harbour, with a narrow entrance between two rocks, on which are two towers to defend the paffage. Here, in all probability, ftood the famous Coloffus, a ftatue of bronze, 70 cubits high, reckoned one of the feven wonders of the world: it was thrown down by an earthquake; and when the Saracens became mafters of this ifland in 665, they knocked it to pieces, with which they loaded 900 camels. The knights of Jerufalem took Rhodes from the Saracens in 1309, and kept it till it was taken from them by the Turks, in 1523. It is looked upon as an impregnable fortrefs, being furrounded by triple walls and double ditches. It is inhabited by Turks and Jews; for the Chriftians are obliged to live in the fuburbs, they not being fuffered to be within the walls in the nighttime. E. lon. 28. 25. N. lat. 36 24.

RHODIOLA, ROSE-WORT, in botany: a genus of the octandria order, belonging to the dioecia clafs of plants: and in the natural method ranking under the 13th order, *Succulentæ*. The male calyx is quadripartite; the corolla tetrapetalous. The female calyx is quadripartite, and there is no corolla; the nectaria are four; the piftils four; and there are four polyfpermous capfules. There are two fpecies, the rofea and the minor: the firft grows naturally in the clefts of the rocks and rugged mountains of Wales, Yorkfhire, and Weftmorland. It has a very thick flefhy root, which when cut or bruifed fends out an odour like rofes. It has thick fucculent ftalks, like thofe of orpine, about nine inches long, clofely garnifhed with thick fucculent leaves indented at the top. The ftalk is terminated by a clufter of yellowifh herbaceous flowers, which have an agreeable fcent, but are of fhort continuance. The fecond fort is a native of the Alps, and has purplifh flowers which come out later than the former; it is alfo of a fmaller fize. Both fpecies are eafily propagated by parting their roots; and require a fhady fituation, and dry undunged foil. The fragrance of the firft fpecies, however, is greatly diminifhed by cultivation.

OIL OF RHODIUM. See ASPALATHUS.

RHODODENDRON, DWARF ROSE-BAY, in botany: a genus of the monogynia order, belonging to the decandria clafs of plants; and in the natural method ranking under the 18th order, *Bicornes*. The calyx is quinquepartite; the corolla funnel-fhaped; the ftamina declining; the capfule quinquelocular. There are feven fpecies; the moft remarkable of which are, 1. The *hirfutum*, with naked hairy leaves, grows naturally on the Alps and feveral mountains of Italy. It is a low fhrub, which feldom rifes two feet high, fending out many ligneous branches covered with a light-brown bark, garnifhed clofely with oval fpear-fhaped leaves, fitting pretty clofe to the branches. They are entire, having a great number of fine iron-coloured hairs on their edges and underfide. The flowers are produced in bunches at the end of the branches in May, having one funnel-fhaped petal cut into five obtufe fegments, and of a pale-red colour. They make a good fhow, and are fucceeded by oval capfules, containing ripe feeds in Auguft. 2. The *ferrugineum*, with fmooth leaves, hairy on their underfide; is a native of the Alps and Apennines. It rifes with a fhrubby ftalk near three feet high, fending out many irregular branches covered with a purplifh bark, and clofely garnifhed

with ſmooth ſpear-ſhaped entire leaves, whoſe borders are reflexed backward; the upper ſide is of a light lucid green, their under ſide of an iron colour. The flowers are produced at the ends of the branches, are funnel-ſhaped, cut into five ſegments, and of a pale roſe colour. Theſe plants are propagated by ſeeds; but being natives of barren rocky ſoils and cold ſituations, they do not thrive in gardens, and for want of their uſual covering of ſnow in the winter are often killed by froſt in this country. 3. The *chamæciſtus*, or ciliated-leaved dwarf roſe-bay, is a low deciduous ſhrub, native of Mount Baldus, and near Saltzburg in Germany. It grows to the height of about a yard; the branches are numerous, produced irregularly, and covered with a purpliſh bark. The leaves are oval, ſpear-ſhaped, ſmall, and in the under ſurface of the colour of iron. The flowers are produced at the end of the branches in bunches, are of a wheel-ſhaped figure, pretty large, of a fine crimſon colour, and handſome appearance. They appear in June, and are ſucceeded by oval capſules containing ripe ſeeds in September. 4. The *Dauricum*, or Daurian dwarf roſe-bay, is a low deciduous ſhrub, and native of Dauria. Its branches are numerous, and covered with a browniſh bark. The flowers are wheel-ſhaped, large, and of a beautiful roſe-colour: they appear in May, and are ſucceeded by oval capſules full of ſeeds, which in England do not always ripen. 5. The maximum, or American mountain laurel, is an evergreen ſhrub, and native of Virginia, where it grows naturally on the higheſt mountains, and on the edges of cliffs, precipices, &c. where it reaches the ſize of a moderate tree, though with us it ſeldom riſes higher than ſix feet. The flowers continue by ſucceſſion ſometimes more than two months, and are ſucceeded by oval capſules full of ſeeds. 6. The *Ponticum*, or Pontic dwarf roſe-bay, is an evergreen ſhrub, native of the Eaſt, and of moſt ſhady places near Gibraltar. It grows to the height of four or five feet. The leaves are ſpear-ſhaped, gloſſy on both ſides, acute, and placed on ſhort foot-ſtalks on the branches: the flowers, which are produced in cluſters, are bell-ſhaped, and of a fine purple colour. They appear in July, and are ſucceeded by oval capſules containing ſeeds, which in England ſeldom attain to maturity.

In Siberia, a ſpecies of this plant is uſed with great ſucceſs in gouty and rheumatic affections; of which the following account is given in the 5th volume of the Medical Commentaries, p. 434. in a letter from Dr. Guthrie of Peterſburgh to Dr. Duncan of Edinburgh. "It is the rhododendrum chryſanthemum, nova ſpecies, belonging to the claſs of decandria, diſcovered by profeſſor Pallas in his tour through Siberia. This Alpine ſhrub grows near the tops of the high mountains named *Sajanes*, in the neighbourhood of the river Jeniſe in Siberia; and delights in the ſkirts of the ſnow-covered ſummits, above the region that produces trees. When the inhabitants of that country mean to exhibit it in arthritic or rheumatic diſorders, they take about two drachms of the dried ſhrub, ſtalk and leaves, with nine or ten ounces of boiling water, and putting them into an earthen pot, they lute on the head, and place them in an oven during the night. This infuſion (for it is not allowed to boil) the ſick man drinks next morning for a doſe. It occaſions heat, together with a degree of intoxication, reſembling the effects of ſpirituous liquors, and a ſingular kind of uneaſy ſenſation in the parts affected, accompanied with a ſort of vermiculatio, which is likewiſe confined to the diſeaſed parts. The patient is not permitted to quench the thirſt which this medicine occaſions; as fluids, particularly cold water, produce vomiting, which leſſens the power of the ſpecific. In a few hours, however, all the diſagreeable effects of the doſe diſappear, commonly with two or three ſtools. The patient then finds himſelf greatly relieved of his diſorder; and has ſeldom occaſion to repeat the medicine above two or three times to complete a cure. The inhabitants of Siberia call this ſhrub *chei* or *tea*, from their drinking, in common, a weak infuſion of it, as we do the Chineſe plant of that name. This practice ſhows that the plant, uſed in ſmall quantities, muſt be innocent. Profeſſor Pallas informs me, that he ſent ſome time ago ſome of this ſhrub dried to profeſſor Koelpin at Stetin; and he ſhowed me a letter from that gentleman, where he ſays, that he has given it with ſucceſs in ſeveral caſes, particularly in what he calls the *arthritica venerea*, with a tophus arthriticus on the carpus, and it produced a complete cure. It muſt be remarked, that the doſe which theſe hardy Siberians take, who are alſo in the habit of drinking it as tea, would, in all probability, be too ſtrong for our countrymen; however, it is a medicine which we may certainly give with ſafety, beginning with ſmall doſes."

RHŒA. See Rhea.

RHŒADEÆ (*rhœas*, Linnæus's name, after Dioſcorides, for the red poppy), the name of the 27th order in Linnæus's fragments of a natural method, conſiſting of poppy and a few genera which reſemble it in habit and ſtructure. See Botany.

RHOMBOIDES, in geometry, a quadrilateral figure whoſe oppoſite ſides and angles are equal, but is neither equilateral nor equiangular.

Rhomboides, in anatomy, a thin, broad, and obliquely ſquare fleſhy muſcle, ſituated between the baſis of the ſcapula and the ſpina dorſi; ſo called from its figure. Its general uſe is to draw backward and upward the ſubſpinal portion of the baſis ſcapulæ.

RHOMBUS, in geometry, an oblique angled parallelogram, or quadrilateral figure, whoſe ſides are equal and parallel, but the angles unequal, two of the oppoſite ones being obtuſe and two acute.

RHONE, one of the largeſt rivers in France, which, riſing among the Alps of Switzerland, paſſes through the lake of Geneva, viſits that city, and then runs ſouth-weſt to Lyons; where, joining the river Soane, it continues its courſe due ſouth, paſſing by Orange, Avignon, and Arles, and falls into the Mediterranean a little above Marſeilles.

RHOPIUM, in botany: a genus of the triandria order, belonging to the gynandria claſs of plants; and in the natural method ranking with thoſe that are doubtful. The calyx is monophyllous and ſexpartite; there is no corolla nor any ſtamina; the three antheræ are each attached to one of the ſtyli; the capſule is tricoccous and ſexlocular, each containing two ſeeds. There is only one ſpecies, *viz.* the meborea, a native of Guiana. This is a ſhrub riſing about three or four feet in height. The flowers grow in the form of a corymbus; they are of a yellowiſh green colour; the capſules are black.

RHOPOLA, in botany: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking with thoſe that are doubtful. There is no calyx; the petals are four, oblong, obtuſe, and narrowing at the baſe; the ſtamina are four, inſerted in the corolla, and have large antheræ; the ſeed-veſſel unilocular, and contains one ſeed. There is only one ſpecies, *viz.* the montana. This is a ſhrubby plant growing in Guiana, and remarkable for the great number of branches ſent off from its trunk in every direction, and for the fetid ſmell of the wood and bark of this plant.

RHUBARB. See Rheum.

RHUMB, in navigation, a vertical circle of any given place, or interſection of ſuch a circle with the horizon; in which laſt ſenſe rhumb is the ſame with a point of the compaſs.

Rhumb-*Line* is alſo uſed for the line which a ſhip deſcribes when ſailing in the ſame collateral point of the compaſs, or oblique to the meridians.

RHUS, SUMACH, in botany: A genus of the trigynia order, belonging to the pentandria clafs of plants; and in the natural method ranking under the 43d order, *Dumofæ*. The calyx is quinquepartite; the petals five; the berry monofpermous. There are 24 fpecies, of which the moft remarkable are,

1. The *coriaria*, or elm-leaved fumach, grows naturally in Italy, Spain, Turkey, Syria, and Paleftine. The branches of this tree are ufed inftead of oak bark for tanning of leather; and it is faid that the Turkey leather is all tanned with this fhrub. It has a ligneous ftalk, which divides at bottom into many irregular branches, rifing to the height of eight or ten feet; the bark is hairy, of a herbaceous brown colour; the leaves are winged, compofed of feven or eight pair of lobes, terminated by an odd one, bluntly fawed on their edges, hairy on their under fide, of a yellowifh-green colour, and placed alternately on the branches; the flowers grow in loofe panicles on the end of the branches, which are of a whitifh herbaceous colour, each panicle being compofed of feveral fpikes of flowers fitting clofe to the footftalks. The leaves and feeds of this fort are ufed in medicine, and are efteemed very reftringent and ftiptic.

2. The *typhinum*, Virginian fumach, or vinegar plant, grows naturally in almoft every part of North America. This has a woody ftem, with many irregular branches, which are generally crooked and deformed. The young branches are covered with a foft velvet-like down, refembling greatly that of a young ftag's horn, both in colour and texture, from whence the common people have given it the appellation of *ftag's horn*; the leaves are winged, compofed of fix or feven pair of oblong heart-fhaped lobes, terminated by an odd one, ending in acute points, hairy on their underfide, as is alfo the midrib. The flowers are produced in clofe tufts at the end of the branches, and are fucceeded by feeds, inclofed in purple woolly fucculent covers; fo that the bunches are of a beautiful purple colour in autumn; and the leaves, before they fall in autumn, change to a purplifh colour at firft, and before they fall to a feuillemort. This plant, originally a native of North America, has been long cultivated in the north of Germany, and is lately introduced into Ruffia. It has got the name of the *vinegar plant* from the double reafon of the young germen of its fruit, when fermented, producing either new or adding to the ftrength of old weak vinegar, whilft its ripe berries afford an agreeable acid, which might fupply the place when neceffary of the citric acid. The powerful aftringency of this plant in all its parts recommends it as ufeful in feveral of the arts. As for example, the ripe berries boiled with alumn make a good dye for hats. The plant in all its parts may be ufed as a fuccedaneum for oak bark in tanning, efpecially the white glove leather. It will likewife anfwer to prepare a dye for black, green, and yellow colours; and with martial vitriol it makes a good ink. The milky juice that flows from incifions made in the trunk or branches, makes when dried the bafis of a varnifh little inferior to the Chinefe. Bees are remarkably fond of its flowers; and it affords more honey than any of the flowering fhrubs, fo that it may prove a ufeful branch of economy, where rearing thefe infects is an object. The natives of America ufe the dried leaves as tobacco.

3. The *glabrum*, with winged leaves, grows naturally in many parts of North America; this is commonly titled by the gardeners *New England fumach*. The ftem of this is ftronger and rifes higher than that of the former; the branches fpread more horizontally; they are not quite fo downy as thofe of the laft, and the down is of a brownifh colour; the leaves are compofed of many more pair of lobes, which are fmooth on both fides; the flowers are difpofed in loofe panicles, which are of a herbaceous colour.

4. The *Carolinianum*, with fawed winged leaves, grows naturally in Carolina; the feeds of this were brought from thence by the late Mr. Catefby, who has given a figure of the plant in his Natural Hiftory of Carolina. This is by the gardeners called the *fcarlet Carolina fumach*; it rifes commonly to the height of feven or eight feet, dividing into many irregular branches, which are fmooth, of a purple colour, and pounced over with a grayifh powder, as are alfo the footftalks of the leaves. The leaves are compofed of feven or eight pair of lobes terminated by an odd one; thefe are not always placed exactly oppofite on the midrib, but are fometimes alternate. The upper fides of the lobes are of a dark green, and their under hoary, but fmooth. The flowers are produced at the end of the branches in very clofe panicles, which are large, and of a bright red colour.

5. The *Canadenfe*, with winged fpear-fhaped leaves, grows naturally in Canada, Maryland, and feveral other parts of North America. This hath fmooth branches of a purple colour, covered with a gray pounce. The leaves are compofed of feven or eight pair of lobes, terminated by an odd one; the lobes are fpear-fhaped, fawed on their edges, of a lucid green on their upper furface, but hoary on their under, and are fmooth. The flowers are produced at the end of the branches in large panicles, which are compofed of feveral fmaller, each ftanding upon feparate footftalks; they are of a deep red colour, and the whole panicle is covered with a gray pounce, as if it had been fcattered over them.

6. The *copallinum*, or narrow-leaved fumach, grows naturally in moft parts of North America, where it is known by the title of *leach fumach*, probably from the place where it grows. This is of humbler growth than either of the former, feldom rifing more than four or five feet high in Britain, dividing into many fpreading branches, which are fmooth, of a light brown colour, clofely garnifhed with winged leaves, compofed of four or five pair of narrow lobes, terminated by an odd one; they are of a light green on both fides, and in autumn change purplifh. The midrib, which fuftains the lobes, has on each fide a winged or leafy border, which runs from one pair of lobes to another, ending in joints at each pair, by which it is eafily diftinguifhed from the other forts. The flowers are produced in loofe panicles at the end of the branches, of a yellowifh herbaceous colour.

Thefe fix forts are hardy plants, and will thrive in the open air here. The firft and fourth forts are not quite fo hardy as the others, fo muft have a better fituation, otherwife their branches will be injured by fevere froft in the winter. They are eafily propagated by feeds, which if fown in autumn the plants will come up the following fpring; but if they are fown in fpring, they will not come up till the next fpring; they may be either fown in pots, or the full ground. If they are fown in pots in autumn, the pots fhould be placed under a common frame in winter, where the feeds may be protected from hard froft; and in the fpring, if the pots are plunged into a very moderate hot-bed, the plants will foon rife, and have thereby more time to get ftrength before winter. When the plants come up, they muft be gradually hardened to bear the open air, into which they fhould be removed as foon as the weather is favourable, placing them where they may have the morning fun; in the fummer, they muft be kept clean from weeds, and in dry weather watered. Toward autumn it will be proper to ftint their growth by keeping them dry, that the extremity of their fhoots may harden; for if they are replete with moifture, the early frofts in autumn will pinch them, which will caufe their fhoots to decay almoft to the bottom if the plants are not fcreened from them. If the pots are put under a common frame in autumn, it will fecure the plants from injury: for while they are young and the fhoots foft, they will be in danger of fuffering, if the winter proves very

fevere; but in mild weather they muft always enjoy the open air, therefore fhould never be covered but in froft. The fpring following, juft before the plants begin to fhoot, they fhould be fhaken out of the pots, and carefully feparated, fo as not to tear the roots; and tranfplanted into a nurfery, in rows three feet afunder, and one foot diftance in the rows. In this nurfery they may ftand two years to get ftrength, and then may be tranfplanted where they are to remain.

7. Befides thefe, Linnæus has included in this genus the *toxicodendron* or poifon-tree, under the name of *rhus vernix* or *poifon-afh*. This grows naturally in Virginia, Penfylvania, New England, Carolina, and Japan, rifing with a ftrong woody ftalk to the height of 20 feet and upwards; though in this country it is feldom feen above 12, by reafon of the plant's being extremely tender. The bark is brown, inclining to gray; the branches are garnifhed with winged leaves compofed of three or four pair of lobes terminated by an odd one. The lobes vary greatly in their fhape, but for the moft part they are oval and fpear-fhaped. The footftalks become of a bright purple towards the latter part of fummer, and in autumn all the leaves are of a beautiful purple before they fall off.

All the fpecies of fumach abound with an acrid milky juice, which is reckoned poifonous; but this property is moft remarkable in the vernix. The moft diftinct account of it is to be found in Profeffor Kalm's Travels in North America.

The natives are faid to diftinguifh this tree in the dark by its extreme coldnefs to the touch. The juice of fome kinds of fumach, when expofed to the heat of the fun, becomes fo thick and clammy, that it is ufed for bird-lime, and the infpiffated juice of the poifon-afh is faid to be the fine varnifh of Japan. A cataplafm made with the frefh juice of the poifon-afh, applied to the feet, is faid by Hughes, in his Natural Hiftory of Barbadoes, to kill the vermin called by the Weft Indians *chigers*. Very good vinegar is made from an infufion of the fruit of an American fumach, which for that reafon is called the *vinegar-tree*. The refin called *gum copal* is from the rhus copallinum. See Copal.

RHYME, Rhime, *Ryme*, or *Rime*, in poetry, the fimilar found or cadence and termination of two words which end two verfes, &c. Or rhyme is a fimilitude of found between the laft fyllable or fyllables of a verfe, fucceeding either immediately or at a diftance of two or three lines. See Poetry.

RHYMER, (Thomas the), was a native of the parifh of Earlftown, in the county of Berwick. His real name and title was fir Thomas Lermont. He lived at the weft end of Earlftown, where part of his houfe is ftill ftanding, called *Rhymer's Tower*; and there is a ftone built in the fore wall of the church with this infcription on it, "*Auld Rhymer's race lies in this place.*" He lived in the 13th century, and was contemporary with one of the earls of March, who lived in the fame place.

RHYTHM, in mufic, the variety in the movement, as to the quicknefs or flownefs, length or fhortnefs, of the notes. Or it may be defined more generally, the proportion which the parts of the motion have to each other.

RIAL, or Ryal, a Spanifh coin. See Money-*Table*.

Rial, or *Royal*, is alfo the name of a piece of gold anciently current among us for 10s.

RIBAN, or Ribban, in heraldry, the eighth part of a bend. See Heraldry.

RIBAND, or Ribbon, a narrow fort of filk, chiefly ufed for head-ornaments, badges of chivalry, &c. In order to give our readers an idea of the manner in which this curious and valuable branch of manufactures is managed, a view of the ribbon-weaver at his loom is reprefented in Plate 4, where, 1. Is the frame of the loom. 2. The caftle, containing 48 pulleys. 3. The branches, on which the pulleys turn. 4. The tires, or the riding-cords, which run on the pulleys, and pull up the high-liffes. 5. The lift-fticks, to which the high-liffes are tied. 6. The high-liffes, or lifts, are a number of long threads, with platines, or plate-leads, at the bottom; and ringlets, or loops, about their middle, through which the cords or crofs-threads of the ground-harnefs ride. 7. The plate-leads, or platines, are flat pieces of lead, about fix inches long, and three or four inches broad at the top, but round at the bottom; fome ufe black flates inftead of them: their ufe is to pull down thofe liffes which the workman had raifed by the treddle, after his foot is taken off. 8. The branches or cords of the ground harnefs, which go through the loops in the middle of the high-liffes: on the well-ordering of thefe cords chiefly depends the art of ribbon-weaving, becaufe it is by means of this contrivance that the weaver draws in the thread or filk that makes the flower, and rejects or excludes the reft. 9. The batton: this is the wooden frame that holds the reed or fhuttle, and beats or clofes the work: where, obferve, that the ribbon-weaver does not beat his work; but as foon as the fhuttle is paffed, and his hand is taken away, the batton is forced, by a fpring from the top, to beat the work clofe. 10. The fhuttle, or reed. 11. The fpring of the batton, by which it is made to clofe the work. 12. The long-harnefs are the front-reeds, by which the figure is raifed. 13. The linguas are the long pieces of round or fquare lead, tied to the end of each thread of the long-harnefs to keep them tight. 14. The broad piece of wood, about a foot fquare, leaning fomewhat forward, intended to eafe the weaver as he ftoops to his fhuttle; it is fixed in the middle of the breaft-beam. Some weavers, inftead of this, have a contrivance of a cord or rope that is faftened to the front-frame, and comes acrofs his breaft; this is called a *ftopfall*. 15. The feat-bench; this leans forward very much. 16. The foot-ftep to the treddles. 17. The breaft-beam, being a crofs-bar that paffes from one of the ftandards to the other, fo as to front the workman's breaft: to this breaft-bar is fixed a roll, upon which the ribbon paffes in its way to be rolled upon the roller, that turns a little below. 18. The clamps, or pieces of wood, in which the broaches that confine the treddles reft. 19. The treddles are long narrow pieces of wood, to the ends of which the cords that move the liffes are faftened. 20. The treddle-cords are only diftinguifhed from the riding-cords by a board full of holes, which divide them, in order to prevent the plate-leads, which are tied to the high-liffes, from pulling them too high when the workman's foot is off the treddle: which ftop is made by a knot in the treddle-cord, too big to be forced through that hole in the board. 21. The lames are two thin narrow pieces of board, only ufed in plain works, and then to fupply the place of the long-harnefs. 22. The knee-roll, by which the weaver rolls up his ribbon as he fees proper, or by bit and bit as it is finifhed. 23. The back-rolls, on which the warp is rolled. It is to be obferved, that there are always as many rolls as colours in the work to be woven. 24. The clamps, which fupport the rollers. 25. The returning-fticks, or, as others call them, the *returns*, or the *tumblers*, or *pulleys*, to which the tiers are tied, to clear the courfe of cords through the high-liffes. 26. The catch-board for the tumblers. 27. The tire-board. 28. The buttons for the knee-rolls and treddle-board, defcribed in number 20. Ribbons of all forts are prohibited from being imported.

RIBANDS (from *rib* and *band*), in naval architecture, long narrow flexible pieces of timber, nailed upon the outfide of the ribs, from the ftem to the ftern-poft, fo as to envelope the fhip lengthwife, and appear on her fide and bottom like the meridians on the furface of the globe. The ribands being judicioufly arranged with regard to their height and diftance from each other, and forming regular fweeps about the fhip's body, will compofe a kind of frame, whofe interior furface

will determine the curve of all the intermediate or filling-timbers which are ftationed between the principal ones. As the figure of the fhip's bottom approaches to that of a conoid, and the ribands have a limited breadth, it is apparent that they cannot be applied to this convex furface without forming a double curve, which will be partly vertical and partly horizontal; fo that the vertical curve will increafe by approaching the ftem, and ftill more by drawing near the ftern-poft. It is alfo evident, that by deviating from the middle line of the fhip's length, as they approach the extreme breadth at the midfhip-frame, the ribands will alfo form a horizontal curve. The loweft of thefe, which is termined upon the ftem and ftern-poft, at the height of the rifing-line of the floor, and anfwers to the upper part of the floor-timber upon the midfhip-frame, is called the *floor-riband*. That which coincides with the wing-tranfom, at the height of the lower-deck upon the midfhip-frame, is termed the *breadth-riband*; all the reft, which are placed between thefe two, are called *intermediate ribands*. See SHIP-BUILDING.

RIBES, the CURRANT and GOOSEBERRY-BUSH: A genus of the monogynia order, belonging to the pentandria clafs of plants; and in the natural method ranking under the 36th order, *Pomaceæ*. There are five petals, and ftamina inferted into the calyx; the ftyle is bifid; the berry polyfpermous, inferior. The currant and the goofeberry were long confidered each as a feparate genus; *ribes* the currant, and *groffularia* the goofeberry; but they are now joined together, the groffularia being made a fpecies of *ribes*; all the currant kinds having inermous or thornlefs branches, and racemous clufters of flowers and fruit; and the goofeberry having fpinous branches, and flowers and fruit for the moft part fingly.

There are three fpecies of the currant-tree, two of which, and their varieties, merit culture for their fruit; the other as a plant of variety or obfervation: all of which are inermous or unarmed, having no thorns on the branches. 1. *Rubrum*, common red-currant tree, &c. has a fhrubby ftem, dividing low into many branches, forming a bufhy head, five or fix feet high or more, without thorns; broad trilobate leaves, and fmooth pendulous clufters of plane greenifh flowers, fucceeded by fmall clufters of berries. It grows naturally in woods and the hedges in moft parts of Europe, and comprifes all forts of red and white currants; as common fmall red currant—large bunched red currant—Champaigne pale-red currant—common fmall white currant—large white Dutch currant—yellow blotched-leaved currant—filver ftriped leaved—gold ftriped leaved—goofeberry-leaved. All thefe forts are varieties of one fpecies, *ribes rubrum*, or common red currant; it being the parent from which all the others were firft obtained from the feed, and improved by culture. They all flower in the fpring, and the fruit ripens in June and July: and by having the trees in different fituations and modes of training, fuch as plantations of ftandards in the open quarters for the general fupply, others trained againft walls or pales of different afpect, the fruit may be continued ripe and in good perfection from about the middle of June until November, provided the later crops are defended with mats or nets from the birds. 2. The *nigrum*, or black currant tree, has a fhrubby ftem, dividing low into many branches, forming a bufhy head five or fix feet high; broad trilobate leaves of a rank odour, and having racemous clufters of oblong greenifh flowers, fucceeded by thin clufters of black berries. The fruit of this fpecies being of a ftrong flavour, and fomewhat phyfical relifh, is not generally liked; it, however, is accounted very wholefome: there is alfo made of it a fyrup of high eftimation for fore throats and quinfies; hence the fruit is often called *fquinancy berries*. There is a variety called the *Pennfylvanian black currant*, having fmaller fhoots and leaves not ftrong fcented, and fmall fruit but of little value; fo the fhrub is efteemed only for variety and fhrubberies. The mode of bearing of all the varieties of currants is both in the old and young wood all along the fides of the branches and fhoots, often upon a fort of fmall fprigs and fnags, producing the fruit in numerous long pendulous clufters. 3. The *groffularia*, or common goofeberry bufh, rifes with a low fhrubby ftem, dividing low into a very branchy bufhy head, armed with fpines; trilobate fmallifh leaves, having hairy ciliated footftalks; and fmall greenifh flowers, fucceeded by hairy berries. It confifts of many varieties, of different fizes and colours. 4. The *reclinatum*, or reclinated broad-leaved goofeberry-bufh, rifes with a low fhrubby ftem, and reclinated fomewhat prickly branches, tribolate broadifh leaves, and fmall greenifh flowers, having the pedunculi furnifhed with triphyllous bracteæ. 5. The *oxyacanthoides*, or oxyacantha-leaved goofeberry, has a fhrubby ftem, and branches armed on all fides with fpines, and largifh trilobate hawthorn leaves. 6. The *uva crifpa*, or fmooth goofeberry, has a fhrubby ftem, and branches armed with fpines; trilobate leaves; pedicles having monophyllous bracteæ; and fmooth fruit. 7. The *cynofbati*, or prickly-fruited goofeberry bufh, has a fhrubby ftem and branches, armed with fpines, moftly at the axillas, and prickly fruit in clufters.

All the above feven fpecies of ribes, both currants and goofeberry kinds, and their refpective varieties, are very hardy fhrubs, that profper almoft anywhere, both in open and fhady fituations, and in any common foil; bearing plentifully in any expofure, though in open funny fituations they produce the largeft and faireft fruit, ripening to a richer vinous flavour; but it is eligible to plant them in different fituations and afpects, in order to have the fruit as early and late as poffible. They are commonly planted in the kitchen-garden, moftly as dwarf ftandards, in the open quarters, for the general fupply; being difpofed fometimes in continued plantations in rows, eight or ten feet by fix afunder, where great quantities of the fruit are required for market or other large fupplies; and are fometimes difpofed in fingle ranges round the outward edge of the quarters, eight feet afunder; frequently in fingle crofs rows, in order to divide the ground into feparate wide plats or breaks, of from 20 to 30 or 40 feet wide, which alfo ferves to fhelter the ground little in winter; in all of which methods of planting them as ftandards, they fhould be generally trained up to a fingle ftem about a foot high, then fuffered to branch out every way all around into bufhy heads, keeping the middle, however, open, and the branches moderately thin, to admit the fun and free air; though if fome are fanned, that is, trimmed on two fides oppofitely, fo as to make the other branches range in a line like an efpalier, they will take up much lefs of the ground, and, by admitting the fun and air more freely, they will produce large fair fruit. They are likewife trained againft walls or palings, like other wall-trees, but principally fome of the large red and white Dutch currants, in which they will produce fine large fruit, and thofe againft any fouth fence will ripen early, and be high flavoured; but it is proper to plant a few both againft fouth, north, eaft, and weft walls, in order to obtain the fruit ripe both early and late, in a long fucceffion. It is alfo proper to plant a few of the fineft forts of goofeberries againft a warm fence, both to have early green goofeberries for tarts, &c. as well as to ripen early; and they will grow very large and fine. Sometimes both currants and goofeberries are alfo trained in low efpaliers for variety, and they produce very fine fruit. The fruits both of the currant and goofeberry are of an acid and cooling nature, and as fuch are fometimes ufed in medicine, efpecially the juice reduced to a jelly by boiling with fugar. From the juice of currants alfo a very agreeable wine is made.

RICAUT, or RYCAUT (SIR PAUL), an eminent Englifh tra-

veller, of the time of whose birth we find no account; but in 1661 he was appointed secretary to the earl of Winchelsea, who was sent ambassador extraordinary to the Ottoman Porte. During his continuance in that station, he wrote, "The present State of the Ottoman Empire, in three books, containing the maxims of the Turkish policy, their religion, and military discipline," London, folio, 1670. He afterwards resided 11 years as consul at Smyrna, where, at the command of Charles II. he composed "The present state of the Greek and Armenian Churches, *anno Christi* 1678." On his return, Lord Clarendon, being appointed lord-lieutenant of Ireland, made him his principal secretary for Leinster and Connaught: king James II. knighted him; and made him one of the privy council in Ireland, and judge of the court of admiralty; all which he held to the Revolution. He was employed by King William as resident at the Hanse-towns in Lower Saxony, where he continued for ten years; but being worn out with age and infirmities, he obtained leave to return in 1700, and died the same year. Ricaut continued "Knolles's History of the Turks, and Platina's Lives of the Popes;" besides which, there are some other productions under his name.

RICCIA, in botany: A genus of the natural order of algæ, belonging to the cryptogamia class of plants. There is no calyx, but a vesicular cavity within the substance of the leaf. There is no corolla; the antheræ are cylindrical, and sessile, placed on the germen, which is turbinated; the style is filiform, perforating the anthera; and the seed-case is spherical, crowned with the withered anthera; the seeds are hemispherical and pedicellated.

RICE. See Oryza. "Rice *bras*, (says Mr. Marsden) whilst in the husk, is in India called *paddee*, and assumes a different name in each of its other various states. We observe no distinction of this kind in Europe, where our grain retains through all its stages, till it becomes flour, its original name of barley, wheat, or oats. The following, beside many others, are names applied to rice, in its different stages of growth and preparation: *paddee*, original name of the seed: *oossay*, grain of last season: *bunnee*, the plants before removed to the sawoors: *bras* or *bray*, rice, the husk of the paddee being taken off: *charroop*, rice cleaned for boiling; *nassee*, boiled rice: *peerang*, yellow rice: *jambar*, a service of rice, &c. Among people whose general objects of contemplation are few, those which do of necessity engage their attention, are often more nicely discriminated than the same objects among more enlightened people, whose ideas ranging over the extensive field of art and science, disdain to fix long on obvious and common matters. *Paddee*, on Sumatra and the Malay islands, is distinguished into two sorts; *Laddang* or up-land paddee, and *Sawoor* or low-land, which are always kept separate, and will not grow reciprocally. Of these the former bears the higher price, being a whiter, heartier, and better flavoured grain, and having the advantage in point of keeping. The latter is much more prolific from the seed, and liable to less risk in the culture, but is of a watery substance, produces less increase in boiling, and is subject to a swifter decay. It is, however, in more common use than the former. Beside this general distinction, the paddee of each sort, particularly the Laddang, presents a variety of species, which, as far as my information extends, I shall enumerate, and endeavour to describe. The common kind of dry ground paddee: colour, light brown: the size rather large, and very little crooked at the extremity. Paddee *undallong*: dry ground: short round grain: grows in whorls or bunches round the stock. Paddee *ebbass*: dry ground: large grain: common. Paddee *gallo*: dry ground: light coloured: scarce. Paddee *sennee*: dry ground: deep coloured; small grain: scarce. Paddee *ejoo*: dry ground; light coloured. Paddee *kooning*: dry ground: deep yellow: fine rice: crooked, and pointed. Paddee *coocoor ballum*: dry ground: much esteemed: light coloured; small, and very much crooked, resembling a dove's nail, from whence its name. Paddee *pesang*: dry ground: outer coat light brown; inner red: longer, smaller, and less crooked than the *coocoor ballum*. Paddee *Santong*: the finest sort that is planted in wet ground: small, straight, and light coloured. In general it may be observed that the larger grained rice is the least esteemed, and the smaller and whiter the most prized. In the Lampoon country they make a distinction of paddee *crawang* and paddee *jerroo*; the former of which is a month earlier in growth than the latter."

Rice-*Bird*. See Oryzivora.

Rice-*Bunting*. See Emberiza.

RICHARDIA, in botany: A genus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 47th order, *Stellatæ*. The calyx is sexpartite; the corolla monopetalous, and subcylindrical; and there are three seeds.

RICHARDSON (Samuel), a celebrated English sentimental novel writer, born in 1688, was bred to the business of a printer, which he exercised all his life with eminence. Though he is said to have understood no language but his own, yet he acquired great reputation by his three epistolary novels, intitled *Pamela*, *Clarissa*, and *Sir Charles Grandison*; which show an uncommon knowledge of human nature. His purpose being to promote virtue, his pictures of moral excellence are by much too highly coloured; and he has described his favourite characters such rather as we might wish them to be, than as they are to be found in reality. It is also objected by some, that his writings have not always the good effect intended: for that, instead of improving natural characters, they have fashioned many artificial ones; and have taught delicate and refined ladies and gentlemen to despise every one but their own self-exalted persons. But, after all that can be urged of the ill effects of Mr. Richardson's novels on weak minds, eager to adopt characters they can only burlesque, a sensible reader will improve more by studying such models of perfection, than of those nearer to the natural standard of human frailty, and where those frailties are artfully exaggerated so as to fix and misemploy the attention on them. A stroke of the palsy carried off Mr. Richardson, after a few days illness, upon the 4th of July 1761. He was a man of fine parts, and a lover of virtue; which, for aught we have ever heard to the contrary, he showed in his life and conversation as well as in his writings. Besides the works above-mentioned, he is the author of an Æsop's Fables, a Tour through Britain, 4 vols, and a volume of Familiar Letters upon business and other subjects. He is said from his childhood to have delighted in letter-writing; and therefore was the more easily led to throw his romances into that form; which, if it enlivens the history in some respects, yet lengthens it with uninteresting prate, and formalities that mean nothing, and on that account is sometimes found a little tedious and fatiguing.

The most eminent writers of our own country, and even of foreign parts, have paid their tribute to the transcendent talents of Mr. Richardson, whose works have been published in almost every language and country of Europe. They have been greatly admired, notwithstanding every dissimilitude of manners, or every disadvantage of translation. M. Diderot, a late celebrated French author, speaking of the means employed to move the passions, in his Essay on Dramatic Poetry, mentions Richardson as a perfect master of that art: "How striking (says he), how pathetic, are his descriptions! His personages, though silent, are alive before me; and, of those who speak, the actions are still more affecting than the words."—The famous John-James Rousseau, speaking, in his letter to M. d'Alembert, of the novels of Richardson, asserts "that nothing was ever

written equal to, or even approaching them, in any language."—Mr. Aaron Hill calls his Pamela a "delightful nurfery of virtue."—Dr. Warton fpeaks thus of Clementina: "Of all reprefentations of madnefs, that of Clementina, in the Hiftory of Sir Charles Grandifon, is the moft deeply interefting. I know not whether even the madnefs of Lear is wrought up, and expreffed by fo many little ftrokes of nature and paffion. It is abfolute pedantry to prefer and compare the madnefs of Orefles in Euripides to this of Clementina."—Dr. Johnfon, in his Introduction to the 97th number of the Rambler, which was written by Mr. Richardfon, obferves that the reader was indebted for that day's entertainment to an author "from whom the age has received greater favours; who has enlarged the knowledge of human nature, and taught the paffions to move at the command of virtue;" and, in his Life of Rowe, he fays, "The character of Lothario feems to have been expanded by Richardfon into that of Lovelace; but he has excelled his original in the moral effect of the fiction. Lothario, with gaiety which cannot be hated, and bravery which cannot be defpifed, retains too much of the fpectator's kindnefs. It was in the power of Richardfon alone to teach us at once efteem and deteftation; to make virtuous refentment overpower all the benevolence which wit, and elegance, and courage, naturally excite; and to lofe at laft the hero in the villain."—Dr. Young very pertinently obferved, that Mr. Richardfon, with the mere advantages of nature, improved by a very moderate progrefs in education, ftruck out at once, and of his own accord, into a new province of writing, in which he fucceeded to admiration. And, what is more remarkable, that he not only began, but finifhed, the plan on which he fet out, leaving no room for any one after him to render it more complete: and that not one of the various writers that have ever fince attempted to imitate him have in any refpect equalled, or at all approached near him. This kind of romance is peculiarly his own; and "I confider him (continues the Doctor) as a truly great natural genius; as great and fupereminent in his way as Shakefpeare and Milton were in theirs."

Richardson (Jonathan), a celebrated painter of heads, was born about the year 1665, and againft his inclination was placed by his father-in law apprentice to a fcrivener, with whom he lived fix years; when obtaining his freedom by the death of his mafter, he followed the bent of his difpofition, and at 20 years old became the difciple of Riley; with whom he lived four years, whofe niece he married, and of whofe manner he acquired enough to maintain a folid and lafting reputation, even during the lives of Kneller and Dahl; and to remain at the head of the profeffion when they went off the ftage.

There is ftrength, roundnefs, and boldnefs in his colouring; but his men want dignity, and his women grace. The good fenfe of the nation is characterifed in his portraits. You fee he lived in an age when neither enthufiafm nor fervility were predominant. Yet with a pencil fo firm, poffeffed of a numerous and excellent collection of drawings, full of the theory, and profound in reflections on his art, he drew nothing well below the head, and was void of imagination. His attitudes, draperies, and back-grounds, are totally infipid and unmeaning; fo ill did he apply to his own practice the fagacious rules and hints he beftowed on others. Though he wrote with fire and judgment, his paintings owed little to either. No man dived deeper into the inexhauftible ftores of Raphael, or was more fmitten with the native luftre of Vandyck. Yet though capable of tafting the elevation of the one and the elegance of the other, he could never contrive to fee with their eyes, when he was to copy nature himfelf. One wonders that he could comment their works fo well, and imitate them fo little.

He quitted bufinefs himfelf fome years before his death; but his temperance and virtue contributed to protract his life to a great length in the full enjoyment of his underftanding and in the felicity of domeftic friendfhip. He had had a paralytic ftroke that affected his arm, yet never difabled him from his cuftomary walks and exercife. He had been in St. James's Park, and died fuddenly at his houfe in Queen's-fquare on his return home, May 28, 1745, when he had paffed the 80th year of his age. He left a fon and four daughters, one of whom was married to his difciple Mr. Hudfon, and another to Mr. Grigfon an attorney. The tafte and learning of the fon, and the harmony in which he lived with his father are vifible in the joint works they compofed. The father in 1719 publifhed two difcourfes: 1. An Effay on the whole Art of Criticifm as it relates to Painting; 2. An Argument in behalf of the Science of a Connoiffeur; bound in one volume octavo. In 1722 came forth An Account of fome of the ftatues, bas-reliefs, drawings, and pictures, in Italy, &c. with Remarks by Mr. Richardfon, fenior and junior. The fon made the journey; and from his notes, letters, and obfervations, they both at his return compiled this valuable work. As the father was a formal man, with a flow, but loud and fonorous voice, and, in truth, with fome affectation in his manner; and as there is much fingularity in his ftyle and expreffion, thefe peculiarities (for they were fcarcely foibles) ftruck fuperficial readers, and between the laughers and the envious the book was much ridiculed. Yet both this and the former are full of matter, good fenfe, and inftruction: and the very quaintnefs of fome expreffions, and their laboured novelty, fhow the difficulty the author had to convey mere vifible ideas through the medium of language. Thofe works remind one of Cibber's inimitable treatife on the ftage: when an author writes on his own profeffion, feels it profoundly, and is fenfible his readers do not, he is not only excufable, but meritorious, for illuminating the fubject by new metaphors or bolder figures than ordinary. He is the coxcomb that fneers, not he that inftructs, in appropriated diction.

If thefe authors were cenfured when converfant within their own circle, it was not to be expected that they would be treated with milder indulgence when they ventured into a fifter region. In 1734, they publifhed a very thick octavo, containing explanatory notes and remarks on Milton's Paradife Loft, with the life of the author, and a difcourfe on the poem. Again were the good fenfe, the judicious criticifms, and the fentiments that broke forth in this work, forgotten in the fingularities that diftinguifh it. The father having faid in apology for being little converfant in claffic literature, that he had looked into them through his fon, Hogarth, whom a quibble could furnifh with wit, drew the father peeping through the nether end of a telefcope, with which his fon was perforated at a Virgil aloft on a fhelf. Yet how forcibly Richardfon entered into the fpirit of his author, appears from his comprehenfive expreffion, that *Milton was an ancient, born two thoufand years after his time.* Richardfon, however, was as incapable of reaching the fublime or harmonious in poety, as he was in painting, though fo capable of illuftrating both. Some fpecimens of verfe that he has given us here and there in his works, excite no curiofity for more, though he informs us in his Milton, that if painting was his wife, poetry had been his fecret concubine. It is remarkable, that another commentator of Milton has made the fame confeffion,

——Sunt & mihi carmina, me quoque dicunt
Vatum paftores——

fays Dr. Bentley. Neither the doctor nor the painter add *fed non ego credulus illis*, though all their readers are ready to fupply it for both. Befides his pictures and commentaries, we have a few etchings by his hand, particularly two or three of Milton, and his own head. The fale of his collection of drawings, in February 1747, lafted 18 days, and produced

about 2060l, his pictures about 700l. Hudson his son-in-law bought many of the drawings.

RICHELET (CÆSAR PETER), a French writer, born in 1631 at Chemin in Champagne. He was the friend of Patru and Ablancourt; and like them applied himself to the study of the French language with success. He compiled a dictionary of that language, full of new and useful remarks; but exceptionable, as containing many satirical reflections and obscenities. The best edition is that of Lyons, 3 vol. folio, 1728. He also collected a small dictionary of rhymes, and composed some other pieces in the grammatical and critical way. He died in 1698.

RICHES, a word used always in the plural number, means wealth, money, possession, or a splendid sumptuous appearance. When used to express the fortune of private persons whether patrimonial or acquired, it signifies *opulence*; a term which expresses not the enjoyment, but the possession, of numerous superfluities.—The riches of a state or kingdom expresses the produce of industry, of commerce, of different incorporated bodies, of the internal and external administration of the principal members of which the society is composed, &c.

RICHLIEU (JOHN ARMAND DU PLESSIS DE), cardinal of Richlieu and Fronsac, bishop of Lucon, &c. was born at Paris in 1585. He was of excellent parts; and at the age of 22 had the address to obtain a dispensation to enjoy the bishopric of Lucon in 1607. Returning into France, he applied himself in a particular manner to the function of preaching; and his reputation this way procured him the office of almoner to the queen Mary de Medicis. His abilities in the management of affairs advanced him to be secretary of state in 1616; and the king soon gave him the preference to all his other secretaries. The death of the marquis d'Ancre having produced a revolution in state affairs, Richlieu retired to Avignon; where he employed himself in composing books of controversy and piety. The king having recalled him to court, he was made a cardinal in 1622; and, two years after, first minister of state, and grand master of the navigation. In 1626, the isle of Rhée was preserved by his care, and Rochelle taken, having stopped up the haven by the famous dyke which he ordered to be made there. He accompanied the king to the siege of Cazal, and contributed not a little to the raising of it in 1629. He also obliged the Huguenots to the peace at Alets, which proved the ruin of that party; he took Pamerol, and succoured Cazal besieged by Spinola. In the mean time the nobles found fault with his conduct, and persuaded the king to discard him. The cardinal, for his part, was unmoved with it; and by his reasonings overthrew what was thought to be determined against him; so that, instead of being disgraced, he from that moment became more powerful than ever. He punished all his enemies in the same manner as they would have had him suffer; and the day which produced this event, so glorious to cardinal Richlieu, was called the *day of dupes*. This able minister had from thenceforwards an ascendency over the king's mind; and he now resolved to humble the excessive pride of the house of Austria. For that purpose he concluded a treaty with Gustaphus Adolphus king of Sweden, for carrying the war into the heart of Germany. He also entered into a league with the duke of Bavaria; secured Lorrain; raised a part of the princes of the empire against the emperor; treated with the Dutch to continue the war against Spain; favoured the Catalans and Portuguese till they shook off the Spanish yoke; and, in short, took so many different measures, that he accomplished his design; and, after having carried on the war with success, was thinking of concluding it by a peace, when he died at Paris on the 4th of December 1642, aged 58. He was interred in the Sorbonne, where a magnificent mausoleum is erected to his memory. This great politician made the arts and sciences flourish; formed the botanical garden at Paris, called the *king's garden*; founded the French academy; established the royal printing-house; erected the palace afterwards called *Le Palais Royal*, which he presented to the king; and rebuilt the Sorbonne with a magnificence that appears truly royal. Besides his books of controversy and piety, there go under the name of this minister, A Journal, in 2 vols. 12mo; and a Political Testament, in 12mo; all treating of politics and state affairs. Cardinal Mazarine pursued Richlieu's plan, and completed many of the schemes which he had begun, but left unfinished.

RICINUS, or PALMA CHRISTI, in botany: A genus of the monadelphia order, belonging to the monœcia class of plants; and in the natural method ranking under the 38th order, *Tricoccæ*. The male calyx is quinquepartite; there is no corolla; the stamina numerous. The female calyx is tripartite; there is no corolla, but three bifid styles, with a trilocular capsule, and a single seed. There are three species, of which the most remarkable is the communis, or common palma Christi. See pl. 1. This tree is of speedy growth, as in one year it arrives at its full height, which seldom exceeds 20 feet. The trunk is subligneous; the pith is large; the leaves broad and palmated; the flower spike is simple, and thickly set with yellow blossoms in the shape of a cone; the capsules are triangular and prickly, containing three smooth gray mottled seeds. When the bunches begin to turn black, they are gathered, dried in the sun, and the seeds picked out. They are afterwards put up for use as wanted, or for exportation.

Castor oil is obtained either by expression or by decoction. The first method is practised in England; the latter in Jamaica. It is common first to parch the nuts or seeds in an iron pot over the fire; but this gives the oil an empyreumatic taste, smell, and colour; and it is best prepared in this manner: A large iron pot or boiler is first prepared, and half filled with water. The nuts are then beaten in parcels in deep wooden mortars, and after a quantity is beaten it is thrown into the iron vessel. The fire is then lighted, and the liquor is gently boiled for two hours, and kept constantly stirred. About this time the oil begins to separate, and swims on the top, mixed with a white froth, and is skimmed off till no more rises. The skimmings are heated in a small iron pot, and strained through a cloth. When cold, it is put up in jars or bottles for use.

Castor oil, thus made, is clear and well flavoured, and if put into proper bottles will keep sweet for years. The expressed castor oil soon turns rancid, because the mucilaginous and acrid parts of the nut are squeezed out with the oil. On this account the preference is given to well prepared oil by decoction. An English gallon of the seeds yield about two pounds of oil, which is a great proportion.

Before the disturbances in America, the planters imported train oil for lamps and other purposes about sugar works. It is now found that the castor oil can be procured as cheap as the fish oil of America: it burns clearer, and has not any offensive smell. This oil, too, is fit for all the purposes of the painter, or for the apothecary in ointments and plaisters. As a medicine it purges without stimulus, and is so mild as to be given to infants soon after birth, to purge off the meconium. All oils are noxious to insects, but the castor oil kills and expels them. It is generally given as a purge after using the cabbage bark some days. In constipation and belly-ach this oil is used with remarkable success. It sits well on the stomach, allays the spasm, and brings about a plentiful evacuation by stool, especially if at the same time fomentations, or the warm bath, are used.—Belly-ach is at present less frequent in Jamaica than formerly, owing to several causes. The inhabitants, in general, live better, and drink better liquors; but the excessive drinking of new rum still makes it frequent amongst soldiers, sailors, and

the lower order of white people. It has been known to happen too from visceral obstructions after intermittents, or marsh fevers, in Jamaica.

The ricinus *Americanus* grows as tall as a little tree, and is so beautiful that Millar says it deserves a place in every curious garden, and he planted it himself at Chelsea. It expands into many branches; the leaves are sometimes two feet in diameter, and the stem as large as a middle-sized broom staff, towards the top of the branch it has a cluster of flowers, something resembling a bunch of grapes; the flowers are small and staminous, but on the body of the plant grow bunches of rough triangular husks, each containing three speckled seeds, generally somewhat less than horse beans; the shell is brittle, and contains white kernels of a sweet, oily, and nauseous taste. From this kernel the oil is extracted, and if the medicine should become officinal, the seeds may be imported at a reasonable rate, as the plant grows wild and in great plenty in all the British and French American islands. See OLEUM *Palmæ Christi*. Of the ricinus communis there are a great many varieties; all of them fine majestic plants, annual, or at most biennial, in this country; but in their native soil they are said to be perennial both in root and stem. They are propagated by seeds sown on a hot-bed, and require the same treatment as other tender exotics.

RICKETS, in medicine. See MEDICINE.

RICOCHET, in gunnery, is when guns, howitzers, or mortars are loaded with small charges, and elevated from 5 to 12 degrees, so as to fire over the parapet, and the shot or shell rolls along the opposite rampart: it is called *ricochet-firing*, and the batteries are likewise called *ricochet batteries*. This method of firing was first invented by M Belidor, and first used at the siege of Ath in 1697. This mode of firing out of mortars was first tried in 1723 at the military school at Strasbourg, and with success. At the battle of Rosbach, in 1757, the king of Prussia had several 6-inch mortars made with trunnions, and mounted on travelling carriages, which fired obliquely on the enemy's lines, and amongst their horse, loaded with 8 ounces of powder, and at an elevation of one degree 15 minutes, which did great execution; for the shells rolling along the lines, with burning fuzes, made the stoutest of the enemy not wait for their bursting.

RICOTIA, in botany: A genus of the siliquosa order, belonging to the tetradynamia class of plants; and in the natural method ranking under the 39th order, *Siliquosæ*. The siliqua is unilocular, oblong, and compressed, with plain valvules.

RIDGE, in agriculture, a long piece of rising land between two furrows. See HUSBANDRY.

RIDGLING, or RIDGEL, among farriers, &c. the male of any beast that has been but half-geit.

RIDING, in general, signifies the being carried along on any vehicle

RIDING on horseback. See HORSEMANSHIP. During this exercise all the viscera are shaken and pressed against each other; at the same time the pure air acts with a greater force on the lungs. Weakly persons, or those whose stomachs are infirm, should, however, be cautious of riding before their meals are somewhat digested.

RIDING, in naval affairs, is the state of a ship's being retained in a particular station, by means of one or more cables with their anchors, which are for this purpose sunk into the bottom of the sea, &c. in order to prevent the vessel from being driven at the mercy of the wind or current.—A rope is said to *ride*, when one of the turns by which it is wound about the capstern or windlass lies over another, so as to interrupt the operation of heaving.

RIDING *Athwart*, the position of a ship which lies across the direction of the wind and tide, when the former is so strong as to prevent her from falling into the current of the latter.

RIDING *between the Wind and Tide*, the situation of a vessel at anchor, when the wind and tide act upon her in direct opposition, in such a manner as to destroy the effort of each other upon her hull; so that she is in a manner balanced between their reciprocal force, and rides without the least strain on her cables. When a ship does not labour heavily, or feel a great strain when anchored in an open road or bay, she is said to ride easy. On the contrary, when she pitches violently into the sea, so as to strain her cables, masts, or hull, it is called *riding hard*, and the vessel is termed a *bad roader*. A ship is rarely said to *ride* when she is fastened at both the ends, as in a harbour or river, that situation being comprehended in the article MOORING.

RIDING, a district visited by an officer.—Yorkshire is divided into three ridings, viz. the east, west, and north ridings. In all indictments in that county, both the town and riding must be expressed.

RIDING, as connected with gardening, and susceptible of embellishment. A riding, though in extent differing so widely from a garden, yet agrees with it in many particulars: for exclusive of that community of character which results from their being both improvements, and both destined to pleasure, a closer relation arises from the property of a riding, *to extend the idea of a seat*, and appropriate a whole country to the mansion; for which purpose it must be distinguished from common roads, and the marks of distinction must be borrowed from a garden. Those which a farm or a park can supply are faint and few; but whenever circumstances belonging to a garden occur, they are immediately received as evidence of the domain. The species of the trees will often be decisive: plantations of firs, whether placed on the sides of the way, or in clumps or woods in the view, denote the neighbourhood of a seat: even limes and horse-chesnuts are not indifferent; for they have always been frequent in improvements, and rare in ordinary scenes of cultivated nature. If the riding be carried through a wood, the shrubs, which for their beauty or their fragrance have been transplanted from the country into gardens, such as the sweet-briar, the viburnum, the euonymus, and the woodbine, should be encouraged in the underwood; and to these may be added several which are still peculiar to shrubberies, but which might easily be transferred to the wildest coverts, and would require no further care.

RIDLEY (NICHOLAS) bishop of London, and a martyr to the Reformation, was descended of an ancient family, and born in the beginning of the 16th century, at Wilmontswick in Northumberland. From the grammar-school at Newcastle upon Tyne, he was sent to Pembroke-hall in Cambridge, in the year 1518, where he was supported by his uncle Dr. Robert Ridley, fellow of Queen's college. In 1522 he took his first degree in arts; two years after, was elected fellow; and, in 1525, he commenced master of arts. In 1527, having taken orders, he was sent by his uncle, for further improvement, to the Sorbonne at Paris; from thence he went to Louvain, and continued abroad till the year 1529. On his return to Cambridge, he was chosen under-treasurer of the university; and, in 1533, was elected senior proctor. He afterwards proceeded bachelor of divinity, and was chosen chaplain of the university, orator, and *magister glomeriæ*. At this time he was much admired as a preacher and disputant. He lost his kind uncle in 1536; but was soon after patronised by Dr. Cranmer, archbishop of Canterbury, who made him his domestic chaplain, and presented him to the vicarage of Herne in East Kent; where, we are told, he preached the doctrine of the Reformation. In 1540, having commenced doctor of divinity, he was

made king's chaplain; and, in the same year, was elected master of his college in Cambridge. Soon after, Ridley was collated to a prebend in the church of Canterbury; and it was not long before he was accused in the bishop's court, at the instigation of bishop Gardiner, of preaching against the doctrine of the Six Articles. The matter being referred to Cranmer, Ridley was acquitted. In 1545, he was made a prebendary of Westminster abbey; in 1547 was presented by the fellows of Pembroke-hall, to the living of Soham, in the diocese of Norwich; and the same year was consecrated bishop of Rochester. In 1550 he was translated to the see of London; in which year he was one of the commissioners for examining bishop Gardiner, and concurred in his deprivation. In the year 1552, our prelate returning from Cambridge, unfortunately for himself, paid a visit to the princess, afterwards queen Mary; to whom, prompted by his zeal for reformation, he expressed himself with too much freedom: for she was scarcely seated on the throne when Ridley was doomed a victim to her revenge. With Cranmer and Latimer he was burnt alive at Oxford, on the 16th of October 1555. He wrote, 1. A treatise concerning images in churches. 2. Brief declaration of the Lord's Supper. 3. Certain godly and comfortable conferences between bishop Ridley and Mr. Hugh Latimer, during their imprisonment. 4. A comparison between the comfortable doctrine of the Gospel and the traditions of the Popish religion; and other works.

RIFLE, in gunnery. See GUNNERY.

RIGA, a large, strong, populous, and rich town of the Russian empire, and capital of Livonia. It is a large trading place and has a very considerable fortress; the trade is chiefly in corn, skins, leather, and naval stores. It was taken by the Russians in 1710, after they had blocked it up a long while, during which the inhabitants were afflicted with the plague. The castle is square, and defended by four towers and six bastions; besides which, it has a fine arsenal. The Protestants have still a handsome college here. It is seated on a large plain on the river Dwina. E. lon. 24. 25. N. lat. 57. 0.

RIGADOON, a gay and brisk dance formerly in vogue, borrowed originally from Provence in France, and performed in figure by a man and woman.

RIGGING *of a* SHIP, a general name given to all the ropes employed to support the masts, and to extend or reduce the sails, or arrange them to the disposition of the wind. The former, which are used to sustain the masts, remain usually in a fixed position, and are called *standing rigging*; such are the shrouds, stays, and back stays. The latter, whose office is to manage the sails, by communicating with various blocks or pulleys, situated in different places of the masts, yards, shrouds, &c. are comprehended in the general term of *running rigging*; such are the braces, sheets, halliards, clue lines, brails, &c.

In rigging a mast, the first thing usually fixed upon its head is a circular wreath or rope, called the *gromet*, or *collar*, which is firmly beat down upon the top of the hounds. The intent of this is to prevent the shrouds from being fretted or worn by the trestle-trees, or shoulders of the mast; after this are laid on the two pendants, from whose lower ends the main or fore tackles are suspended; and next, the shrouds of the starboard and larboard side, in pairs, alternately. The whole is covered by the stays, which are the largest ropes of the rigging.—When a yard is to be rigged, a gromet is also driven first on each of its extremities; next to this are fitted on the horses, the braces, and lastly the lifts or top-sail sheet blocks.

The principal objects to be considered in rigging a ship, appear to be strength, convenience and simplicity: or, the properties of affording sufficient security to the masts, yards, and sails; of arranging the whole machinery in the most advantageous manner, to sustain the masts, and facilitate the management of the sails; and of avoiding perplexity, and rejecting whatever is superfluous or unnecessary. The perfection of this art, then, consists in retaining all those qualities, and in preserving a judicious medium between them. See SHIP-BUILDING.

RIGHT, in geometry, signifies the same with straight; thus, a straight line is called a *right* one.

RIGHT is a title conferred, 1. Together with *Reverend*, upon all bishops. 2. Together with *Honourable*, upon earls, viscounts, and barons. 3. By courtesy, together with *Honourable*, upon the sons of dukes, marquisses, and the eldest sons of earls. 4. Together with *Honourable*, to the speaker of the house of commons; but to no other commoner excepting those who are members of his majesty's most honourable privy-council; and the three lord mayors of London, York, and Dublin, and the lord provost of Edinburgh, during their office. See HONOURABLE and PROVOST.

Hereditary Right. See HEREDITARY.

RIGHT is a word which, in the propriety of the English language, is used sometimes as an adjective and sometimes as a substantive. As an adjective it is nearly of the same import with *fit*, *suitable*, *becoming*, *proper*; and whilst it expresses a quality, it indicates a relation. Thus, when we say that an action is *right*, we must not only know the nature of the action, but, if we speak intelligibly, must also perceive its relation to the end for which it was performed; for an action may be *right* with one end in view which would be *wrong* with another. The conduct of that general would be *right*, who, to save an army that could not be otherwise saved, should place a small detachment in a station where he knew they would all be inevitably cut off; but his conduct would be very *wrong* were he to throw away the life of a single individual for any purpose, however important, which he knew how to accomplish without such a sacrifice.

Many philosophers have talked of actions being *right* and *wrong* in the abstract without regard to their natural consequences; and converting the word into a substantive, they have fancied an eternal rule of *right*, by which the morality of human conduct is in every particular case to be tried. But in these phrases we can discover no meaning. Whatever is *right* must be so on *some account or other*; and whatever is *fit*, must be fit for some *purpose*. When he who rests the foundation of virtue on the *moral sense*, speaks of an action being *right*, he must mean that it is such as, through the medium of that sense, will excite complacency in the mind of the agent, and gain to him the general approbation of mankind. When he who rests moral obligation on the will of God, speaks of some actions as *right* and others as *wrong*, he must mean that the former are agreeable to the divine will, however made known to men, and the latter disagreeable to it; and the man who deduces the law of virtue from what he calls the *fitness of things*, must have some *end in view*, for which things are fit, and denominate actions *right* or *wrong* as they tend to promote or counteract that end.

But the word *right*, used as a substantive, has in common as well as in philosophical language a signification which at first view appears to be very different from this. It denotes a *just claim* or an *honest possession*. Thus we say, a father has a *right* to reverence from his children, a husband to the love and fidelity of his wife, and a king to the allegiance of his subjects. But if we trace these *rights* to their source, we shall find that they are all laws of moral obligation, and that they are called *rights* only because it is agreeable to the will of God, to the instinctive dictates of the moral sense, or to the fitness of things, if such a phrase has any meaning, that children reverence their

parents, that wives love their huſbands, and that ſubjects pay allegiance to their ſovereign. This will be apparent to any man who ſhall put to himſelf ſuch queſtions as theſe: "*Why* have parents a *right* to reverence from their children, huſbands to the love of their wives, and ſovereigns to the allegiance of their ſubjects?" As theſe queſtions contain in them nothing abſurd, it is obvious that they are each capable of a preciſe anſwer; but it is impoſſible to give to any of them an anſwer which ſhall have any meaning, and not imply that *right* and *obligation* are reciprocal, or, in other words, that wherever there is a *right* in *one perſon*, there is a correſponding *obligation* upon *others*. Thus, to the queſtion "Why have parents a right to reverence from their children?" it may be anſwered, "Becauſe, under God, they were the authors of their children's being, and protected them from danger, and furniſhed them with neceſſaries, when they were in a ſtate ſo helpleſs that they could do nothing for themſelves." This anſwer conveys no other meaning than that there is an obligation upon children, in return for benefits received, to reverence their parents. But what is the ſource of this obligation? It can only be, the will of God, the moral ſenſe, or the fitneſs of things.

This view of the nature of right will enable us to form a proper judgment of the aſſertion of Mr. Godwin, "that man has no rights." The arguments by which this apparent paradox is maintained, are not merely ingenious and plauſible; they are abſolutely concluſive. But then our philoſopher, who never chooſes to travel in the beaten track, takes the word *right* in a ſenſe very different from that in which it has been uſed by all other men, and conſiders it as equivalent to *diſcretionary power*. "By the word *right* (ſays he) is underſtood a full and complete power of either doing a thing or omitting it, without the perſon's becoming liable to animadverſion or cenſure from another; that is, in other words, without his incurring any degree of turpitude or guilt." In this ſenſe of the word he affirms, and affirms truly, that a man has no rights, no diſcretionary power whatever, except in things of ſuch total indifference as, whether "he ſhall ſit on the right or on the left ſide of his fire, or dine on beef to-day or to-morrow."

A propoſition ſo evidently true as this ſtood not in need of argument to ſupport it; but as his arguments are clearly expreſſed, and afford a complete confutation of ſome popular errors ſanctioned by the reſpectable phraſe *rights of man*, we ſhall give our readers an opportunity of ſtudying them in his own words.

"Political ſociety is founded on the principles of morality and juſtice. It is impoſſible for intellectual beings to be brought into coalition and intercourſe without a certain mode of conduct, adapted to their nature and connection, immediately becoming a duty incumbent on the parties concerned. Men would never have aſſociated if they had not imagined that, in conſequence of that aſſociation, they would mutually conduce to the advantage and happineſs of each other. This is the real purpoſe, the genuine baſis, of their intercourſe; and, as far as this purpoſe is anſwered, ſo far does ſociety anſwer the end of its inſtitution. There is only one poſtulate more that is neceſſary to bring us to a concluſive mode of reaſoning upon this ſubject. Whatever is meant by the term *right*, there can neither be oppoſite rights, nor rights and duties hoſtile to each other. The rights of one man cannot claſh with or be deſtructive of the rights of another: for this, inſtead of rendering the ſubject an important branch of truth and morality, as the advocates of the rights of man certainly underſtand it to be, would be to reduce it to a heap of unintelligible jargon and inconſiſtency. If one man have a right to be free, another man cannot have a right to make him a ſlave; if one man have a right to inflict chaſtiſement upon me, I cannot have a right to withdraw myſelf from chaſtiſement; if my neighbour have a right to a ſum of money in my poſſeſſion, I cannot have a right to retain it in my pocket. It cannot be leſs incontrovertible, that I have no right to omit what my duty preſcribes. From whence it inevitably follows that men have no rights.

"It is commonly ſaid, 'that a man has a right to the diſpoſal of his fortune, a right to the employment of his time, a right to the uncontrolled choice of his profeſſion or purſuits.' But this can never be conſiſtently affirmed till it can be ſhown that he has no duties, preſcribing and limiting his mode of proceeding in all theſe reſpects.

"In reality, nothing can appear more wonderful to a careful inquirer, than that two ideas ſo incompatible as *man* and *rights* ſhould ever have been aſſociated together. Certain it is, that one of them muſt be utterly excluſive and annihilatory of the other. Before we aſcribe rights to man, we muſt conceive of him as a being endowed with intellect, and capable of diſcerning the differences and tendencies of things. But a being endowed with intellect, and capable of diſcerning the differences and tendencies of things, inſtantly becomes a moral being, and has duties incumbent on him to diſcharge: and duties and rights, as has already been ſhown, are abſolutely excluſive of each other.

"It has been affirmed by the zealous advocates of liberty, 'that princes and magiſtrates have no rights;' and no poſition can be more incontrovertible. There is no ſituation of their lives that has not its correſpondent duties. There is no power intruſted to them that they are not bound to exerciſe excluſively for the public good. It is ſtrange, that perſons adopting this principle did not go a ſtep further, and perceive that the ſame reſtrictions were applicable to ſubjects and citizens."

This reaſoning is unanſwerable; but it militates not againſt the *rights of man* in the uſual acceptation of the words, which are never employed to denote diſcretionary power, but a juſt claim on the one hand, implying a correſponding obligation on the other. Whether the phraſe be abſolutely proper is not worth the debating: it is authorized by cuſtom—the *jus et norma loquendi*—and is univerſally underſtood except by ſuch as the dæmons of faction, in the form of paradoxical writers on political juſtice, have been able to miſlead by ſophiſtical reaſonings.

Rights, in the common acceptation of the word, are of various kinds: they are *natural* or *adventitious*, *alienable* or *unalienable*, *perfect* or *imperfect*, *particular* or *general*. See the article Liberty.

Bill of Rights, in law, is a declaration delivered by the lords and commons to the prince and princeſs of Orange, 13th February 1688; and afterwards enacted in parliament, when they became king and queen. It ſets forth, that king James did, by the aſſiſtance of divers evil counſellors, endeavour to ſubvert the laws and liberties of this kingdom, by exerciſing a power of diſpenſing with and ſuſpending of laws; by levying money for the uſe of the crown by pretence of prerogative without conſent of parliament; by proſecuting thoſe who petitioned the king, and diſcouraging petitions; by raiſing and keeping a ſtanding army in time of peace; by violating the freedom of election of members to ſerve in parliament; by violent proſecutions in the court of king's bench; and cauſing partial and corrupt jurors to be returned on trials, exceſſive bail to be taken, exceſſive fines to be impoſed, and cruel puniſhments inflicted; all which were declared to be illegal. And the declaration concludes in theſe remarkable words: "And they do claim, demand, and inſiſt upon, all and ſingular the premiſes, as their undoubted rights and liberties." And the act of parliament itſelf (1 W. and M. ſtat. 2. cap. 2.) recognizes "all and ſingular the rights and liberties, aſſerted and claimed in the ſaid declaration, to be the true, ancient, indubitable rights of the people of this kingdom." See Liberty.

RIGIDITY, in physics, denotes a brittle hardness. It is opposed to ductility, malleability, and softness.

RIGOLL, or REGALS, a kind of musical instrument, consisting of several sticks bound together, only separated by beads. It is tolerably harmonious, being well struck with a ball at the end of a stick. Such is the account which Grassineau gives of this instrument. Skinner, upon the authority of an old English dictionary, represents it as a clavichord, or clarichord; possibly founding his opinion on the nature of the office of the tuner of the regals, who still subsists in the establishment of the king's chapel at St. James's, and whose business is to keep the organ of the chapel royal in tune; and not knowing that such wind instruments as the organ need frequent tuning, as well as the clavichord and other stringed instruments. Sir Henry Spelman derives the word *rigoll* from the Italian *rigabello*, a musical instrument, anciently used in churches instead of the organ. Walther, in his description of the regal, makes it to be a reed-work in an organ, with metal and also wooden pipes and bellows adapted to it. And he adds, that the name of it is supposed to be owing to its having been presented by the inventor to some king.—From an account of the regal used in Germany, and other parts of Europe, it appears to consist of pipes and keys on one side, and the bellows and wind-chest on the other. We may add, that lord Bacon (Nat. Hist. cent. ii. § 102.) distinguishes between the regal and organ, in a manner which shows them to be instruments of the same class. Upon the whole there is reason to conclude, that the regal or rigoll was a pneumatic, and not a stringed instrument.

Mersennus relates, that the Flemings invented an instrument, *les regales de bois*, consisting of 17 cylindrical pieces of wood, decreasing gradually in length, so as to produce a succession of tones and semitones in the diatonic series, which had keys, and was played on as a spinet; the hint of which, he says, was taken from an instrument in use among the Turks, consisting of 12 wooden cylinders, of different lengths, strung together, which being suspended and struck with a stick, having a ball at the end, produced music. Hawkins's Hist. Mus. vol. ii. p. 449.

RIGOR, in medicine, a convulsive shuddering from severe cold, an ague fit, or other disorder.

RIMINI, an ancient, populous, and handsome town of Italy, in Romagna, which is part of the territory of the church, with a bishop's see, an old castle, and a strong tower; as also many remains of antiquity, and very fine buildings. It is famous for a council in 1359, consisting of 400 bishops, who were all Arians except 20. It is seated in a fertile plain, at the mouth of the river Marecchia, on the gulph of Venice. E. lon. 12. 39. N. lat. 44. 6.

RIND, the skin of any fruit that may be cut off or pared.

RIND is also used for the inner bark of trees, or that whitish soft substance which adheres immediately to the wood. See PLANT.

RING, an ornament of gold and silver, of a circular figure, and usually worn on the finger. The *episcopal* ring (which makes a part of the pontifical apparatus, and is esteemed a pledge of the spiritual marriage between the bishop and his church) is of very ancient standing. The fourth council of Toledo, held in 633, appoints, that a bishop condemned by one council, and found afterwards innocent by a second, shall be restored, by giving him the ring, staff, &c. From bishops, the custom of the ring has passed to cardinals, who are to pay a very great sum *pro jure annuli cardinalitii*.

RINGS. The antiquity of rings is known from Scripture and profane authors. Judah left his ring or signet with Tamar (Gen. xxxviii. 18.) When Pharaoh committed the government of all Egypt to Joseph, he took his ring from his finger, and gave it to Joseph (Gen. xli. 42.) After the victory that the Israelites obtained over the Midianites, they offered to the Lord the rings, the bracelets, and the golden necklaces, and the ear-rings, that they had taken from the enemy (Numb. xxxi. 50.) The Israelitish women wore rings not only on their fingers, but also in their nostrils and their ears. St. James distinguishes a man of wealth and dignity by the ring of gold that he wore on his finger (James ii. 2.). At the return of the prodigal son, his father orders him to be dressed in a new suit of clothes, and to have a ring put upon his finger (Luke xv. 22.). When the Lord threatened king Jeconiah with the utmost effects of his anger, he tells him, that though he wore the signet or ring upon his finger, yet he should be torn off (Jer. xxii. 24.).

The ring was used chiefly to seal with; and the Scripture generally puts it in the hands of princes and great persons; as the king of Egypt, Joseph, Ahaz, Jezebel, king Ahasuerus, his favourite Haman, Mordecai, who succeeded Haman in his dignity, king Darius (1 Kings xxi. 8.; Esther iii. 10, &c.; Dan. vi. 17.) The patents and orders of these princes were sealed with their rings or signets; and it was this that secured to them their authority and respect. See the article SEAL.

RING-*Bone*. See FARRIERY.

RING *Ousel*, in ornithology, a species of TURDUS.

RIO-GRANDE, a river of Africa, which runs from east to west through Negroland, and falls into the Atlantic ocean, in 11 degrees of latitude. Some take it to be a branch of the Niger, of which there is not the least proof.

RIO-*Grande*, a river of South America, in Brasil, which has its source in an unknown country: it crosses the captainship of Rio-Grande, and falls into the sea at Natal los Reyes.

RIO-*Janeiro*, a river of South America, which rises in the mountains west of Brasil, and, running east through that country, falls into the Atlantic Ocean, in S. lat. 23. 30. The province of Janeiro is one of the richest in Brasil; and produces gold, silver, diamonds, and other precious stones.

RIOM, an ancient town of France, in the department of Puy de Dome and late province of Auvergne, seated on a hill, in a pleasant country, 8 miles N. E. of Clermont, and 115 S. of Paris. E. lon. 3. 13. N. lat. 45. 54.

RIOT, in law. The riotous assembling of 12 persons, or more, and not dispersing upon proclamation, was first made high treason by statute 3 & 4 Edw. VI. c. 5. when the king was a minor, and a change of religion to be effected: but that statute was repealed by statute 1 Mar. c. 1. among the other treasons created since the 25 Edw. III.; though the prohibition was in substance re-enacted, with an inferior degree of punishment, by statute 1 Mar. st. 2. c. 12. which made the same offence a single felony. These statutes specified and particularized the nature of the riots they were meant to suppress; as, for example, such as were set on foot with intention to offer violence to the privy-council, or to change the laws of the kingdom, or for certain other specific purposes; in which cases, if the persons were commanded by proclamation to disperse, and they did not, it was by the statute of Mary made felony, but within the benefit of clergy; and also the act indemnified the peace-officers and their assistants, if they killed any of the mob in endeavouring to suppress such riot. This was thought a necessary security in that sanguinary reign, when popery was intended to be re-established, which was like to produce great discontents: but at first it was made only for a year, and was afterwards continued for that queen's life. And, by statute 1 Eliz. c. 16. when a reformation in religion was to be once more attempted, it was revived and continued during her life also; and then expired. From the accession of James I. to the death of queen Anne, it was never once thought expedient to revive it; but, in the first year of George I. it was judged necessary, in order to support the execution of the act of settlement, to renew it, and at one stroke to make it perpetual, with large additions. For, whereas the former acts ex-

preſſly defined and ſpecified what ſhould be accounted a riot, the ſtatute 1 Geo. I. c. 5. enacts, generally, that if any 12 perſons are unlawfully aſſembled to the diſturbance of the peace, and any one juſtice of the peace, ſheriff, under-ſheriff, or mayor of a town, ſhall think proper to command them by proclamation to diſperſe, if they contemn his orders and continue together for one hour afterwards, ſuch contempt ſhall be felony without benefit of clergy. And further, if the reading of the proclamation be by force oppoſed, or the reader be in any manner wilfully hindered from the reading of it, ſuch oppoſers and hinderers are felons without benefit of clergy; and all perſons to whom ſuch proclamation *ought to have been made*, and knowing of ſuch hindrance, and not diſperſing, are felons without benefit of clergy. There is the like indemnifying clauſe, in caſe any of the mob be unfortunately killed in the endeavour to diſperſe them; being copied from the act of queen Mary. And by a ſubſequent clauſe of the new act, if any perſon, ſo riotouſly aſſembled, begin even before proclamation to pull down any church, chapel, meeting-houſe, dwelling-houſe, or outhouſes, they ſhall be felons without benefit of clergy.

Riots, routs, and unlawful aſſemblies, muſt have three perſons at leaſt to conſtitute them. An *unlawful aſſembly* is, when three, or more, do aſſemble themſelves together to do an unlawful act, as to pull down incloſures, to deſtroy a warren or the game therein; and part without doing it, or making any motion towards it. A *rout* is where three or more meet to do an unlawful act upon a common quarrel, as forcibly breaking down fences upon a right claimed of common, or of way, and make ſome advances towards it. A *riot* is where three or more actually do an unlawful act of violence, either with or without a common cauſe or quarrel; as if they beat a man; or hunt and kill game in another's park, chace, warren, or liberty; or do any other unlawful act with force and violence; or even do a lawful act, as removing a nuiſance, in a violent and tumultuous manner. The puniſhment of unlawful aſſemblies, if to the number of 12, we have juſt now ſeen, may be capital, according to the circumſtances that attend it; but, from the number of three to eleven, is by fine and impriſonment only. The ſame is the caſe in riots and routs by the common law; to which the pillory in very enormous caſes has been ſometimes ſuperadded. And by the ſtatute 13 Hen. IV. c. 7. any two juſtices, together with the ſheriff or under-ſheriff of the county, may come with the *poſſe comitatus*, if need be, and ſuppreſs any ſuch riot, aſſembly, or rout, arreſt the rioters, and record upon the ſpot the nature and circumſtances of the whole tranſaction; which record alone ſhall be a ſufficient conviction of the offenders. In the interpretation of which ſtatute it hath been holden, that all perſons, noblemen and others, except women, clergymen, perſons decrepit, and infants under 15, are bound to attend the juſtices in ſuppreſſing a riot, upon pain of fine and impriſonment; and that any battery, wounding, or killing the rioters, that may happen in ſuppreſſing the riot, is juſtifiable. So that our ancient law, previous to the modern riot-act, ſeems pretty well to have guarded againſt any violent breach of the public peace; eſpecially as any riotous aſſembly on a public or general account, as to redreſs grievances or pull down all incloſures, and alſo reſiſting the king's forces if ſent to keep the peace, may amount to overt acts of high treaſon, by levying war againſt the king.

RIPEN, a town of Denmark, in north Jutland, and capital of a dioceſe of the ſame name, with a biſhop's ſee, a good harbour, a caſtle, two colleges, and a public library. The tombs of ſeveral of the kings of Denmark are in the cathedral church, which is a very handſome ſtructure. The harbour, which has contributed greatly to the proſperity of this place, is at a ſmall diſtance, being ſeated at the mouth of the river Nipſaa, in a country which ſupplies the beſt beeves in Denmark. It is 54 miles north-weſt of Sleſwick and 25 ſouth-by-weſt of Wiburg. E. lon. 8. 94. N. lat. 55. 25. The dioceſe is bounded on the north by thoſe of Wiburg and Athuys, on the ſouth by the duchy of Sleſwick, and on the eaſt and weſt by the ſea.

RIPHÆAN MOUNTAINS, are a chain of high mountains in Ruſſia, to the north eaſt of the river Oby, where there are ſaid to be the fineſt ſables of the whole empire.

RIPHATH, or RIPHAT, ſecond ſon of Gomer, and grandſon of Japhet (Gen. x. 3. רפת *Riphat*). In moſt copies he is called *Diphath* in the Chronicles (1 Chr. i. 6. דפת *Diphat*). The reſemblance of the two Hebrew letters ר *Reſh* and ד *Daleth* is ſo much, that they are very often confounded. But, to the credit of the tranſlators of our Engliſh verſion be it ſaid, that in this inſtance, as well as in many others, they have reſtored the original reading, and rendered it Riphath. The learned are not agreed about the country that was peopled by the deſcendants of Riphath. The Chaldee and Arabic take it for France; Euſebius for the country of the Sauromatæ; the Chronicon Alexandrinum for that of the Garamantæ; Joſephus for Paphlagonia. Mela aſſures us, that anciently the people of this province were called *Riphatæi*, or Riphaces; and in Bithynia, bordering upon Paphlagonia, may be found the river Rhebeus, a people called *Rhebantes*, and a canton of the ſame name. Theſe reaſons have prevailed with Bochart to believe, that Riphath peopled Paphlagonia. Others think he peopled the Montes Riphei; and this opinion ſeems the moſt reaſonable to us, becauſe the other ſons of Gomer peopled the northern countries towards Scythia, and beyond the Euxine ſea.

RISIBLE, any thing capable of exciting laughter. *Ludicrous* is a general term, ſignifying, as may appear from its derivation, what is playſome, ſportive, or jocular. *Ludicrous* therefore ſeems the genus, of which *riſible* is a ſpecies, limited as above to what makes us laugh.

RITE, among divines, denotes the particular manner of celebrating divine ſervice in this or that country.

RITORNELLO, or REPEAT, in muſic, the burden of a ſong, or the repetition of the firſt or other verſes of a ſong at the end of each couplet.

RITTERHUSIUS (CONRAD), a learned German civilian, born at Brunſwick in 1560. He was profeſſor of civil law at Altdorf, and publiſhed a variety of works, particularly as a civilian; together with an edition of Oppian in Greek and Latin: he was moreover an excellent critic; his notes upon many eminent authors having been inſerted in the beſt editions of them. He died in 1613.

RITUAL, a book directing the order and manner to be obſerved in performing divine ſervice in a particular church, dioceſe, or the like. The ancient heathens had alſo their rituals, which contained their rites and ceremonies to be obſerved in building a city, conſecrating a temple or altar, in ſacrificing, deifying, &c.

RIVAL, a term applied to two or more perſons who have the ſame pretenſions; and which is properly applied to a competitor in love, and figuratively to an antagoniſt in any other purſuit.

RIVER, a current or ſtream of freſh water flowing in a bed or channel, from its ſource into the ſea. See the article SPRING. The great as well as the middle-ſized rivers proceed either from a confluence of brooks and rivulets, or from lakes; but no river of conſiderable magnitude flows from one ſpring, or one lake, but is augmented by the acceſſion of others. Thus, the Wolga receives above 200 rivers and brooks before it diſcharges itſelf into the Caſpian ſea; and the Danube receives no fewer before it enters the Euxine ſea. Some rivers are much augmented by frequent rains, or melted ſnow. In the country of Peru and Chili, there are ſmall rivers that only flow in the day; becauſe they are only fed by the ſnow

upon the mountains of the Andes, which is then melted by the heat of the fun. There are alfo feveral rivers upon both fides the extreme parts of Africa, and in India, which for the fame reafon are greater by day than by night. The rivers alfo in thefe places are almoft dried up in fummer, but fwell and overflow their banks in winter or in the wet feafon. The Wolga in May and June is filled with water, and overflows its fhelves and iflands, though at other times of the year it is fo fhallow, as fcarcely to afford a paffage for loaded fhips. The Nile, the Ganges, the Indus, &c. are fo much fwelled with rain or melted fnow, that they overflow their banks; and thefe deluges happen at different times of the year, becaufe they proceed from various caufes. Thofe that are fwelled with rain, are generally higheft in winter, becaufe it is ufually then more frequent than at other times of the year; but if they proceed from fnow, which in fome places is melted in the fpring, in others in fummer, or between both, the deluges of the rivers happen accordingly. Again, fome rivers hide themfelves under ground, and rife up in other places, as if they were new rivers. Thus, the Tigris meeting with mount Taurus runs under it, and flows out at the other fide of the mountain; alfo, after it has run through the lake Tofpia, it again immerges, and, being carried about 18 miles under ground, breaks out again, &c.

In a memoir of the academy of fciences lately publifhed, we have fome curious obfervations and conjectures concerning the difappearing of rivers, by the abbe Guettard. "It is very furprifing, (he obferves,) if we reflect on it, that a river in its courfe, which is often very extenfive, fhould not meet with fpongious foils to fwallow up its waters, or gulphs in which they are loft: neverthelefs, as there has been hitherto known but a fmall number of rivers whofe waters thus difappear, this phenomenon has been accounted very extraordinary, both by the ancients and moderns. Pliny fpeaks of it with an energy familiar to him; and Seneca mentions it in his *Queftiones Naturales*. he even diftinguifhes thefe rivers into two forts, thofe that are loft by degrees, and thofe which are fwallowed up all at once or ingulphed; which would make one believe that the ancients had collected fome obfervations concerning them.

But leaving apart what may be wonderful in thefe rivers, it may be afked, how they are loft? From what particular qualities of the foil over which they flow, and from what fituation of the places through which they pafs, does this phenomenon arife? Upon this head we find but little light in authors. We might, perhaps, be informed a great deal more, if the obfervations of the ancients had reached us.

Mr. Guettard has undertaken to remove part of this obfcurity by defcribing what he has obferved in feveral rivers of Normandy, which are loft and afterwards appear again; thefe are five in number, viz. the Rille, the Ithon, the Aure, the river of Sap-Audré, and the Drôme.

The three firft difappear gradually, and then come in fight again; the fourth lofes itfelf entirely by degrees, but afterwards re-appears; the fifth lofes fome of its water in its courfe, and ends by precipitating itfelf into a cavity, from whence it is never feen to rife again.

What feems to occafion the lofs of the Rille, the Ithon, and the Aure, is the nature of the foil through which they pafs. M. Guettard has obferved that it is in general porous, and compofed of a thick fand, the grains of which are not well compacted together; it finks fuddenly down by its own weight in fome places, and there forms great holes; and when the water overflows the meadows, it frequently makes many cavities in feveral parts of them. If we therefore fuppofe inequalities in the channels of thefe rivers, and that there are certain places in which the water ftagnates longer than in others, it muft there dilute the ground, if we may ufe that expreffion; and having carried away the parts which united the grains of fand together, thofe grains will become afterwards no other than a kind of fieve, through which the waters will filtrate themfelves, provided neverthelefs that they find paffage under ground through which they may run. This conjecture appears to be fo well founded, that each of thefe three rivers lofes itfelf nearly in the fame manner, that is, through cavities which the people of the country call *betoirs*, and which fwallow up more or lefs according to their largenefs. M. Guettard, who has carefully examined them, remarks, that thefe betoirs are holes in the form of a tunnel, whofe diameter and aperture is at leaft two feet, and fometimes exceeds eleven; and whofe depth varies in like manner from one and-two feet to five, fix, and even twenty. The water generally gets into thefe cavities, when the river is not very high, making a guggling noife, and turning round in an eddy. A proof that waters are there filtered and abforbed among the grains of the fharp diluted fand, is, that frequently in a betoir two or three feet deep, and through which a great deal of water is loft, one cannot thruft a ftick further than the furface of its bottom. Wherefore, as thefe betoirs fo frequently occur in the bed and banks of the Rille, the Ithon, and the Aure, it is not furprifing that thefe rivers fhould be thus loft. The Rille during the fummer feafon lofes almoft all its water in the fpace of two fhort leagues; the Ithon does very near the fame. But M. Guettard obferves fomething curious concerning this river, to wit, that formerly it was not loft, but kept its courfe without any interruption, as appears by the hiftory of the country: very likely the mud, which had been collected together in feveral parts of its channel, might have occafioned the waters remaining in others, and thereby have caufed many betoirs. This is the more likely, as the mud having been collected together in the bed of the river Aure, it appears that, in confequence thereof, the cavities were greatly increafed, which makes it lofe itfelf much fooner than formerly; however, it has been refolved to cleanfe its channel to remedy this inconvenience. Befides, poffibly an earthquake happening in the country might have caufed feveral fubterraneous canals through which the water of the Ithon (which before very likely could not pafs through the foil beneath its bed) has forced its way. In effect, it appears, that a foil's being porous is not fufficient to caufe the lofs of a river; for if it were, then to do fo it would occafion many fens round about, nor would it renew its courfe after having difappeared a certain time: it muft befides, as we have before faid, find ways under ground through which it may take its courfe. M. Guettard feems alfo much inclined to believe, that there are, in thefe parts, fubterraneous cavities through which the waters may flow; and in confequence of this he reports a number of facts, all tending to prove the truth of it, or at leaft to prove that there muft be hollow quarries ferving for ftrainers to thefe waters. Upon which occafion he goes into a difcuffion of this queftion: Are there any fubterraneous rivers, and is the prepoffeffion of fome perfons in favour of this particular well founded? He makes appear by feveral inftances which he quotes, and by many reafons which he alleges, that there are at leaft very great prefumptions in favour of this opinion. We are too apt not to look beyond the exterior of things: we feel refiftance upon the furface of the earth; when we go deep, we often find it compact. It is therefore hard for us to imagine that it can contain fubterraneous cavities fufficient to form channels for hidden rivers, or for any confiderable body of water; in a word, that it can contain vaft caverns; and yet every thing feems to indicate the contrary. A fact that is obferved in the betoirs of the rivers concerning which we have fpoken, and particularly of the Rille, proves in fome meafure that there are confiderable lakes of waters in the mountains which limit its courfe: this fact is,

that in winter the greateſt part of their betoirs become ſprings, which ſupply anew the river's channel with as much water as they had abſorbed from it during the ſummer. Now from whence can that water come, unleſs from the reſervoirs or lakes that are incloſed in the mountains, which being lower than the river in ſummer, abſorb its water, and being higher in winter by occaſion of the rain they receive, ſend it back again in their turn?

M. Guettard ſtrengthens this conjecture by ſeveral inſtances that render it very probable: he remarks at the ſame time, that this alternate effect of the betoirs ſwallowing up the water and reſtoring it again, cauſes perhaps an invincible obſtacle to the reſtraining of the water within the channel of the river. It has indeed been ſeveral times attempted to ſtop thoſe cavities; but the water returns with ſuch violence in winter, that it generally carries away the materials with which they were ſtopped.

The river of Sap-André is loſt in part, as we have before ſaid, in the ſame manner as the Ithon and the Rille: but there is ſomething more remarkable in it than in thoſe rivers; to wit, that at the extremity of its courſe, where there is no perceptible cavity, it is, as it were, ingulphed, but without any fall: the water paſſes between the pebbles, and it is impoſſible to force a ſtick into that place any further than into the betoirs of which we have ſpoken. What makes this river take that ſubterraneous direction, is an impediment which its ſtream meets with in that place: it is there ſtopped by a riſing ground ſix or ſeven feet high, whoſe bottom it has very likely undermined, to gain a free paſſage, not having been able to make its way over it. At ſome diſtance from thence it appears again; but in winter, as there is a greater quantity of water, it paſſes over that eminence, and keeps an uninterrupted courſe.

Laſtly, the Drôme, after having loſt ſome of its water in its courſe, vaniſhes entirely near the pit of Soucy; in that place it meets with a ſort of ſubterraneous cavity near 25 feet wide, and more than 15 deep, where the river is in a manner ſtopped, and into which it enters, though without any perceptible motion, and never appears again.

We ſee by theſe obſervations of M. Guettard, that rivers which loſe themſelves are not ſo few as is generally imagined, ſince there are five of them in this part of Normandy, which is but of ſmall extent. One might fancy that this is owing to the nature of the ground: yet M. Guettard obſerves, that in a part of Lorrain, which likewiſe is not very extenſive, five other rivers are known to loſe themſelves in the ſame manner: and without doubt we ſhall find by new obſervations that they are much more common; for, as we have remarked, it perhaps is not more ſurpriſing that a river loſes itſelf, than it is extraordinary that it does not ſo.

M. Guettard finiſhes this memoir with ſome obſervations upon the Ierre. This river is loſt in the ſame manner as the Rille; and though it is very near Paris, this ſingularity is unknown to almoſt every body; were it not for the account of M. l'Abbe le Bœuf, M. Guettard would have been alſo ignorant of it. And as he thinks the chief object of a naturaliſt's obſervation ought to be the public good, he examines the means which might be employed to reſtrain the water of the Ierre. The ſame object has made him add a deſcription of the manner how the Rhone is loſt, or rather how its courſe is diſturbed; for it is now very certain that it does not loſe itſelf, but that its channel is extremely confined, in the place where it was pretended that it loſt itſelf, by two mountains, between whoſe feet it runs. M. Guettard makes it appear that it might not be impoſſible to widen that place, and give a ſufficient channel to the river; which would render it navigable, and be of vaſt utility to all the country.

We may add to the above account, that we have in Surrey the river Mole, which riſes in Dorking hundred, and, after a conſiderable courſe, paſſes by Witchill, near Dorking; a little beyond which this river hides itſelf, or is ſwallowed up, in a cavern, at the foot of the hill, from whence Camden ſays it is called the *Swallow*: he alſo takes notice of its running under ground for about two miles and riſing again, and ſpreading itſelf into a wide ſtream. It is alſo frequently reported that there are ſeveral of theſe dipping rivers in Wales, and others in the ſouthern counties of England.

The channels of rivers, except ſuch as were formed at the creation, Varenius thinks, are artificial. His reaſons are, that, when a new ſpring breaks out, the water does not make itſelf a channel, but ſpreads over the adjacent land; ſo that men were neceſſitated to cut a channel for it, to ſecure their grounds. He adds, that a great number of channels of rivers are certainly known from hiſtory to have been dug by men.

The water of moſt rivers flow impregnated with particles of metals, minerals, &c. Thus ſome rivers bring ſands intermixed with grains of gold; as in Japan, Peru, and Mexico, Africa, Cuba, &c. particularly in Guinea is a river, where the negroes ſeparate the gold-duſt from the ſand, and ſell it to the Europeans, who traffic thither for that very purpoſe. The Rhine in many places is ſaid to bring a gold mud. As to rivers that bring grains of ſilver, iron, copper, lead, &c. we find no mention of them in authors; though, doubtleſs there are many.

Theory of the Motion of Rivers. The running of rivers is upon the ſame principle as the deſcent of bodies on inclined planes: for water, no more than a ſolid, can move on a horizontal plane; the re-action of ſuch a plane being equal and contrary to gravity, entirely deſtroys it, and leaves the body at reſt. Here we ſpeak of a plane of ſmall extent, and ſuch as coincides with the curved ſurface of the earth. But if we conſider a large extent or long courſe of water, then we ſhall find that ſuch water can never be at reſt, but when the bottom of the channel coincides every where with the curved ſurface of the earth.

Let ADF pl. 2, fig. 1. be the curved ſurface of the earth, C its centre, CD, CE, two right lines drawn from thence, and EG a tangent to the earth in the point D. Then it is plain, if BD were a channel of water, the water could not run or move, becauſe they are everywhere at an equal diſtance from the centre C, and therefore equally affected by gravity. But if there be any place above the ſurface of the earth, as E, where water can be found, it is evident that water can deſcend in a channel to any part of the earth's ſurface between B and D, becauſe every point in the line ED is nearer to the centre of the earth, and therefore below the point or place E, and its velocity will be ſo much the greater as it tends to a point nearer B, and floweſt of all when it moves in the direction of the tangent ED.

Hence it appears, that the ſource E of all rivers and ſtreams muſt be more than a ſemi-diameter of the earth CB diſtant from the centre C. And ſince all great rivers run to the ſea or ocean, where they diſembogue their waters at the point D, the line DC is a ſemidiameter, and = 4000 miles nearly. Alſo the courſe of all long rivers being in the direction of the tangent at the point D, if they were repreſented by the tangent line EG, then the height of the ſource E above the common ſurface of the earth at B would be eaſily found. Thus, ſuppoſe ED were the river Niger in Africa, whoſe ſource is ſaid to be more than 3000 miles from the ſea; but put ED = 3000, and ſince CD = 4000, we ſhall have CE = 5000, and CE—CB = 1000 = BE = the height of the ſource. But, ſince we know of no mountains above three or four miles high, it is plain that the river Niger, and all ſuch long rivers, are ſo far from moving in a tangent, that their courſe muſt be very nearly of

the same curvature with the earth's surface, and insensibly distant from it.

Since bodies move on planes ever so little inclined, except so far as they are prevented by friction, and since the friction of the particles of water among themselves is inconsiderable, it follows that the water situated on a plane ever so little inclined, will commence a motion; and if the plane be considerably inclined, and the quantity of water great, its velocity will be proportional, and its momentum such as will soon begin to wear away the earth, and create itself a course or channel to glide in. In rivers that are made, it is usual to allow the fall of one foot in 300.

If we allow the same declivity to rivers which make their own way, then we find their height at their source above the surface of the sea, as in example of the Niger thus: As $300 : 1 :: 5280 : \frac{5280}{300} =$ the height at one mile, or 5280 feet. Then again say, as $1 : \frac{5280}{300} :: 3000 : \frac{5280 \times 3000}{300} = 5280 \times 10 = 10$ miles. From whence it is evident that the continents and islands ought to be much above the surface of the sea, to give a necessary descent and course to the waters through them.

Let ABCD fig. 2, be the section of a reservoir, and BCIK the section of a canal of water supplied from thence, and ABN the horizontal line. Now, since the particles of water are governed by the common laws of gravity, the velocity of a particle at any part of the bottom of the canal, as F or H, will be the same as it would acquire by falling through the perpendicular altitude OF or LH, that is, as $\sqrt{OF}$ to $\sqrt{LH}$. Hence the velocity of the stream is accelerated.

For the same reason the velocity of a particle at the bottom of the stream H is to the velocity of a particle at the top G, as $\sqrt{LH}$ to $\sqrt{MG}$; consequently the stream moves with a greater celerity at bottom than at top.

The quantity of the water which passes through the section of the stream HG, is the same that passes through the section of the reservoir BC in the same time. The same may be said of any other section FE; therefore the quantity of water, passing by any two sections of the stream FE and GH, in the same time, is the same.

Since there runs the same quantity of water by GH as by FE in the same time; and since the velocity at GH is greater than at FE; and lastly, since the breadth of the canal is supposed to be every where the same; therefore it follows, that the depth GH must be less than the depth FE, and so the depth of the stream must continually decrease as it runs.

As the stream proceeds, the depth HG decreasing, the lines MG and LH will approach nearer to an equality; and therefore, the different velocities of the water at top and bottom will approach much faster to an equality, as being proportionate to the square roots of those lines. This approach to an equality is much further promoted, by the upper parts being continually accelerated by the lower, and the lower parts retarded continually by the slower motion of the waters above, and pressing upon them.

Since the difference of the descending velocities is greatest near the head of the stream, the waters will there fall or descend with the greatest impetuosity, or cause the loudest noise. But in the course of rivers, the accelerated velocity is quickly reduced to an equable or uniform velocity, by the resistance it meets with from the bottom and sides of the channel, which resistance will be as the squares of the velocities, and therefore soon becomes so great as to equal the accelerating force, and be communicated to the middle part of the stream, causing the whole to move uniformly. Hence, in rivers, the motion of the water is slowed at the sides and bottom of the channel, because there the resistance begins, which is afterwards communicated to all the other parts; and in different parts of the same river, the uniform velocity is greatest where the bottom of the channel has the greatest inclination, or declivity, because the relative gravity of the moving particles is here greatest. Again, in those parts of the river where the velocity of the stream is least, the depth of the water is greatest, and *vice versa*, because equal quantities pass through unequal sections of the river in the same time. Hence also it follows, that the momentum of running water must be every where the same, or a given quantity.

The many advantages which accrue to a country from an abundance of rivers, especially large navigable ones, are too obvious to require any particular detail: but the disadvantages and calamities occasioned by them are frequently no less obvious and fatal. Whole tracts of country are sometimes overflowed on a sudden, and every thing swept away at once; or if the deluge proceeds not such a length, yet by the quantity of stagnating water which is left, marshes are produced, which bring on the most violent diseases in the neighbouring parts. It becomes therefore an object well worthy the public attention how to secure the banks of rivers, or to form their channels in such a manner that the superfluous water may be carried off into the ocean without producing the mischievous effects abovementioned. In a treatise on rivers and canals published in the Phil. Transac. vol. 69. by Mr. Mann, he treats this subject at great length. Having laid down a number of theorems concerning the descent of the water in rivers similar to those abovementioned, he points out a method of determining whether the motion of a river in any particular place is derived from the inclination of the bottom of its channel, or merely from the pressure of the upper parts of the water upon the lower. For this purpose, says he, a pole must be thrust down to the bottom, and held perpendicularly to the current of the water, with its upper end above the surface: if the water swells and rises immediately against the pole, it shows that its flowing is by virtue of a preceding declivity; if, on the contrary, the water stops for some moments before it begins to rise against the pole, it is a proof that it flows by means of the compression of the upper waters upon the lower.

The best and most simple method of measuring the velocity of the current of a river, according to our author, is as follows: "Take a cylindrical piece of dry light wood, and of a length something less than the depth of the water in the river: round one end of it let there be suspended as many small weights as may be necessary to keep up the cylinder in a perpendicular situation in the water, and in such a manner that the other end of it may just appear above the surface of the water. Fix to the centre of that end which appears above water a small and straight rod, precisely in the direction of the cylinder's axis; to the end that, when the instrument is suspended in the water, the deviations of the rod from a perpendicularity to the surface of it may indicate which end of the cylinder advances the fastest, whereby may be discovered the different velocities of the water at different depths: for if the rod incline forwards according to the direction of the current, it is a proof that the surface of the water has the greatest velocity; but if it incline back, it shows that the swiftest current is at the bottom; if it remain perpendicular, it is a sign that the velocities at the surface and bottom are equal.

"This instrument being placed in the current of a river or canal receives all the percussions of the water throughout the whole depth, and will have an equal velocity with that of the whole current *from the surface to the bottom* at the place where it is put in; and by that means may be found, both with ease and exactness, the mean velocity of that part of the river for any determinate distance and time.

"But to obtain the mean velocity of the whole section of the river, the instrument must be put successively both in the middle

and towards the ſides, becauſe the velocities at thoſe places are often very different from each other. Having by this means found the *difference of time required for the currents to run over an equal ſpace*, or *the different diſtances run over in equal times; the mean proportional* of all theſe trials, which is found by dividing the common ſum of them all by the number of trials, *will be the mean velocity of the river or canal.*

"If it be required to find the velocity of the current only at the ſurface, or at the middle, or at the bottom, a ſphere of wood, of ſuch a weight as will remain ſuſpended in equilibrium with the water at the ſurface or depth which we want to meaſure, will be better for the purpoſe than a cylinder, becauſe it is only affected by the water of that part of the current where it remains ſuſpended.

"It is a very eaſy guide both to the cylinder and the globe in that part which we want to meaſure, by means of two threads or ſmall cords, which two perſons muſt hold and direct, one on each ſide of the river; taking care at the ſame time neither to retard nor accelerate the motion of the inſtrument."

Our author next proceeds to deduce from his theory the beſt methods of removing the defects and inconveniencies which muſt neceſſarily happen to rivers and canals in a ſeries of years. From the theory formerly laid down he draws the following concluſion, *that the deeper the waters are in their bed in proportion to its breadth the more their motion is accelerated*; ſo that *their velocity increaſes in an inverſe ratio of the breadth of the bed, and alſo of the greatneſs of the ſection*; from whence are deduced the two following univerſal practical rules: 1ſt, To augment the velocity of water in a river or canal, without augmenting the declivity of the bed, we muſt *increaſe the depth and diminiſh the breadth of its bed*, 2dly, But to diminiſh the velocity of water in a river or canal, we muſt, on the contrary, *increaſe the breadth and diminiſh the depth of its bed.*

The above propoſition is perfectly conformable to obſervation and experience: for it is conſtantly ſeen, that the current is the ſwifteſt where the waters are deepeſt and the breadth of the bed the leaſt, and that they flow ſloweſt where their depth is the leaſt and the breadth of the bed the greateſt. "The velocity of waters," ſays M. de Buffon, "augments in the ſame proportion as the ſection of the channel through which they paſs diminiſhes, *the force of impulſion from the back-waters being ſuppoſed always the ſame.* Nothing," continues he, "produces ſo great a diminution in the ſwiftneſs of a current as its growing ſhallow; and on the contrary, the increaſe of the volume of water augments its velocity more than any other cauſe whatever." The celebrated Wolfe in his Hydraulics aſſures us, that "it is a conſtant and univerſal practice, for accelerating the current of waters, to deepen the bed, and at the ſame time to render it narrower."

When the velocity which a river has acquired by the elevation of its ſprings and the impulſe of the back water, is at laſt totally deſtroyed by the different cauſes of reſiſtance becoming exactly equal to or greater than the firſt, the bed and current at the ſame time being horizontal nothing elſe remains to propagate the motion, except the *ſole perpendicular compreſſion of the upper waters upon the lower, which is always in a direct ratio of their depth.* But this neceſſary reſource, this remaining cauſe of motion in rivers, augments in proportion as all the others diminiſh, and as the want of it increaſes: for as the waters of rivers in extenſive plains loſe the acceleration of motion acquired in their deſcent from their ſprings, their quantity accumulates in the ſame bed by the junction of ſeveral ſtreams together, and their depth increaſes in conſequence thereof. This junction and ſucceſſive accumulation of many ſtreams in the ſame bed, which we ſee univerſally in a greater or leſſer degree in all rivers throughout the known world, and which is ſo abſolutely neceſſary to the motion of their waters, can only be attributed, ſays Signor Guglielmini, to the infinite wiſdom of the ſupreme Author of Nature.

The velocities of flowing waters is very far from being in proportion to the quantity of declivity in their bed. If it was, a river whoſe declivity is uniform and double to that of another, ought only to run with double the ſwiftneſs when compared to it: but in effect it is found to have a much greater, and its rapidity, inſtead of being only double, will be triple, quadruple, and ſometimes even more; for its velocity depends much more on the quantity and depth of the water, and on the compreſſion of the upper waters on the lower, than on the declivity of the bed. Conſequently, whenever the bed of a river or canal is to be dug, the declivity muſt not be diſtributed equally throughout the whole length; but, to give a ſwifter current to the water, the declivity muſt be much greater in the beginning of its courſe than towards the end where it diſembogues itſelf, and where the declivity muſt be almoſt inſenſible, as we ſee is the caſe in all natural rivers: for when they approach near the ſea, their declivity is little or nothing; yet they flow with a rapidity which is ſo much greater, as they contain a greater volume of water; ſo that in great rivers, although a large extent of their bed next the ſea ſhould be abſolutely horizontal, and without any declivity at all, yet their waters do not ceaſe to flow, and to flow even with great rapidiy, both from the impulſion of the back-waters, and from the compreſſion of the upper waters upon the lower in the ſame ſection.

Whoever is well acquainted with the principles of the higher geometry, will eaſily perceive that it would be no difficult matter ſo to dig the bed of a canal or river, that *the velocity of the current ſhould be every where equal.* It would be only giving it in the form of a curve along which a moving body ſhould recede from a given point, and *deſcribe ſpaces every where proportional to the times*, allowance being made therein for the quantity of effect of the compreſſion of the upper waters upon the lower. This curve is what is called the *horizontal iſochronic*, being the flatteſt of an infinity of others which would equally anſwer the problem where fluids were not concerned. Upon theſe curves may be ſeen Leibnitz, Huygens, and the two Bernouilli's, who were the firſt that determined and analyſed them, and alſo many ſucceeding geometricians, if any one is deſirous to occupy himſelf in ſuch ſpeculations as are more curious than uſeful.

Notwithſtanding all we have ſaid concerning the neceſſity of augmenting the depth of a river in a greater proportion than its breadth, if we would accelerate its current; yet it is certain, that this can only be done to a certain point, without deſtroying that equilibrium which ought to reign between the depth and the breadth of the ſection of the ſtream, and thereby putting the river into a ſtate of continual violence, which will inceſſantly exert itſelf to the deſtruction of the banks and wiers made to keep it in, and that action will always exert itſelf in a direct ratio of the greater or leſs want of equilibrium, as it would be eaſy to demonſtrate by the principles of hydraulics. Theſe ſame principles give likewiſe the juſt proportions of this equilibrium between the perpendicular and lateral compreſſion of the water in any river or canal whatſoever, which vary in an inverſe proportion, according to the different degrees of the declivity and velocity of the current; and in a direct one of the greater or leſs coherence and hardneſs of the ſubſtances which compoſe the bed. Rivers which flow in beds compoſed of homogeneous matter of little conſiſtency, ſuch as ſand, &c. are always more broad than deep, when compared to thoſe which run in beds of matter of greater tenacity. It is manifeſt that the equilibrium here ſpoken of is real, becauſe rivers remaining in the ſame ſtate only widen their beds to a certain pitch which they do not ſurpaſs.

M. de Buffon remarks, "That people accuſtomed to rivers can eaſily foretell when there is going to be a ſudden increaſe of

water in the bed from floods produced by fudden falls of rain in the higher countries through which the rivers pafs. This they perceive by a particular motion in the water, which they exprefs in their dialect, by faying that *the river's bottom moves*; that is, the water at the bottom of a channel runs off fafter than ufual; and this increafe of motion at the bottom of the river always announces a fudden increafe of water coming down the ftream. Nor does their opinion therein," continues the fame author, " feem to be ill-grounded on the nature of things: for the motion and weight of the waters coming down, though not yet arrived, muft act upon the waters in the lower parts of the river, and communicate by impulfion part of their motion thereto; fince a canal or river contained in its bed is to be confidered in fome degree as a column of water contained in a long tube, where the motion is communicated at once throughout the whole length." In a river or canal, open above, it is only communicated to a certain diftance; that is, as far as the impulfive force of the new increafe and fuperior rapidity of the back-waters acts upon the ftream, which will always be as far as till this force is gradually, and at laft wholly, deftroyed by the fuperior gravitation of the fuperincumbent waters in the ftream. Something of the fame kind happens when a very great additional weight comes fuddenly upon the furface of a river or canal; for inftance, by the launching of a fhip or of feveral boats together upon it. Thefe caufes increafe the velocity of the water in the lower parts of the bed, and moreover retard its motion at the furface, which effect may properly be called *making the river's bottom move*. For the fame reafon, the increafe of weight of the waters in a fudden flood, as well as the increafe of their impulfive force, muft contribute to produce this effect, and, by increafing the motion in the bottom of the river, may hinder for fome fpace of time the ftream from fenfibly rifing in the bed.

All obftacles whatever in the bed of a river or canal, fuch as rocks, trunks of trees, banks of fand and mud, &c. muft neceffarily hinder proportionably the free running off of the water; for it is evident, from what we have faid, that the waters fo far back from thefe obftacles, until the horizontal level of the bottom of the bed becomes higher than the top of the obftacles, muft be entirely kept up and hindered from running off in proportion thereto. Now as the waters muft continue to come down from their fources, if their free running off is hindered by any obftacles whatever, their relative height back from them muft neceffarily be increafed until their elevation, combined with the velocity of their current proceeding from it, be arrived to fuch a pitch at the point where the obftacles exift, as to counterbalance the quantity of oppofition or impediment proceeding from thence, which frequently does not happen until all the lower parts of the country round about are laid under water.

Now it is certain from all experience, that the beds of rivers and canals in general are fubject to fome or others of the obftacles above-mentioned. If rocks or trees do not bar their channels, at leaft the quantity of fand, earth, and mud, which their ftreams never fail to bring down, particularly in floods, and which are unequally depofited according to the various windings and degrees of fwiftnefs in the current, muft unavoidably, in courfe of time, fill up, in part, different places in the channel, and thereby hinder the free running off of the back-waters. This is certainly the cafe, more or lefs, in all rivers, and in all canals of long ftanding, as is notorious to all thofe well acquainted with them. Hence, if thefe accidents are not carefully and with a conftant attention prevented, come inundations, which fometimes lay wafte whole diftricts, and ruin the fineft tracts of ground, by covering them with fand: hence rivers become unnavigable, and canals ufelefs for the purpofes for which they were conftructed. Canals, in particular, by reafon that their waters for the moft part remain ftagnant in them, are ftill more liable than rivers to have their beds fill up by the fubfiding of mud, and that efpecially for fome diftance above each of their fluices; infomuch, that if continual care be not taken to prevent it, or remedy it as often as it happens, they will foon become incapable of receiving and paffing the fame veffels as formerly. Nay, the very fluices themfelves, if the floors of their bottoms are not of a depth conformable to the bed of the canal, will produce the fame accidents as thofe we have been fpeaking of; for if they are placed too low, they will be continually filling up with fand or mud; if too high, they have the fame effect as banks or bars in the bed of a river, that is, they hinder all the back-waters under their level from running off, and foon fill up the bed to that height by the fubfiding of mud. This effect is much accelerated by the fhutting of the lower fluices, which makes a great volume of water flow back to thofe next above them, till the whole is filled and becomes ftagnant. Now it is evident, that this ftate of things muft contribute far more to the fubfidency of mud and all other matters brought down by the waters in canals, than can be the cafe in rivers whofe currents conftantly flow.

The waters of all rivers and canals are from time to time muddy: their ftreams, particularly during rains and floods, carry along with them earth and other fubftances which fubfide in thofe places where their currents are the leaft, whereby their beds are continually raifed: fo that the fucceffive increafe of inundations in rivers, and of unfitnefs for navigation in canals, when they are neglected and left to themfelves, is a natural and neceffary confequence of the ftate of things, which no intelligent perfon can be at a lofs to account for; and yet whole countries remain in this habitual ftate of negligence, to their very great detriment.

Having thus fhown the principal accidents which rivers and canals are liable to, with the caufes of them, our author proceeds to point out the moft efficacious methods of preventing them, or at leaft of diminifhing their effects. They flow immediately from the principles laid down in his effay, and do not need many words to make them completely underftood. A work of this kind, he obferves, if it is properly conducted, muft be begun at the lower end of the river or canal; that is to fay, at that end where their waters are difcharged into the fea, or where they fall into fome other greater river or canal, from whence their waters are carried off without further hindrance. If it is a river whofe bed, by being filled up with mud, fand, or other obftacles, and by being otherwife become irregular in its courfe, is thereby often fubject to inundations, and incapable of internal navigation, the point, from which the work muft be begun and directed throughout all the reft of the channel, is from the loweft water-mark of fpring-tides on the fhore at the mouth of the river; or even fomething below it, if it can be done; though this part will foon fill up again by the fand, mud, &c. which the tides ceafe not to roll in.

If it is a canal whofe bed is to be dug anew, or one already made, which is to be cleaned and deepened from the fea-fhore or fome large river back into the country, and where no declivity is to be loft, as is the cafe in all flat countries; the work muft be begun, and the depth of the whole channel directed, from the low water-mark of fpring tides, if the mouth is to the fea, or from fuch a depth in the channel of the river, if the canal falls into one, that there may be fuch a communication of water from the canal to the river, in all fituations of the current, as may let boats freely pafs from one to the other. This, of courfe, muft alfo direct the depth of the floor of the laft fluice towards the mouth of the canal, be it to the fea or into a river. If the bottom or floor of a fluice already conftructed be too low, it will foon fill up with fand or mud, and thereby hinder the gates from opening, unlefs it be continually cleaned out; if, on the contrary, this floor be too high, and in a canal whofe natural declivity is too little for the free current of the water, as is generally the cafe in Holland and Flanders, all depth of the bed of the canal

below the horizontal level of the bottom of the ſluice will ſerve to no manner of purpoſe, either for navigation, or for carrying off the back-waters, but will ſoon fill up with mud, in ſpite of all means uſed to the contrary, except that of digging it continually anew to no manner of purpoſe.

Setting off from this determinate point, at the mouth of a river, or at the bottom of the laſt ſluice upon a canal, which are to be cleaned and deepened; the work muſt be carried on, in conſequence, uniformly throughout their whole courſe backwards into the country as far as is found neceſſary for the purpoſes intended. This is to be done after the following manner:

1ſt, One muſt dig up and carry away all irregularities in the bottom and ſides of the bed, ſuch as banks of ſand and mud, rocks, ſtumps or trunks of trees, and whatever elſe may cauſe an obſtacle to the regular motion of the water, and to the free paſſage of veſſels upon it.

2dly, If the declivity of the bed ſhould be ſtill too little to give a ſufficient current to carry off the water as often and as faſt as is neceſſary, the whole bed itſelf muſt be regularly deepened, and what is dug out from the bottom muſt be laid upon the ſides, to render it narrower in proportion to its depth.

3dly, Wherever the banks are too low to contain the ſtream in all its ſituations, they muſt be ſufficiently raiſed; which may be conveniently done with what is dug out from the bed: and the whole being covered with green turf will render theſe banks firm and ſolid againſt the corroſion of the water. It is proper at all times to lay upon the banks what is dug from the bed, by which they are continually ſtrengthened againſt the force of the current.

4thly, It is often neceſſary to diminiſh the windings and ſinuoſities in the channel as much as poſſible, by making new cuts whereby its courſe may approach towards a right line. This is a great reſource in flat countries ſubject to inundations; becauſe thereby all the declivity of a great extent of the river, through its turns and windings, may be thrown into a ſmall ſpace by cutting a new channel in a ſtraight line; as may generally be done without obſtacle in ſuch countries as we are ſpeaking of, and hereby the velocity of the current will be very greatly augmented, and the back-waters carried off to a ſurpriſing degree.

5thly, Wherever there is a confluence of rivers or canals, the angle of their junction muſt be made as acute as poſſible, or elſe the worſt of conſequences will ariſe from the corroſion of their reſpective ſtreams; what they carry off from the ſides will be thrown into irregular banks in the bottom of the bed. This acute angle of the junction may always be procured by taking the direction at ſome diſtance from the point of confluence.

6thly, Wherever the ſides or banks of a river are liable to a more particular corroſion, either from the confluence of ſtreams, or from irremediable windings and turns in the channel, they muſt be ſecured againſt it as much as poſſible by weirs: for this corroſion not only deſtroys the banks, and alters by degrees the courſe of the river, but alſo fills up the bed, and thereby produces all the bad effects we have ſpoken of above.

7thly, But the principal and greateſt attention in digging the beds of rivers and canals muſt be had to the quantity and form of their declivity. This muſt be done uniformly throughout their whole extent, or ſo much of it as is neceſſary for the purpoſes in hand, according to the principles laid down. Conformable thereto, the depths of their beds, and of the floors of their ſluices, at the mouths whereby they diſcharge their waters, being fixed, the depth of the reſt of the beds, and the quantity of declivity therein, muſt be regulated in conſequence thereof, ſo as to increaſe regularly the quantity of the declivity in equal ſpaces the further we recede from their mouths, and proceed towards their ſources or to the part where the regular current is to take place.

If the depth and volume of water in a river or canal is conſiderable, it will ſuffice, in the part next the mouth, to allow one foot perpendicular of declivity through ſix, eight, or even, according to Deſchales, ten thouſand feet in horizontal extent; at moſt it muſt not be above one in ſix or ſeven thouſand. From hence the quantity of declivity in equal ſpaces muſt ſlowly and gradually increaſe as far as the current is to be made fit for navigation; but in ſuch a manner, as that at this upper end there may not be above one foot of perpendicular declivity in four thouſand feet of horizontal extent. If it be made greater than that in a regular bed containing a conſiderable volume of water, the current will be ſo ſtrong as to be found very unfit for the purpoſes of navigation.

I dare boldly affirm, ſays Mr. Mann, from the certain principles of hydrodynamics laid down in this eſſay, that if the above-mentioned things were carried into execution in a proper manner, the velocity of currents, and the acceleration of motion of the waters in rivers, and in canals when their ſluices are open, might be increaſed to any degree that can be required for opening their beds, and for preventing inundations during great rains or ſudden floods; by carrying off more ſwiftly the great acceſſion of water which then takes place. It would not be difficult, by theſe means, to increaſe the velocity of the current to double and triple what it is in rivers and canals, whoſe beds for a long ſpace of time have been left to themſelves. There is not, perhaps, a country on earth but what might be freed from inundations by theſe means. But it may be objected, that if all I have adviſed were put in execution, even in the flatteſt countries, the currents of rivers (for canals ſhut up with ſluices are here out of the queſtion) would become incommodious, if not unfit for navigation, eſpecially againſt their ſtreams. This objection would be of weight, if it were not evident that the various means which I have pointed out may be executed in whole or in part, to a certain degree, and no further than neceſſary for the purpoſes required. But, as it is certain that a ſtrong and regular current in a river is the beſt of all means for keeping it open and deep, and for preventing the formation of banks in the bed, by the ſubſidency of mud, &c. which it does not allow time to precipitate; I leave it to be conſidered, whether it is better to have a free and open navigation ſomething incommoded by the ſtrength of the current, or ſoon to have no navigation at all, without repeatedly digging the bed anew. Rivers flowing along plains, as well as through valleys, have naturally their beds in the loweſt part of the ground compriſed between the oppoſite hills and mountains: nevertheleſs, the ſurface of the water of a river in the midſt of a plain is often higher than the ſurface of the grounds adjacent to the banks of the river. This proceeds from the continual ſubſiding of the mud, &c. brought down by the ſtream during floods; the waters in that caſe uſually overflowing the banks ſpread themſelves over the plain, where they loſe a great part of the ſwiftneſs of their current, which contributes greatly to the ſubſiding of the mud they contain; ſo that the further they flow upon the plain, the clearer they grow, and the leſs remains to ſubſide. From hence the greateſt precipitation of mud muſt be in the parts of the plain neareſt the ſides of the river, which in length of time will raiſe theſe grounds above the reſt of the plain. Again, the waters in the bed itſelf depoſiting inceſſantly a part of the mud, &c. brought down by the ſtream, muſt continually, though inſenſibly (for a long ſpace of time), raiſe the channel and banks of the river above the reſt of the plain. Theſe cauſes may at laſt contribute to the forming of an entire new bed for the river: for as all rivers carry down in their ſtreams more or leſs mud and other heterogeneous matters, which do not ſubſide regularly in all parts alike, but muſt precipitate faſteſt where the current is ſloweſt; there muſt accumulate by little and little in theſe parts, ſuch banks of ſand and mud as will in time hinder the

current of the waters, make them reflow, and at laſt totally change their direction.

Canals are ſtill more ſubject than rivers to have their beds raiſed and their currents ſtopped by the ſubſiding of mud and heterogeneous matter in different places, and eſpecially juſt above their ſluices; becauſe of the ſudden ſtagnation of the water which firſt begins there as often as the ſluices are ſhut: and as there is a neceſſity for keeping them for the moſt part ſhut, the ſtagnating waters in their beds muſt precipitate their mud, &c. in a much greater proportion than can be done in the currents of rivers which are in a continual motion towards the ſea.

Mr. Mann calls *centre of the current*, or, more properly, *line of greateſt current*, that *line which paſſes through all the ſections of a river, in the point where the velocity of the current is the greateſt of all.* If the current of a river is regular, and in a right line, its centre or line of greateſt velocity will be preciſely in the centre of the ſections: but, on the contrary, if the bed is irregular and full of turns and windings, the centre, or line of greateſt current, will likewiſe be irregular, and often change its diſtance and direction with regard to the centres of the ſections through which the waters flow, approaching ſucceſſively, and more or leſs, to all parts of the bed, but always in proportion and conformably to the irregularities in the bed itſelf.

This deviation of the line of greateſt current from the centres of the ſections through which it paſſes, is a cauſe of many and great changes in the beds of rivers, ſuch as the following:

1ſt, In a ſtraight and regular bed, the greateſt corroſion of the current will be in the middle of the bottom of the bed; becauſe it is that part which is neareſt to the line of greateſt current, and at the ſame time which is moſt acted upon by the perpendicular compreſſion of the water. In this caſe, whatever matters are carried off from the bottom will be thrown, by the force of the current, equally towards the two ſides, where the velocity of the ſtream is the leaſt in the whole ſection.

2dly, If the bed is irregular and winding, the line of greateſt current will be thrown towards one ſide of the river, where its greateſt force will be exerted in proportion to the local cauſes which turn it aſide: in ſhort turns of a river there will be a gyration, or turning round of the ſtream, by reaſon of its beating againſt the outer ſide of the angle; this part will be corroded away, and the bottom near it excavated to a great depth. The matters ſo carried off will be thrown againſt the oppoſite bank of the river where the current is the leaſt, and produce a new ground, called an *alluvion.*

3dly, Inequalities at the bottom of a river retain and diminiſh the velocity of the water, and ſometimes may be ſo great as to make them reflow; all theſe effects contribute to the ſubſiding of ſand earth, and other matters thereon, which ceaſe not to augment the volume of the obſtacles themſelves, and produce ſhallows and banks in the channel. Theſe in time, and by a continuance of the cauſes, may become iſlands, and ſo produce great and permanent changes and irregularities in the beds of rivers.

4thly, The percuſſions of the centre of the current againſt the ſides of the bed are ſo much the greater as they are made under a greater angle of incidence; from whence it follows, that the force of percuſſion, and the quantity of corroſion and detriment done to the banks and weirs of rivers, and to the walls of buildings made therein, and which are expoſed to that percuſſion, are always in a direct compound proportion of the angle of incidence, of the greatneſs and depth of the ſection together, and of the quantity of velocity of the current.

5thly, It may happen in time, that the excavation of the bottom, and the corroſion of the ſides, will have ſo changed the form of the bed as to bring the force of percuſſion into equilibrium with the velocity and direction of the current; in that caſe, all further corroſion and excavation of the bed ceaſes.

6thly, This gives the reaſon why when one river falls into another almoſt in a perpendicular direction, and makes with it too great an angle of incidence, this direction is changed in time, by corroſions and alluvions, into an angle much more acute, till the whole comes into equilibrium.

7thly, So great and ſuch continued irregularities, from local cauſes, may happen in the motion of a river as will entirely change its ancient bed, corrode through the banks where they are expoſed to the greateſt violence of percuſſion of the ſtream, and open new beds in grounds lower than what the old one is become.

8thly, Hereupon the ſtate of the old bed will entirely depend on the quantity of water, and on the velocity and direction of the current in the new one; for immediately after this diviſion of the waters into two beds is made, the velocity of the current in the old one will be diminiſhed in proportion to its leſs depth. In conſequence thereof, the waters therein will precipitate more of their mud, &c. in equal ſpaces than they did before; which will more and more raiſe up the bottom, ſometimes even till it becomes equal with the ſurface of the ſtream. In this caſe, all the water of the river will paſs into the new bed, and the old one will remain entirely dry. It is well known, that this has happened to the Rhine near Leyden, and to many other rivers.

9thly, Hence the cauſe of the formation of the new branches and mouth, whereby many great rivers diſcharge their waters into the ſea.

But in proportion as a river, that has none of theſe obſtacles in its bed, approaches towards its mouth, we ſee the velocity of its current augment, at the ſame time that the declivity of the bed diminiſhes, the cauſes of which have been explained above. It is for this reaſon that inundations are more frequent and conſiderable, and do more damage in the interior parts of a country, than towards the mouths of moſt rivers.

In the Po, for example, the height of the banks made to keep in the waters, diminiſhes as the river approaches to the ſea. At Ferrara, they are 20 feet high: whereas, nearer the ſea, they do not exceed 10 or 12 feet, although the channel of the river is not larger in one place than in the other.

The mouths of rivers, by which they diſcharge their waters into the ſea, are liable to great variations, which produce many changes in them.

1ſt, The velocity and direction of the current at theſe mouths are in a continual variation, cauſed by the tides, which alternately retard and accelerate the ſtream.

2dly, During the flowing of the tide, the current of the river is firſt ſtopped, then turned into a direction entirely contrary throughout a conſiderable extent: if we may believe M. de Buffon, there are rivers in which the effect of the tides is ſenſible at 150 or 200 leagues from the ſea.

3dly, This ſtate of things is a cauſe of a great quantity of ſand, mud, &c. being precipitated and accumulated in the channel near the mouth. This continually raiſes and widens the bed, and at laſt changes it entirely into a new place, or at leaſt opens new mouths to diſcharge the waters at. The Rhine, the Danube, the Wolga, the Indus, the Ganges, the Nile, the Miſſiſſippi, and many other rivers, are inſtances of this.

4thly, All theſe effects are leſs ſenſible at the mouths of little rivers, as their currents oppoſe no ſenſible obſtacle to the flowing of the tides; ſo that the ebb carries off again what the flow had brought in.

Whenever the courſe of a river throughout a conſiderable extent of country, approaches towards a right line, its current will have a very great rapidity; and the velocity wherewith it runs diminiſhing the effect of its natural gravitation, the middle of the current will riſe up, and the ſurface of the river will form a convex curve of ſufficient elevation to be perceived by the eye; the higheſt point of this curve is always directly above the line of greateſt current in the ſtream.

On the contrary, when rivers approach near enough to their mouths for a ſenſible effect to be produced in them by the flowing of the tides; and alſo, when in other parts of their courſe they meet with obſtacles at the ſides of their channel; in both theſe caſes the ſurface of the water at the ſides of the current is higher than in the middle, even though the ſtream be rapid. In this ſituation of things, the ſurface of the river forms a concave curve, the loweſt point of which, or that of inflection, is directly over the line of greateſt current. The reaſon thereof is, that there are in this caſe two different and oppoſite currents in the river; that whereby the waters flow towards the ſea, and preſerve their motion therein even to a conſiderable diſtance; and that of the waters which remount, either by the flowing of the tide, or by their meeting with local obſtacles, which form a counter current, ſo much the more ſenſible as the flowing of the tide is ſtronger, or as the percuſſion of the water is made againſt greater obſtacles, and in a direction nearer to a perpendicular to them. From both theſe cauſes, the greater of which by far is that of the tides, the water near the ſides of the channel, where the velocity of the deſcending ſtream is naturally the leaſt, takes a contrary direction, and runs back in the river, while that in the middle continues to flow on towards the ſea. This counter current is what the French call a *remous*.

An iſland in the middle of a river produces the ſame effect as obſtacles at the ſides, regard being had to the difference of ſituation of each.

Eddies and whirlpools in rivers, in the centre of which there appears a conical or ſpiral cavity, and about which the water turns with great rapidity and ſucks in whatever approaches it, proceed in general from the mutual percuſſion of theſe two counter currents; and the vacuity in the middle is produced by the action of the centrifugal force, whereby the water endeavours to recede, in a direct ratio of its velocity, from the centre about which it moves.

If rivers perſevered always nearly in the ſame ſtate, the beſt means of diminiſhing the velocity of the current, when it is found too great for the purpoſes of navigation, would be by widening the channel: but as all rivers are ſubject to frequent increaſe and diminution, and conſequently to very different degrees of velocity and force in the current, this method is liable to produce very detrimental effects; for, when the waters are low, if the channel is very large in proportion, the ſtream will excavate a particular bed, which, according to the irregularities of the bottom, will form various turnings and windings with regard to the principal bed; and, when the waters come to increaſe, they will follow, to a certain degree, the directions which the bottom waters take in this particular bed, and thereby will ſtrike againſt the ſides of the channel, ſo as to deſtroy the banks and cauſe great damages.

It would be poſſible to prevent in part the bad effects proceeding from the current ſtriking againſt the banks, by opening, at thoſe places where it ſtrikes, little gulphs into the land, dug in ſuch a form and direction as that the ſtriking current ſhould enter and circulate therein, ſo as to deſtroy, or at leaſt greatly diminiſh, its velocity. This effect would be felt for a conſiderable way down the river.

This ſame method might probably be uſed with ſucceſs againſt the deſtruction of bridges, weirs, &c. by the violence of the ſtream during floods. Such gulfs being dug into the outer ſide of thoſe turnings in the river which are immediately above the place to be ſecured from the violence of the ſtream, would ſucceſſively diminiſh its velocity, its force and dangerous effects, a conſiderable way down the river. It is true, this method might contribute to produce an overflowing of the river upon the grounds adjacent to thoſe artificial gulphs this being a natural conſequence of the decreaſe of the velocity of the current in thoſe places; and it would remain to be conſidered whether thoſe local inundations, or the danger of deſtruction of the bridges or edifices in the river, were the leſſer evil.

The nature of inundations, and the manner of their formation, merit a particular attention in this place.

While the volume of water in the bed of a river increaſes, the velocity of the current increaſes in proportion; but from the moment that part of this water overflows the bed, the velocity thereof begins to diminiſh, and does ſo more and more, the further it flows and ſpreads on the plain. So that the overflowing being once begun, it is a natural conſequence, that the inundation ſhould continue for ſeveral days; for though the volume of water brought down by the flood during that time ſhould decreaſe, yet, as the quantity of what runs off decreaſes likewiſe, from the great decreaſe of velocity in what overflows the plains, it will continue to produce the ſame effect as if the volume of water coming down had not diminiſhed, until the whole of the ſtream be every where contained again within the bed of the river. When that is become the caſe, the waters that have overflowed the plain will decreaſe thereon, by gradually and ſlowly running off, and alſo by evaporation, till they wholly diſappear. If this were not ſo, we ſhould ſee rivers overflow for an hour or two, and then return again within their beds, a thing contrary to general obſervation; for we conſtantly ſee inundations, once begun in flat countries, laſt for ſeveral days together, although in the mean while the rain ceaſes, and the quantity of water coming down diminiſhes. This muſt be the caſe, becauſe as the overflowing diminiſhes the velocity, and conſequently the quantity of water carried off, it has the ſame effect as if a greater quantity ſtill continued to come down.

It may not be uſeleſs to remark here, that if the wind blows directly contrary to the current of the river, the overflowing will be greater than it would have been otherwiſe, becauſe this accident diminiſhes the velocity of the ſtream: but, on the contrary, if the winds blow in the ſame direction with the current of the river, the inundation will be leſs than otherwiſe, and ſooner at an end; becauſe this accidental cauſe augments the velocity of the ſtream.

River-*Water*. This is generally much ſofter and better accommodated to œconomical purpoſes than ſpring-water. For though rivers proceed originally from ſprings, yet, by their rapid motion, and by being expoſed during a long courſe to the influence of the ſun and air, the earthy and metallic ſalts which they contain are decompoſed, the acid flies off, and the terreſtrial parts precipitate to the bottom. Rivers are alſo rendered ſofter by the vaſt quantity of rain water, which, paſſing along the ſurface of the earth, is conveyed into their channels. But all rivers carry with them a great deal of mud and other impurities; and, when they flow near large and populous towns, they become impregnated with a number of heterogeneous ſubſtances, in which ſtate the water is certainly unfit for the purpoſes of life; yet, by remaining for ſome time at reſt, all the feculencies ſubſide, and the water becomes ſufficiently pure and potable.

RIVINIA, in botany: A genus of the monogynia order, belonging to the tetrandria claſs of plants.—The perianthus is four leaved, coloured, and permanent, the leaflet oblong-egged and obtuſe; there is no corolla, unleſs the calyx be conſidered as ſuch. There are four or eight filaments, ſhorter than the calyx, approaching by pairs, permanent; the antheræ are ſmall. The germ is large and roundiſh; the ſtyle very ſhort; the ſtigma ſimple and obtuſe. The berry is globular, ſitting on the green reflected calyx, one-celled with an incurved point. There is one ſeed, lens orm and rugged. This plant is called *Solanoides* by Tournefort, and *Piercea* by Miller. It grows naturally in moſt of the iſlands of the Weſt Indies. The juice of the berries of the plant will ſtain paper and linen of a bright red colour, and many experiments made with it to colour flowers have ſucceeded extremely well in the following manner: the juice of the berries

was preſſed out, and mixed with common water, putting it into a phial, ſhaking it well together for ſome time, till the water was thoroughly tinged; then the flowers, which were white and juſt fully blown, were cut off, and their ſtalks placed into the phial; and in one night the flowers have been finely variegated with red; the flowers on which the experiments were made, were the tuberoſe and the double white narciſſus.

RIVULET, a diminutive of river. See RIVER.

ROACH, in ichthyology. See CYPRINUS.

ROAD, an open way, or public paſſage, forming a communication between one place and another. Of all the people in the world the Romans took the moſt pains in forming roads; and the labour and expenſes they were at in rendering them ſpacious, firm, ſtraight, and ſmooth, are incredible. They uſually ſtrengthened the ground by ramming it, laying it with flints, pebbles, or ſands, and ſometimes with a lining of maſonry, rubbiſh, bricks, &c. bound together with mortar. In ſome places in the Lionois, F. Meneſtrier obſerves that he has found huge cluſters of flints cemented with lime, reaching 10 or 12 feet deep, and making a maſs as hard and compact as marble; and which, after reſiſting the injuries of time for 1600 years, is ſtill ſcarce penetrable by all the force of hammers, mattocks, &c. and yet the flints it conſiſts of are not bigger than eggs. The moſt noble of the Roman roads was the Via Appia, which was carried to ſuch a vaſt length, that Procopius reckons it five days journey to the end of it, and Leipſius computes it at 350 miles: it is 12 feet broad, and made of ſquare free ſtone, generally a foot and a half on each ſide; and though this has laſted for above 1800 years, yet in many places it is for ſeveral miles together as entire as when it was firſt made.

The ancient roads are diſtinguiſhed into military roads, double roads, ſubterraneous roads, &c. The military roads were grand roads, formed by the Romans for marching their armies into the provinces of the empire; the principal of theſe Roman roads in England are Watling ſtreet, Ikenild-ſtreet, Foſs-way, and Erminage-ſtreet. Double roads among the Romans, were roads for carriages, with two pavements, the one for thoſe going one way, and the other for thoſe returning the other: theſe were ſeparated from each other by a cauſeway raiſed in the middle, paved with bricks, for the conveniency of foot paſſengers; with borders and mounting ſtones from ſpace to ſpace, and military columns to mark the diſtance. Subterraneous roads are thoſe dug through a rock, and left vaulted; as that of Puzzuoli near Naples, which is near half a league long, and is 15 feet broad and as many high.

The firſt law enacted reſpecting highways and roads in England was in the year 1285; when the lords of the ſoil were enjoined to enlarge thoſe *ways* where buſhes, woods, or ditches be, in order to prevent robberies. The next law was made by Edward III. in the year 1346, when a commiſſion was granted by the king to lay a toll on all ſorts of carriages paſſing from the hoſpital of St Giles in the fields to the bar of the old Temple, and alſo through another highway called *Portpool* (now Gray's Inn Lane) joined to the before-mentioned highway; which roads were become almoſt impaſſable. Little further relating to this ſubject occurs till the reign of Henry VIII. when the pariſhes were entruſted with the care of the roads, and ſurveyors were annually elected to take care of them. But the increaſe of luxury and commerce introduced ſuch a number of heavy carriages for the conveyance of goods, and lighter ones for the convenience and eaſe of travelling, that pariſh aid was found inſufficient to keep the beſt frequented roads in repair. This introduced toll gates or turnpikes; that ſomething might be paid towards their ſupport by every individual who enjoyed the benefit of theſe improvements, by paſſing over the roads.

Speaking of roads, the Abbé Raynal juſtly remarks—"Let us travel over all the countries of the earth, and whereever we ſhall find no facility of trading from a city to a town, and from a village to a hamlet, we may pronounce the people to be barbarians; and we ſhall only be deceived reſpecting the degree of barbariſm."

ROAD, in navigation, a bay, or place of anchorage, at ſome diſtance from the ſhore, whither ſhips or veſſels occaſionally repair to receive intelligence, orders, or neceſſary ſupplies; or to wait for a fair wind, &c. The excellence of a road conſiſts chiefly in its being protected from the reigning winds and the ſwell of the ſea; in having a good anchoring-ground, and being at a competent diſtance from the ſhore. Thoſe which are not ſufficiently incloſed are termed *open roads*.

ROAN, in the manege. A *roan* horſe is one of a bay, ſorrel, or black colour, with gray or white ſpots interſperſed very thick. When this party-coloured coat is accompanied with a black head and black extremities, he is called a *roan horſe with a black-a-moor's head*: and if the ſame mixture is predominant upon a deep ſorrel, he is called *claret-roan*.

ROANOAK, an iſland of North America, near the coaſt of North Carolina. Here the Engliſh firſt attempted to ſettle in 1585, but were obliged to leave it for want of proviſions. E. lon. 75. 0. N. lat. 35. 40.

ROANOAK, a river of North America, which riſes in Virginia, runs through Carolina, and at length falls into the ſea, where it forms a long narrow bay called *Albemarle ſound*.

ROASTING, in metallurgic operations, ſignifies the diſſipation of the volatile parts of an ore by heat. See METALLURGY, *paſſim*.

ROB, in pharmacy, the juices of fruits purified and inſpiſſated till it is of the conſiſtence of honey.

ROBBERY, the *rapina* of the civilians, is the felonious and forcible taking, from the perſon of another, of goods or money to any value, by violence or putting him in fear. 1. There muſt be a taking, otherwiſe it is no robbery. A mere attempt to rob was indeed held to be a felony ſo late as Henry IVth's time; but afterwards it was taken to be only a miſdemeanour, and puniſhable with fine and impriſonment; till the ſtatute 7 Geo. II. c. 21. which makes it a felony (tranſportable for ſeven years) unlawfully and maliciouſly to aſſault another, with any offenſive weapon or inſtrument; or by menaces, or by other forcible or violent manner, to demand any money or goods; with a felonious intent to rob. If the thief, having once taken a purſe, returns it, ſtill it is a robbery: and ſo it is whether the taking be ſtrictly from the perſon of another, or in his preſence only; as where a robber by menaces and violence puts a man in fear, and drives away his ſheep or his cattle before his face. 2. It is immaterial of what value the thing taken is: a penny, as well as a pound, thus forcibly extorted, makes a robbery. 3. Laſtly, the taking muſt be by force, or a previous putting in fear; which makes the violation of the perſon more atrocious than privately ſtealing. For, according to the maxim of the civil law, "*qui vi rapuit, fur improbior eſſe videtur.*" This previous violence, or putting in fear, is the criterion that diſtinguiſhes robbery from other larcenies. For if one privately ſteals ſixpence from the perſon of another, and afterwards keeps it by putting him in fear, this is no robbery, for the fear is ſubſequent: neither is it capital as privately ſtealing, being under the value of twelve-pence. Not that it is indeed neceſſary, though uſual, to lay in the indictment that the robbery was committed by *putting in fear*: it is ſufficient, if laid to be done by *violence*. And when it is laid to be done by putting in fear, this does not imply any great degree of terror or affright in the party robbed: it is enough that ſo much force or threatening, by word or geſture, be uſed, as might create an apprehenſion of danger, or induce a man to part with his property without or againſt his conſent. Thus, if a man be knocked down without

vious warning, and ftripped of his property while fenfelefs, though ftrictly he cannot be faid to be *put in fear*, yet this is undoubtedly a robbery. Or, if a perfon with a fword drawn begs an alms, and I give it him through miftruft and apprehenfion of violence, this is a felonious robbery. So if under a pretence of fale, a man forcibly extorts money from another, neither fhall this fubterfuge avail him. But it is doubted, whether the forcing a higler, or other chapman, to fell his wares, and giving him the full value of them, amounts to fo heinous a crime as robbery.

This fpecies of LARCENY is debarred of the benefit of clergy by ftatute 23 Hen. VIII. c. 1. and other fubfequent ftatutes; not indeed in general, but only when committed in a dwelling-houfe, or in or near the king's highway. A robbery therefore in a diftant field, or footpath, was not punifhed with death; but was open to the benefit of clergy, till the ftatute 3 & 4 W. and M. c. 9. which takes away clergy from both principals and acceffories before the fact, in robbery, wherefoever committed. See LAW.

ROBERT BRUCE, king of Scotland, in 1306; a renowned general, and the deliverer of his country from a ftate of vaffalage to the Englifh.

ROBERTSON (Dr. WILLIAM), one of the moft celebrated hiftorians of his age, was one of thofe great characters whofe private life, flowing in an even and unvaried ftream, can afford no important information to the biographer, although his writings will be read to the lateft pofterity with undiminifhed pleafure. He was born at the manfe of Borthwick in the year 1721. His father was, at the time of his death, one of the minifters of the Old Gray Friars church in Edinburgh, which the Doctor came afterwards to fupply. In 1743 he was licenfed preacher, and placed in the parifh of Gladsmuir in 1744; whence, in 1758, he was tranflated to Lady Yefter's parifh in Edinburgh. In 1761, on the death of principal Goldie, he was elected principal of the univerfity of Edinburgh, and appointed one of the minifters of the Old Gray Friars church. About this period he received the degree of Doctor of Divinity, and was appointed hiftoriographer to his majefty for Scotland, and one of his majefty's chaplains for that kingdom.

We find it not eafy to afcertain at what period were firft unfolded the great and fingular talents which deftined Dr. Robertfon to be one of the firft writers that refcued this ifland from the reproach of not having any good hiftorians. We are, however, affured, that before the publication of any of his literary performances, even from his firft appearance in public life, his abilities had begun to attract the notice of obferving men; and to his more intimate friends he difcovered marks of fuch high-minded ambition, as, feconded by thofe abilities, could not have failed to carry him to the firft honours of his profeffion, in whatever fphere he had been placed, and whatever oppofition he might have had to combat.

The firft theatre that offered for the difplay of his talents, was the General Affembly of the Church of Scotland. It is the annual meetings of this court that produce to view men who would otherwife remain in the deepeft obfcurity. There the humble paftor, whofe lot has been caft in the remoteft corner of the Highland wilds, feels himfelf, for a time, on a footing of equality with the firft citizen in the kingdom: he can there difpute with him the prize of eloquence, the moft flattering diftinction to a liberal mind; a diftinction which is naturally fought after with the greater eagernefs in that affembly, as the fimple eftablifhment of the church of Scotland has rendered it the only pre-eminence to which the greateft part of its members can ever hope to attain.

From the moment Dr. Robertfon firft appeared in this affembly, he became the object of univerfal attention and applaufe. His fpeeches were marked with the fame manly and perfuafive eloquence that diftinguifhes his hiftorical compofitions; and it was obferved by all, that while his young rivals in oratory contented themfelves with opening a caufe, or delivering a ftudied harangue, he fhowed equal ability to ftart objections, to anfwer, or to reply; and that even his moft unpremeditated effufions were not unadorned with thofe harmonious and feemingly meafured periods, which have been fo much admired in his works of labour and reflection. He foon came to be confidered as the ableft fupporter of the caufe he chofe to efpoufe, and was now the unrivalled leader of one of the great parties which have long divided the church of which he was a member.

When we reflect upon this circumftance, and confider how much mankind are the fame in every fociety, we fhall be the lefs furprifed to find, in the literary works of Dr. Robertfon, an acquaintance with the human heart, and a knowledge of the world, which we look for in vain in other hiftorians. The man who has fpent his life in the difficult tafk of conducting the deliberations of a popular affembly, in regulating the paffions, the interefts, the prejudices, of a numerous faction, has advantages over the pedant, or mere man of letters, which no ability, no ftudy, no fecond-hand information can ever compenfate.

The firft work which extended the doctor's reputation beyond the walls of the general affembly, was a fermon preached at Edinburgh before the fociety for propagating Chriftian knowledge, and afterwards publifhed; the fubject of which was, 'The ftate of the world at the appearance of Jefus Chrift.' The ingenuity with which a number of detached circumftances are there collected, and fhown to tend to one fingle point, may perhaps rival the art which is fo much admired in the bifhop of Meaux's celebrated Univerfal Hiftory.

This fermon did great honour to the author; and it is probably to the reputation he gained by it, that we ought to attribute the unanimity with which he was called to be one of the minifters of Edinburgh—an event which happened not long after, viz. in the year 1758. In 1759, he publifhed, in two volumes quarto, 'The Hiftory of Scotland, during the reigns of Queen Mary and of King James VI. till his acceffion to the Crown of England, with a Review of the Scots Hiftory previous to that period.' This work in its ftructure is one of the moft complete of all modern hiftories. It is not a dry jejune narrative of events, deftitute of ornament; nor is it a mere frothy relation, all glow and colouring. The hiftorian difcovers a fufficient ftore of imagination to engage the reader's atttention, with a due proportion of judgment to check the exuberance of fancy. The arrangement of his work is admirable, and his defcriptions are animated. His ftyle is copious, nervous, and correct. He has difplayed confummate fkill in rendering fuch paffages of our hiftory as are familiar to our recollection agreeable and entertaining. He has embellifhed old materials with all the elegance of modern drefs. He has very judicioufly avoided too circumftantial a detail of trite facts. His narratives are fuccinct and fpirited; his reflections copious, frequent, and generally pertinent. His fentiments refpecting the guilt of Mary have indeed been warmly controverted by Meffrs. Tytler, Stuart, and Whitaker; and the general opinion now feems to be, that their victory is complete. That victory, however, on the part of Whitaker, is fullied by the acrimony with which he writes. Dr. Robertfon was no rancorous or malignant enemy of the unfortunate queen. While relating what he doubtlefs believed, he makes every poffible allowance for Mary from the circumftances in which fhe was placed; and his hiftory will be read with pleafure by candid men of all parties as long as

the language in which it is compofed fhall continue to be underftood.

In 1769, Dr. Robertfon publifhed, in three volumes quarto, The Hiftory of the Reign of the Emperor Charles V. with a View of the Progrefs of Society in Europe from the Subverfion of the Roman Empire to the beginning of the 16th century.—The vaft and general importance of the period which this hiftory comprifes, together with the reputation which our hiftorian had defervedly acquired, co-operated to raife fuch high expectations in the public, that no work perhaps was ever more impatiently wifhed for, or perufed with greater avidity. The firft volume (which is a preliminary one, containing the progrefs of fociety in Europe, as mentioned in the title) is a very valuable part of the work; for it ferves not only as a key to the pages that follow, but may be confidered as a general introduction to the ftudy of hiftory in that period in which the feveral powers of Europe were formed into one great political fyftem, in which each took a ftation, wherein it has fince remained (till within a very few years at leaft) with lefs alterations than could have been expected, after the fhocks occafioned by fo many internal revolutions, and fo many foreign wars. Of the hiftory itfelf, it may be fufficient to obferve, that it is juftly ranked among the capital pieces of hiftorical excellence. There is an elegance of expreffion, a depth of difcernment, and a correctnefs of judgment, which do honour to the hiftorian. The characters are inimitably penned. They are not contrafted by a ftudied antithefis, but by an oppofition which refults from a very acute and penetrating infight into the real merits of each character, fairly deduced from the feveral circumftances of his conduct exemplified in the hiftory. For this work the doctor got 4500l. fterling.

In 1779, Dr. Robertfon publifhed The Hiftory of America, in two volumes quarto. This celebrated work may be confidered with great propriety as a fequel to the preceding hiftory. From the clofe of the 15th century we date the moft fplendid era in the annals of modern times. Difcoveries were then made, the influence of which defcended to pofterity; and events happened that gave a new direction to the fpirit of nations.

To the inhabitants of Europe, America was in every refpect a new world. There the face of the earth changed its appearance. The plants and trees and animals were ftrange; and nature feemed no longer the fame. A continent opened that appeared to have recently come from the hands of the Creator, and which fhowed lakes, rivers, and mountains, on a grander fcale, and the vegetable kingdom in greater magnificence, than in the other quarters of the globe; but the animal tribes in a ftate of degradation, few in number, degenerated in kind, imperfect, and unfinifhed. The human fpecies in the earlieft ftage of its progrefs, vaft and numerous nations in the rudeft form of the favage ftate which philofophers have contemplated, and two great empires in the loweft degree of civilization which any records have tranfmitted to our review, prefented to the philofophic eye at this period the moft fruitful fubject of fpeculation that was to be found in the annals of hiftory.

The difcovery of the New World, moreover, was not only a curious fpectacle to the philofopher, but, by the change which it effected, an interefting fpectacle to the human race. When Columbus fet fail for unknown lands, he little expected that he was to make a revolution in the fyftem of human affairs, and to form the deftiny of Europe for ages to come. The importance and celebrity therefore of the fubject had attracted the attention of philofophers and hiftorians. Views and fketches of the new world had been given by able writers, and fplendid portions of the American ftory had been adorned with all the beauties of eloquence. But, prior to the appearance of Dr. Robertfon's hiftory, no author had beftowed the mature and profound inveftigation which fuch a fubject required, or had finifhed, upon a regular plan, that complete narration and perfect whole which it is the province of the hiftorian to tranfmit to pofterity. And as the fubject upon which our author entered was grand, his execution was mafterly. The character of his former works was immediately difcerned in it. They had been read with uncommon admiration. When the Hiftory of Scotland was firft publifhed, and the author altogether unknown, Lord Chefterfield pronounced it to be equal in eloquence and beauty to the productions of Livy, the pureft and moft claffical of all the Roman hiftorians. His literary reputation was not confined to his own country: the teftimony of Europe was foon added to the voice of Britain. It may be mentioned, indeed, as the characteriftic quality of our author's manner, that he poffeffed in no common degree that fupported elevation which is fuitable to compofitions of the higher clafs; and, in his Hiftory of America, he difplayed that happy union of ftrength and grace which becomes the majefty of the hiftoric mufe. In the fourth book of his firft volume, which contains a defcription of America when firft difcovered, and a philofophical inquiry into the manners and policy of its ancient inhabitants, he difplays, moreover, fo much patient inveftigation and found philofophy, abounds in fuch beautiful or interefting defcription, and exhibits fuch variety and copioufnefs of elegant writing, that future times will probably refer to it as that part of his works which gives the beft idea of his genius, and is the moft finifhed of all his productions.

In 1787 appeared a tranflation of the Abbé Clavigero's Hiftory of Mexico; in which work the author threw out various reflections, tending in feveral inftances to impeach the credit of Dr. Robertfon's Hiftory of America. This attack induced our learned hiftorian to revife his work, and to inquire into the truth of the charges brought againft it by the Hiftorian of New Spain: and this he appears to have done with a becoming attention to the importance of the facts that are controverted, and to the common interefts of truth. The refult he publifhed in 1788, under the title of Additions and Corrections to the former Editions of Dr. Robertfon's Hiftory of America.—In many of the difputed paffages, he fully anfwered the Abbé Clavigero, and vindicated himfelf: in others he candidly fubmitted to correction, and thus gave additional value to his own work.

The literary labours of Dr. Robertfon appear to have been terminated in 1791 by the publication of An Hiftorical Difquifition concerning the Knowledge which the Ancients had of India, and the progrefs of Trade with that Country prior to the Difcovery of the Paffage to it by the Cape of Good Hope; with an Appendix, containing Obfervations on the Civil Polity, the Laws, and Judicial Proceedings, the Arts, the Sciences, and Religious Inftitutions of the Indians.—The perufal of Major Rennell's Memoir, for illuftrating his map of Hindoftan, fuggefted to Dr. Robertfon the defign of examining more fully than he had done, in his Hiftory of America, into the knowledge which the ancients had of India, and of confidering what is certain, what is obfcure, and what is fabulous, in their accounts of that remote country. Of his various performances, this is not that of which the defign is the moft extenfive, or the execution the moft elaborate; but in this hiftorical difquifition we perceive the fame patient affiduity in collecting his materials, the fame difcernment in arranging them, the fame perfpicuity of narrative, and the fame power of illuftration, which fo eminently diftinguifh his other writings, and which have long rendered them the delight of the Britifh reader at home, and an honour to Britifh literature abroad.

A truly ufeful life Dr. Robertfon clofed on the 11th of

June 1793, at Grange-house, near Edinburgh, after a lingering illness, which he endured with exemplary fortitude and resignation. It may be truly observed of him, that no man lived more respected, or died more sincerely lamented. Indefatigable in his literary researches, and possessing from nature a sound and vigorous understanding, he acquired a store of useful knowledge, which afforded ample scope for the exertion of his extraordinary abilities, and raised him to the most distinguished eminence in the republic of letters. As a minister of the gospel, he was a faithful pastor, and justly merited the esteem and veneration of his flock. In a word, he may be pronounced to be one of the most perfect characters of the age; and his name will be a lasting honour to the island that gave him birth. His conversation was cheerful, entertaining, and instructive; his manners affable, pleasing, and endearing.

Dr. Robertson left three sons and two daughters. The eldest son is procurator for the church of Scotland, and an advocate. The other two are officers in the army; and one of them distinguished himself under Lord Cornwallis in such a manner as to command the warmest praise from that illustrious general.

ROBIGUS AND ROBIGO, a Roman god and goddess, who joined in the preservation of corn from *blight*. Their festival was kept on the 25th of April.

ROBIN HOOD. See HOOD.

ROBIN *Red-Breast*. See MOTACILLA.

ROBINIA, FALSE ACACIA, in botany: A genus of the decandria order, belonging to the diadelphia class of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The calyx is quadrifid; the legumen gibbous and elongated. There are nine species. The most remarkable are the *caragnana* and *ferox*, the leaves of the former of which are conjugated, and composed of a number of small folioles, of an oval figure, and ranged by pairs on one common stock. The flowers are leguminous, and are clustered on a filament. Every flower consists of a small bell-shaped petal, cut into four segments at the edge, the upper part being rather the widest. The keel is small, open, and rounded. The wings are large, oval, and a little raised. Within are to stamina united at the base, curved towards the top, and rounded at the summit. In the midst of a sheath, formed by the filaments of the stamina, the pistil is perceivable, consisting of an oval germen, terminated by a kind of button. This germen becomes afterwards an oblong flattish curved pod, containing four or five seeds, of a size and shape irregular and unequal; yet in both respects somewhat resembling a lentil.

This tree grows naturally in the severe climates of Northern Asia, in a sandy soil mixed with black light earth. It is particularly found on the banks of great rivers, as the Oby, Jenisia, &c. It is very rarely met with in the inhabited parts of the country, because cattle are very fond of its leaves, and hogs of its roots; and it is so hardy, that the severest winters do not affect it. Gmelin found it in the neighbourhood of Tobolsk, buried under 15 feet of snow and ice, yet had it not suffered the least damage. Its culture consists in being planted or sowed in a lightish sandy soil, which must on no account have been lately manured. It thrives best near a river, or on the edge of a brook or spring; but presently dies if planted in a marshy spot, where the water stagnates. If it is planted on a rich soil, well tilled, it will grow to the height of 20 feet, and in a very few years will be as big as a common birch tree.

In a very bad soil this tree degenerates, and becomes a mere shrub: the leaves grow hard, and their fine bright green colour is changed to a dull deep green. The Tongusian Tartars, and the inhabitants of the northern parts of Siberia, are very fond of the fruit of this tree, it being almost the only sort of pulse they eat. M. Strahlemberg, author of a well-esteemed description of Siberia, assures us that this fruit is tolerably pleasant food, and very nourishing. These pease are first infused in boiling water, to take off a certain acrid taste they have, and are afterwards dressed like common pease or Windsor beans; and being ground into meal, pretty good cakes are made of them. The leaves and tender shoots of this tree make excellent fodder for several sorts of cattle. The roots being sweet and succulent, are very well adapted to fattening hogs, and the fruit is greedily eaten by all sorts of poultry. After several experiments somewhat similar to the methods used with anil and indigo, a fine blue colour was procured from its leaves. The smaller kind of this tree seems still better adapted to answer this purpose. The striking elegance of its foliage, joined to the pleasing yellow colour of its beautiful flowers, should, one would imagine, bring it into request for forming nosegays, or for speedily making an elegant hedge.

Besides the qualities above recited, it possesses the uncommon advantage of growing exceedingly quick, and of being easily transplanted. There are large plantations of it now in Sweden, Norway, Lapland, and Iceland. Linnæus assures us, that, after the *Pinus fol. quinis*, erroneously called the *cedar tree of Siberia*, this tree, of all that are to be found in Siberia, is most worthy of cultivation.

The *robinia ferox* is a beautiful hardy shrub, and, on account of its robust strong prickles, might be introduced into this country as a hedge plant, with much propriety. It resists the severest cold of the climate of St. Petersburgh, and perfects its seed in the garden of the empress there. It rises to the height of six or eight feet; does not send out suckers from the root, nor ramble so much as to be with difficulty kept within bounds. Its flowers are yellow, and the general colour of the plant a light pleasing green. A figure of it is given in the *Flora Rossica* by Dr. Pallas, who found it in the southern districts, and sent the seeds to St. Petersburgh, where it has prospered in a situation where few plants can be made to live.

ROBINS (BENJAMIN), a most ingenious mathematician, was born at Bath in 1707. His parents were Quakers, and of low condition, consequently neither able nor willing to have him much instructed in human learning. Nevertheless his own propensity to science procured him a recommendation to Dr. Pemberton at London; by whose assistance, while he attained the sublimer parts of mathematical knowledge, he commenced teacher of the mathematics. But the business of teaching, which required confinement, not suiting his active disposition, he gradually declined it, and engaged in business that required more exercise. Hence he tried many laborious experiments in gunnery, from the persuasion that the resistance of the air has a much greater influence on swift projectiles than is generally imagined. Hence also he was led to consider the mechanic arts that depend on mathematical principles; as the construction of mills, the building of bridges, the draining of fens, the rendering of rivers navigable, and the making of harbours. Among other arts, fortification much engaged his attention; and he met with opportunities of perfecting himself by viewing the principal strong places of Flanders, in some tours he made abroad with persons of distinction.

Upon his return from one of these excursions, he found the learned amused with Dr. Berkeley's work, entitled *The Analyst*, in which an attempt was made to explode the method of fluxions. Mr. Robins was therefore advised to clear up this affair by giving a distinct account of Sir Isaac Newton's doctrines, in such a manner as to obviate all the objections that had been made without naming them. Accordingly he published, in 1735, A Discourse concerning the Nature and Certainty of Sir Isaac Newton's Method of Fluxions: and some exceptions being made to his manner of defending Sir Isaac Newton, he afterwards wrote two or three additional dis-

courſes. In 1738 he defended the ſame great philoſopher againſt an objection contained in a note at the end of a Latin piece, called *Matho, ſive Coſmotheoria puerilis*; and the following year printed Remarks on M. Euler's Treatiſe of Motion, on Dr. Smith's Syſtem of Optics, and on Dr. Jurin's Diſcourſe of diſtinct and indiſtinct Viſion, annexed to Dr. Smith's work. In the meanwhile, Mr. Robins did not ſolely confine himſelf to mathematical ſubjects: for in 1739 he publiſhed three pamphlets on political affairs, without his name; when two of them, relating to the convention and negotiations with Spain, were ſo univerſally eſteemed, as to occaſion his being employed in a very honourable poſt; for, on a committee being appointed to examine into the paſt conduct of ſir Robert Walpole, he was choſen their ſecretary.

In 1742, Mr. Robins publiſhed a ſmall treatiſe, entitled *New Principles of Gunnery*, containing the reſult of many experiments; when a Diſcourſe being publiſhed in the Philoſophical Tranſactions, in order to invalidate ſome of his opinions, he thought proper, in an account he gave of his book in the ſame Tranſactions, to take notice of thoſe experiments; in conſequence of which, ſeveral of his Diſſertations on the Reſiſtance of the Air were read, and the experiments exhibited before the Royal Society, for which he was preſented by that honourable body with a gold medal.

In 1748 appeared Lord Anſon's Voyage round the World, which, though Mr. Walter's name is in the title, has been generally thought to be the work of Mr. Robins. Mr. Walter, chaplain on board the Centurion, had brought it down to his departure from Macao for England, when he propoſed to print the work by ſubſcription. It was, however, it is ſaid, thought proper, that an able judge ſhould review and correct it, and Mr. Robins was appointed; when, upon examination, it was reſolved that the whole ſhould be written by Mr. Robins, and that what Mr. Walter had done ſhould only ſerve as materials. Hence the introduction entire, and many diſſertations in the body of the work, it is ſaid, were compoſed by him, without receiving the leaſt aſſiſtance from Mr. Walter's manuſcript, which chiefly related to the wind and the weather, the currents, courſes, bearings, diſtances, the qualities of the ground on which they anchored, and ſuch particulars as generally fill up a ſailor's account. No production of this kind ever met with a more favourable reception; four large impreſſions were ſold within a twelvemonth; and it has been tranſlated into moſt of the languages of Europe. The fifth edition, printed at London in 1749, was reviſed and corrected by Mr. Robins himſelf. It appears, however, from the corrigenda and addenda to the 1ſt volume of the Biographia Britannica, printed in the beginning of the fourth volume of that work, that Mr. Robins was only conſulted with reſpect to the diſpoſition of the drawings, and that he had left England before the book was printed. Whether this be the fact, as it is aſſerted to be by the widow of Mr. Walter, it is not for us to determine.

It is certain, however, that Mr. Robins acquired the fame, and he was ſoon after deſired to compoſe an apology for the unfortunate affair at Preſtonpans in Scotland, which was prefixed as a preface to The Report of the Proceedings of the Board of General Officers on their Examination into the Conduct of Lieutenant General Sir John Cope; and this preface was eſteemed a maſterpiece in its kind. He afterwards, through the intereſt of Lord Anſon, contributed to the improvements made in the Royal Obſervatory at Greenwich. Having thus eſtabliſhed his reputation, he was offered the choice of two conſiderable employments; either to go to Paris as one of the commiſſaries for adjuſting the limits of Arcadia, or to be engineer-general to the Eaſt India company. He choſe the latter, and arrived in the Eaſt Indies in 1750; but the climate not agreeing with his conſtitution, he died there the year following.

ROBINSON (the moſt Rev. Sir Richard), archbiſhop of Armagh and Lord Rokeby, was immediately deſcended from the Robinſons of Rokeby in the North Riding of the county of York, and was born in 1709. He was educated at Weſtminſter ſchool, from whence he was elected to Chriſt-Church, Oxford, in 1726. After continuing his ſtudies there the uſual time, doctor Blackburne, archbiſhop of York, appointed him his chaplain, and collated him firſt to the rectory of Elton, in the Eaſt Riding of Yorkſhire, and next to the prebend of Grindal, in the cathedral of York. In 1751 he attended the duke of Dorſet, lord-lieutenant of Ireland, to that kingdom, as his firſt chaplain, and the ſame year was promoted to the biſhopric of Killala. A family connection with the earl of Holderneſſe, who was ſecretary of ſtate that year, with the earl of Sandwich and other noblemen related to him, opened the faireſt proſpects of attaining to the firſt dignity in the Iriſh church. Accordingly in 1759 he was tranſlated to the united ſees of Leighlin and Ferns, and in 1761 to Kildare. The duke of Northumberland being appointed to the lieutenancy of Ireland in 1765, he was advanced to the primacy of Armagh, made lord-almoner, and vice-chancellor of the univerſity of Dublin. When lord Harcourt was lord lieutenant of Ireland in 1777, the king was pleaſed by privy-ſeal at St. James's February 6th, and by patent at Dublin the 26th of the ſame month, to create him baron Rokeby of Armagh, with remainder to Matthew Robinſon of Weſt-Layton, eſq. and in 1783 he was appointed prelate to the moſt illuſtrious order of St. Patrick. On the death of the duke of Rutland lord-lieutenant of Ireland in 1787, he was nominated one of the lords-juſtices of that kingdom. Sir William Robinſon, his brother, dying in 1785, the primate ſucceeded to the title of baronet, and is the ſurvivor in the direct male line of the Robinſons of Rokeby, being the 8th in deſcent from William of Kendal. His grace died at Clifton near Briſtol in the end of October 1794.

No primate ever ſat in the ſee of Armagh who watched more carefully over the intereſt of the church of Ireland, as the ſtatute-book evinces. The act of the 11th and 12th of his preſent majeſty, which ſecures to biſhops and eccleſiaſtical perſons repayment by their ſucceſſors of expenditures in purchaſing glebes and houſes, or building new houſes, originated from this excellent man, and muſt ever endear his name to the clergy. The other acts for repairing churches, and facilitating the recovery of eccleſiaſtical dues, were among the many happy exertions of the primate.

But it was at Armagh, the ancient ſeat of the primacy, that he diſplayed a princely munificence. A very elegant palace, 90 feet by 60, and 40 high, adorns that town; it is light and pleaſing, without the addition of wings or leſſer parts; which too frequently wanting a ſufficient uniformity with the body of the edifice, are unconnected with it in effect, and divide the attention. Large and ample offices are conveniently placed behind a plantation at a ſmall diſtance. Around the palace is a large lawn, which ſpreads on every ſide over the hills, ſkirted by young plantations, in one of which is a terrace, which commands a moſt beautiful view of cultivated hill and dale; this view from the palace is much improved by the barracks, the ſchool, and a new church at a diſtance; all which are ſo placed as to be exceedingly ornamental to the whole country.

The barracks were erected under the primate's direction, and form a large and handſome edifice. The ſchool is a building of conſiderable extent, and admirably adapted for the purpoſe; a more beautiful or better contrived one is nowhere to be ſeen; there are apartments for a maſter, a ſchool-room

56 feet by 28, a large dining room and ſpacious airy dormitories, with every other neceſſary, and a ſpacious play-ground walled in; the whole forming a handſome front: and attention being paid to the reſidence of the maſter (the ſalary is 400l. a year), the ſchool flouriſhes, and muſt prove one of the greateſt advantages to the country. This edifice was built entirely at the primate's expenſe. The church is erected of white ſtone, and having a tall ſpire, makes a very agreeable object, in a country where churches and ſpires do not abound. The primate built three other churches, and made conſiderable reparations to the cathedral; he was alſo the means of erecting a public infirmary, contributing amply to it himſelf: he likewiſe conſtructed a public library at his own coſt, endowed it, and gave it a large collection of books; the room is 45 feet by 25, and 20 high, with a gallery and apartments for the librarian. The town he ornamented with a market-houſe and ſhambles, and was the direct means, by giving leaſes upon that condition, of almoſt new-building the whole place. He found it a neſt of mud cabins, and he left it a well-built city of ſtone and ſlate. Theſe are noble and ſpirited works, in which the primate expended no leſs than 30,000l. Had this ſum been laid out in improving a paternal eſtate, even then they would be deſerving great praiſe; but it is not for his poſterity but the public good that his grace was ſo munificent. A medal was ſtruck by the ingenious William Moſſop of Dublin, which has on one ſide the head of the primate, inſcribed "Richard Robinſon, Baron Rokeby, Lord Primate of all Ireland." And on the reverſe the ſouth front of the obſervatory at Armagh, erected by his grace, with this admirable motto, "The Heavens declare the glory of God." M CCLXXXIX.

ROBORANTS, in pharmacy, medicines which ſtrengthen the parts, and give new vigour to the conſtitution.

ROCHEFORT, a ſeaport of France, in the department of Lower Charente and late territory of Aunis, with a commodious harbour, one of the moſt famous in France. It was built by Lewis XIV. in 1664 15 miles from the mouth of the Charente, the entrance of which is defended by ſeveral forts. The ſtreets are broad and ſtraight; the houſes low, but regular; and it is ſuppoſed to contain 10,000 inhabitants. It has a magnificent hoſpital, vaſt barracks, the fineſt hall of arms in France, a noble arſenal, a rope yard, a foundry for cannon, and all the other magazines neceſſary for the conſtruction and equipment of ſhips of war. It is 18 miles S. S. E. of Rochelle, and 127 S. W. of Paris. W. lon. 0. 54. N. lat. 46. 3.

ROCHEFOUCAULT (Francis earl of), deſcended of an illuſtrious family, next in dignity to that of the ſovereigns, was chamberlain to king Charles VIII. and Louis XII. His character at court was admired as obliging, generous, upright, and ſincere. In 1494 he ſtood godfather to Francis I. who when he came to the throne, continued to pay great reſpect to that ſpiritual relation. He made him his chamberlain in ordinary, and erected, in 1515, the barony of Rochefoucault into an earldom; and, in his writ of erection, obſerves, that he did this in memory of the great, honourable, highly uſeful and commendable ſervices which the ſaid Francis had done to his predeceſſors, to the crown of France, and to himſelf. The earl of Rochefoucault died in 1517, leaving behind him an illuſtrious memory, and a character univerſally reſpected. Since his time all the eldeſt ſons of that family have taken the name of Francis.

Rochefoucault (Francis duke de la), prince of Marſillac, governor of Poitou, was born in 1603.—He was the ſon of Francis, the firſt duke of Rochefoucault, and was diſtinguiſhed equally by his courage and his wit. Theſe ſhining qualities endeared him to all the nobility at court, who were ambitious of decorating themſelves at once with the laurels of Mars and of Apollo. He wrote two excellent works; the one a book of Maxims, which, M. de Voltaire ſays, has contributed more than any thing elſe to form the taſte of the French nation; and the other, Memoirs of the Regency of Queen Anne of Auſtria. It was partly at the inſtigation of the beautiful ducheſs de Longueville, to whom he had been long attached, that the duke de Rochefoucault engaged in the civil wars, in which he ſignalized himſelf particularly at the battle of St. Antoine. Beholding one day a portrait of this lady, he wrote underneath it theſe two lines from the tragedy of Alcyonée:

"*Pour meriter ſon cœur, pour plaire a ſes beaux yeux,*
"*J'ai fait la guerre aux rois, je l'aurois fait aux dieux.*"

Which may be thus rendered in Engliſh:

"To gain her heart, and pleaſe her ſparkling eyes,
"I've warr'd with kings, and would have brav'd the ſkies."

It is reported, that after his rupture with Madame Longueville, he parodied the above verſes thus:

"*Pour ce cœur inconſtant, qu'enfin je connois mieux,*
"*Je fais la guerre aux rois, j'en ai perdu les yeux.*"

After the civil wars were ended, he thought of nothing but enjoying the calm pleaſures of friendſhip and literature. His houſe became the rendezvous of every perſon of genius in Paris and Verſailles. Racine, Boileau, Savigne, and La Fayette, found in his converſation charms which they ſought for in vain elſewhere. He was not, however, with all his elegance and genius, a member of the French Academy. The neceſſity of making a public ſpeech the day of his reception was the only cauſe that he did not claim admittance. This nobleman, with all the courage he had diſplayed upon various critical occaſions, and with his ſuperiority of birth and underſtanding over the common run of men, did not think himſelf capable of facing an audience, to utter only four lines in public, without being out of countenance. He died at Paris in 1680, aged 68, leaving behind him a character which has been variouſly drawn by thoſe who during his life were proud of his friendſhip. That he was well acquainted with human nature is certain; and his merit in that reſpect was fully admitted by Swift, who was himſelf not eaſily impoſed upon by the artificial diſguiſes of the hypocrite.

ROCHELLE, a fortified town of France, in the department of Lower Charente and late territory of Aunis, with a commodious and ſafe harbour. It was lately a biſhop's ſee, and contains 16,000 inhabitants. It has five gates; and the houſes are ſupported by piazzas, under which perſons may walk in all weathers. Lewis XIII took this place from the Huguenots, in 1628, after a ſiege of 13 months, during which the inhabitants ſuffered all the horrors of famine, only 4000, out of 15,000, ſurviving the ſiege. To prevent the Engliſh throwing in ſuccours by ſea, cardinal Richelieu conſtructed a prodigious mole, 4482 feet in extent. The inhabitants carry on a conſiderable trade, eſpecially in wines, brandy, ſugar, ſalt, paper, linen, and ſerges. Rochelle is ſeated on the bay of Biſcay, 67 miles N. by E. of Nantes, and 220 S. W. of Paris. W. lon. 1. 4. N. lat. 46. 9.

ROCHESTER, a city in Kent, with a market on Wedneſday and Friday. It is ſeated on the Medway, over which is a ſtone bridge. It is governed by a mayor, and ſends two members to parliament. It is an ancient place, and was formerly much larger than at preſent. Its caſtle, now in ruins, once rendered it of great importance; and here alſo are ſome remains of a priory. Rocheſter is a biſhop's ſee, and has, beſide the cathedral, three pariſh churches. It conſiſts chiefly of one principal ſtreet, which is wide and paved. The inha-

bitants are chiefly tradesmen and inn-keepers; no sort of manufacture being carried on here. It has two free-schools, one called the king's, and the other the city school. Here is also an alms house for six poor travellers, who are supplied with a supper, a bed, and a breakfast, with fourpence to carry them forward on their journey; but they are to stay no longer than one night; and an inscription over the door intimates, that rogues and proctors are excepted. The corporation has jurisdiction over the great oyster-fishery in the several creeks of the Medway. Rochester is parted from Stroud on the W. by its bridge, and it is contiguous to Chatham on the E. It is 27 miles NW. of Canterbury, and 30 S. E. of London. E. lon. 0. 36. N. lat. 51. 23.

ROCHESTER (earl of). See WILMOT.

ROCK, a large mass or block of hard stone rooted in the ground. See MOUNTAIN, PETRIFACTION, and STONE.

ROCK, in ornithology, a species of VULTURE.

ROCK *Basons* are cavities or artificial basons of different sizes, from six feet to a few inches diameter, cut in the surface of the rocks for the purpose, as is supposed, of collecting the dew and rain pure as it descended from the heavens, for the use of ablutions and purifications, prescribed in the druidical religion; these, especially the dew, being deemed the purest of all fluids. There are two sorts of these basons, one with lips or communications between the different basons, the other simple cavities. The lips as low as the bottom of the basons, which are horizontal, and communicate with one somewhat lower, so contrived that the contents fell by a gradual descent through a succession of basons either to the ground, or into a vessel set to receive it. The basons without lips might be intended for reservoirs to preserve the rain or dew in its original purity without touching any other vessel, and was perhaps used for the druid to drink, or wash his hands, previous to officiating at any high ceremony, or else to mix with their misletoe. Some of these basons are so formed as to receive the head and part of the human body; one of this kind is found on a rock called king Arthur's bed, in the parish of North Hall in Cornwall, where are also others, called by the country people Arthur's troughs, in which they say he used to feed his dogs.

ROCK-*Crystal*, in natural history, otherwise called *sprig-crystal*, a name given to the third order of crystals, from their being affixed to a rock or other solid body. See CRYSTAL.

ROCK-*Salt*. See SALT.

ROCK *Oil*. See PETROLEUM.

ROCK *Fish*. See GOBIUS.

ROCKET, an artificial fire-work, consisting of a cylindrical case of paper, filled with a composition of certain combustible ingredients; which, being tied to a stick, mounts into the air, and then bursts. See PYROTECHNY. Mariotte takes the rise of rockets to be owing to the impulse or resistance of the air against the flame. Dr. Desaguliers accounts for it otherwise. Conceive the rocket to have no vent at the choak, and to be set on fire in the conical bore; the consequence will be either that the rocket would burst in the weakest place, or, if all its parts were equally strong, and able to sustain the impulse of the flame, the rocket would burn out immoveable. Now, as the force of the flame is equable, suppose its action downwards, or that upwards, sufficient to lift 40 pounds. As these forces are equal, but their directions contrary, they will destroy each other's action.

Imagine then the rocket opened at the choak; by this means the action of the flame downwards is taken away, and there remains a force equal to 40 pounds acting upwards, to carry up the rocket, and the stick it is tied to. Accordingly, we find that if the composition of the rocket be very weak, so as not to give an impulse greater than the weight of the rocket and stick, it does not rise at all; or if the composition be slow, so that a small part of it only kindles at first, the rocket will not rise.

The stick serves to keep it perpendicular; for if the rocket should begin to tumble, moving round a point in the choak, as being the common centre of gravity of rocket and stick, there would be so much friction against the air by the stick between the centre and the point, and the point would beat against the air with so much velocity, that the friction of the medium would restore it to its perpendicularity.

When the composition is burnt out, and the impulse upwards is ceased, the common centre of gravity is brought lower towards the middle of the stick; by which means the velocity of the point of the stick is decreased, and that of the point of the rocket increased; so that the whole will tumble down, with the rocket-end foremost.

All the while the rocket burns, the common centre of gravity is shifting and getting downwards, and still the faster and the lower as the stick is the lighter, so that it sometimes begins to tumble before it be burnt out; but when the stick is a little too heavy, the weight of the rocket bearing a less proportion to that of the stick, the common centre of gravity will not get so low but that the rocket will rise straight, though not so fast.

ROCKET, in botany. See BRASSICA.

ROCKINGHAM, a town in Northamptonshire, in England, 87 miles from London, stands on the river Welland. It has a charity-school, a market on Thursday, and a fair on Sept. 8. for five days. Its forest was reckoned one of the largest and richest of the kingdom, in which William the Conqueror built a castle; it extended, in the time of the ancient Britons, almost from the Welland to the Nen, and was noted formerly for iron-works, great quantities of flags, *i. e.* the refuse of the iron-ore, being met with in the adjacent fields. It extended, according to a survey in 1641, near 14 miles in length, from the west of Middleton-Woods to the town of Mansford, and five miles in breadth, from Brigstock to the Welland; but is now dismembered into parcels, by the interposition of fields and towns, and is divided into three bailiwicks. In several of its woods a great quantity of charcoal is made of the tops of trees, of which many waggon-loads are sent every year to Peterborough. There is a spacious plain in it called Rockinghamshire, which is a common to the four towns of Cottingham, Rockingham, Corby, and Gretton. King William Rufus called the council here of the great men of the kingdom. W. lon. 0. 46. N. lat. 52. 32.

ROCKING-STONES. See *Rocking*-STONES.

ROCKOMBOLE. See ALLIUM.

ROD, a land measure of 16 feet and a half; the same with perch and pole.

Black ROD. See USHER *of the Black Rod.*

Fishing ROD, a long taper rod or wand, to which the line is fastened for angling. See FISHING-*Rod.*

RODNEY (GEORGE BRIDGES), Lord Rodney, was born in the year 1718. Of the place of his birth and the rank of his ancestors we have not been able to procure any well authenticated account. His father was a naval officer; and commanding, at the time of his son's birth, the yacht in which the king, attended by the duke of Chandos, was passing to or from Hanover, he asked and obtained leave to have the honour of calling his infant son, *George Bridges*. The royal and noble godfathers advised captain Rodney to educate his boy for his own profession, promising, as we have been told, to promote him as rapidly as the merit he should display and the regulations of the navy would permit.

Of young Rodney's early exertions in the ſervice of his country, nothing, however, is known to the writer of this abſtract, nor indeed, any thing of ſufficient importance to be inſerted in articles ſo circumſcribed as all our biographical ſketches muſt be, till 1751, when we find him, in the rank of a commodore, ſent out to make accurate diſcoveries reſpecting an iſland which was ſuppoſed to lie about 50° N. l. and about 300 leagues W. of England: but he returned without having ſeen any ſuch iſland as that which he was appointed to ſurvey. In the war which ſoon followed this voyage of diſcovery, he was promoted to the rank of a rear-admiral, and was employed to bombard Havre de Grace; which in 1759 and 1760 he conſiderably damaged, together with ſome ſhipping. In 1761 he was ſent on an expedition againſt Martinico, which was reduced in the beginning of the year 1672, and about the ſame time St. Lucia ſurrendered to Captain Harvey. Both theſe iſlands were reſtored to the French at the peace of 1763.

In reward for his ſervices, he was created a knight of the Bath; but being inattentive, as many ſeamen are, to the rules of economy, his circumſtances became ſo embarraſſed that he was obliged to fly from his country, with very ſlight hopes of ever being able to return. He was in France when the ill-adviſed policy of that court made them take a decided part with America againſt Great Britain; and it is ſaid that ſome men in power, no ſtrangers to the deſperate ſtate of ſir George's affairs, offered him a high command in the French navy, if he would carry arms againſt his own country. This offer he rejected with becoming indignation. Soon after this gallant behaviour, the duke de Chartres, afterwards the infamous Orleans, told ſir George that he was to have a command in the fleet which was to be oppoſed to that under the command of his countryman Mr. Keppel; and with an inſulting air aſked him what he thought would be the conſequence of their meeting? "That my countryman will carry your Highneſs with him to learn Engliſh," was the high-ſpirited reply.—When the diviſions, which the mutual recriminations of admiral Keppel and ſir Hugh Palliſer excited in the Britiſh navy, made it difficult for the miniſtry to procure experienced, and at the ſame time popular commanders for their fleets, lord Sandwich wrote to ſir George Bridges Rodney, offering him a principal command: but the difficulty was for the veteran to find money to pay his accounts in France, ſo that he might be permitted to leave that kingdom. The money, it has been repeatedly affirmed, was advanced to him by the courtiers whoſe offer he had before indignantly rejected. He arrived, therefore, in England, and was again employed in the ſervice of his country. His firſt exploit after his appointment was in January 1780, when he took 19 Spaniſh tranſports bound to Cadiz from Bilboa, together with a 64 gun ſhip and 5 frigates, their convoy. On the 16th of the ſame month he fell in with the Spaniſh fleet, conſiſting of 11 ſail of the line, under the command of Don Juan de Langara; of which one was blown up during the engagement, five were taken and carried into Gibraltar, among which was the admiral's ſhip, and the reſt were much ſhattered. In April the ſame year, he fell in with the French fleet, under the command of admiral Guichen, at Martinico, whom he obliged to fight, and whom he completely beat; though from the ſhattered ſtate of his own fleet, and the unwillingneſs of the enemy to riſk another action, he took none of their ſhips. The ſucceſsful efforts of our gallant admiral during the year 1780 were generally applauded through the nation. He received the thanks of both houſes of parliament and addreſſes of thanks from various parts of Great Britain, and the iſlands to which his victories were more particularly ſerviceable. In December the ſame year, he made an attempt, together with general Vaughan, on St. Vincent's, but failed. In 1781, he continued his exertions, with much ſucceſs, in defending the Weſt India iſlands: and, along with the above named general, he conquered St. Euſtatius; on which occaſion his conduct to the inhabitants has been much, though perhaps unjuſtly, cenſured. The iſland was certainly a neſt of contraband traders.

On the 12th of April 1782, he came to a cloſe action with the French fleet under count de Graſſe; during which he ſunk one ſhip and took five, of which the admiral's ſhip the Ville de Paris, was one. The following year brought peace; but, as a reward for his numerous ſervices, he had a grant of 2000l. a-year for himſelf and his two ſucceſſors. He had long before been created a baronet, was rear-admiral of Great Britain, and at length was juſtly promoted to the peerage, by the title of baron Rodney of Stoke, Somerſetſhire, and made vice-admiral of Great-Britain. He was once alſo governor of Greenwich hoſpital.

Lord Rodney had been twice married; firſt to the ſiſter of the earl of Northampton, and ſecondly to the daughter of John Clies, eſq. with whom he did not reſide for ſeveral years before his death, which happened on the 24th of May, 1792. He was ſucceeded in title and eſtates by his ſon George, who married in 1781 Martha, daughter of the right hon. alderman Harley, by whom he has iſſue.

Of the private life of lord Rodney we know but little. His attention to the wants of the ſeamen, and the warrant officers ſerving under him, indicated that humanity which is always allied to true courage. He has often, from the number of diſhes which his rank brought to his table, ſelected ſomething very plain for himſelf, and ſent the reſt to the midſhipmen's meſs. His public tranſactions will tranſmit his name with honour to poſterity; his bravery was unqueſtionable, and his ſucceſs has been ſeldom equalled. It has, indeed, been very generally ſaid, that his ſkill in naval tactics was not great, and that he was indebted to the ſuperior abilities of capt. Young and ſir Charles Douglas for the manœuvres by which he was ſo ſucceſsful againſt Langara and De Graſſe. But, ſuppoſing this to be true, it detracts not from his merit. A weak or fooliſh commander could not always make choice of the ableſt officers for his firſt captains, nor would ſuch a man be guided by their advice.

Whatever was lord Rodney's ſkill in the ſcience of naval war, or how much he may have been beholden to the counſels of others, he certainly poſſeſſed himſelf the diſtinguiſhed merit of indefatigable exertion; for he never omitted any thing within the compaſs of his power to bring the enemy to action. He therefore unqueſtionably deſerves the reſpect and the gratitude of his country. In the year 1783 the Houſe of Aſſembly in Jamaica voted 1000l. towards erecting a marble ſtatue to him, as a mark of their gratitude and veneration for his gallant ſervices, ſo timely and glorioſly performed for the ſalvation of that iſland in particular, as well as the whole of the Britiſh Weſt India iſlands and trade in general.

ROE, the ſeed or ſpawn of fiſh. That of the male fiſhes is uſually diſtinguiſhed by the name of *ſoft roe*, or *milt*; and that of the female, *hard roe*, or *ſpawn*. So inconceivably numerous are theſe ovula or ſmall eggs, that M. Petit found 342,144 of them in a carp of 18 inches; but M. Lieuwenhoek found in a carp no more than 211,629. This laſt gentleman obſerves, that there are four times this number in a cod; and that a common one contains 9,344,000 eggs.

Roe, in zoology. See Cervus.

ROELLA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 29th order, *Campanaceæ*. The corolla is funnel-ſhaped, with its bottom ſhut up by ſtaminiferous valvules: the ſtigma is bifid; the capſule bilocular, and cylindrical inferior.

ROGA, in antiquity, a preſent which the emperors made

to the senators, magistrates, and even to the people; and the popes and patriarchs to their clergy. These rogæ were distributed by the emperors on the first day of the year, on their birth-day, or on the *natalis dies* of the cities; and by the popes and patriarchs in passion-week. Roga is also used for the common pay of the soldiers.

ROGATION (ROGATIO), in the Roman jurisprudence, a demand made by the consuls or tribunes of the Roman people, when a law was proposed to be passed. *Rogatio* is also used for the decree itself made in consequence of the people's giving their assent to this demand; to distinguish it from a *senatus consultum*, or decree of the senate.

ROGATION-*Week*, the week immediately succeeding Whitsunday; so called from the three feasts therein, viz. on Monday, Tuesday, and Wednesday.

ROGER DE HOVEDEN, a learned man of the 13th century, was born in Yorkshire, most probably at the town of that name, now called *Howden*, some time in the reign of Henry I. After he had received the first parts of education in his native country, he studied the civil and canon law, which were then become the most fashionable and lucrative branches of learning. He became domestic chaplain to Henry II. who employed him to transact several ecclesiastical affairs; in which he acquitted himself with honour. But his most meritorious work was, his Annals of England, from A. D. 731, when Bede's Ecclesiastical History ends, to A. D. 1202. This work, which is one of the most voluminous of our ancient histories, is more valuable for the sincerity with which it is written, and the great variety of facts which it contains, than for the beauty of its style, or the regularity of its arrangement.

ROGUE, in law, an idle sturdy beggar; who by ancient statutes is for the first offence called a *rogue of the first degree*, and punished by whipping, and boring through the gristle of the right ear with a hot iron; and for the second offence, is termed a *rogue of the second degree*, and, if above 18 years of age, ordered to be executed as a felon.

ROHAN (PETER DE), Chevalier de Gié, and marshal of France, better known by the name of *Marshal de Gié*, was the son of Louis de Rohan, the first of the name, lord of Guémené and Montauban, and descended of one of the most ancient and most illustrious families of the kingdom. The family of Rohan, before the Revolution, held the rank of prince in France in consequence of deriving its origin from the first sovereigns of Brittany, and clearly admitted by the dukes of Brittany themselves in the states general of that province held in 1088. The house of Rohan had still another advantage, which was common to it with very few families, even the most distinguished among the princes, namely, that instead of being aggrandised by the wealth procured from alliances, it had held in itself for seven centuries the largest possessions of any family in the kingdom.

One of the most distinguished branches of this family was Peter, the subject of the present article. Louis XI. rewarded his bravery with the staff of marshal of France in 1475. He was one of the four lords who governed the kingdom during the indisposition of that prince at Chinon in 1484. Two years afterwards he opposed the attacks of the archduke of Austria upon Picardy. He commanded the vanguard at the battle of Fornoue in 1495, and signalized himself much in that engagement. His bravery procured him the countenance and confidence of Louis XII, who appointed him his prime counsellor, and general of the army in Italy; but these advantages he lost by incurring the displeasure of Anne of Brittany the queen.

The marshal had stopped some of her equipage on the road to Nantz; for which that vindictive princess prevailed on her husband to enter into a process against him before the parliament of Toulouse, at that time the most rigorous and severe in the kingdom. He was on the 15th of February 1506 found guilty, banished from the court, and deprived of the privileges and emoluments of his office for five years. The expense of this prosecution amounted to more than 31,000 livres, and it did no honour either to the king or the queen. If indeed it be true, that the queen was never so much delighted as with the humiliation of her enemies, she had good reason to be satisfied here. John of Authon, who hath entered into a pretty full detail of this affair, reports that Gié, being removed to the *Chateau de Dreux*, became an object of ridicule to the witnesses who had sworn against him. He wore a long white beard, and, quite full of the thoughts of his disgrace, took it on one occasion in his hands and covered his face with it. An ape belonging to Alan d'Albret, count of Dreux, jumped from a bed where his master was reposing himself, and attacked the beard of Gié, who with some difficulty, extricated himself. This scene not only occasioned much laughter to the whole company who were present, but likewise became instantly the subject of the farces and mummeries which were then acting in France. Even the school-boys made a representation of it, where, alluding to the name of the queen, they said, that there was a marshal who wished to shoe an ass (*un âne*), but that he received such a blow with the foot, as threw him over the wall into the garden. Mareschal de Gié died at Paris, the 22d April 1513, perfectly disgusted with courts and grandeur.

ROHAN (Henry duke of), peer of France, and prince of Leon, was born at the Chateau de Blein in Brittany in 1579. Henry IV. under whose eyes he gave distinguished proofs of his bravery at the siege of Amiens, when only 16 years of age, loved him with as much affection as if he had been his own son. After the death of Henry, he became chief of the Calvinists in France; and was equally formidable for his genius as his sword. In defence of the civil and religious rights of his party, he maintained three wars against Louis XIII. The first, which terminated to the advantage of the Protestants, broke out when that prince wished to establish the Romish religion in Le Bearn: the second, because of the siege which cardinal De Richlieu caused to be laid to Rochelle: and the third, when that place was besieged a second time. The consequences of this war are sufficiently known: Rochelle surrendered: and the duke de Rohan perceiving, that after the taking of this place, the majority of his party were endeavouring to make up matters with the court, succeeded in procuring for them a general peace in 1629, upon very honourable and advantageous terms. The only sacrifice of importance which the Huguenots were obliged to make, was their fortifications; which put it out of their power to renew the war. Some factious persons, dissatisfied with seeing their fortresses fall into their enemies hands, were ready to accuse their general of having sold them. This great man, undeserving of such odious ingratitude, presented his breast to these enraged malcontents, and said, "Strike, strike! I wish to die by your hands, after I have hazarded my life in your service." The peace of 1629 having extinguished the flame of civil war, the duke de Rohan, no longer of use to his party, and become disagreeable at court, retired to Venice. There is a very particular anecdote of him, extracted from the Memoirs of the duchess of Rohan, Margaret of Bethune, daughter of the famous Sully. Whilst the duke de Rohan was at Venice, a proposal was made to him from the Porte, that for 200,000 crowns, and an annual tribute of 20,000, the Grand Signior would give him the island of Cyprus, and fully invest him with the dignity and prerogatives of king. The duke was warmly inclined to comply with this proposal, and to settle in the island the Protestant families of France and Germany. He negociated this business at the Porte by means of the intervention of the patriarch Cyril, with

whom he had much correfpondence; but different circumftances, and in particular the death of the patriarch, occurred to break off the treaty. The republic of Venice chofe Rohan for their commander in chief againft the Imperialifts; but Louis XIII. took him from the Venetians, and fent him ambaffador into Swifferland, and into the Grifons. He wifhed to affift thefe people in bringing back La Valteline under their obedience, the revolt of which the Spaniards and Imperialifts encouraged. Rohan, being declared general of the Grifons, after many victories, drove the German and Spanifh troops entirely from La Valteline in 1633. He defeated the Spaniards again in 1636 at the banks of the lake of Côme. France, not thinking it proper to withdraw her troops, the Grifons rofe up in arms, and the duke de Rohan, not fatisfied with the conduct of the court, entered into a fpecial treaty with them the 28th of March 1637. This hero, fearing the refentment of cardinal de Richlieu, retired to Geneva with a view to join his friend the duke of Saxe-Weimar, who wifhed him to undertake the command of his army, then ready to engage the Imperialifts near Rhinfield. Although he declined this honour, yet he took the command of the regiment of Naffau, with which he threw the enemy into confufion; but was himfelf wounded, February 28, 1683, and died of his wounds the 13th of April following, at the age of 59. He was interred May 27th, in the church of St. Pierre in Geneva, where there is a magnificent monument of marble erected to his memory, having on it the moft illuftrious actions of his life. The duke de Rohan was one of the greateft generals of his time, equal to the princes of Orange, and capable, like them, of fettling a commonwealth; but more zealous than they for religion, or at leaft appearing to be fo. He was vigilant and indefatigable, not allowing himfelf any pleafures which might take off his intention from his neceffary employments, and well qualified for being the head of a party; a poft very difficult to retain, and in which he had to fear equally from his enemies and his friends. It is in this light that Voltaire has viewed this illuftrious character, when he compofed the following verfe:

Avec tous les talens le Ciel l'avoit fait na'tre:
Il agit en Heros; en Sage il écrivit.
Il fut méme grand homme en combattant fon Maître,
Et plus grand lorfqu'il le fervit.

His military virtues were much heightened by the fweetnefs of his difpofition, his affable and courteous manners, and by a generofity which had few examples. Neither ambition, pride, nor a view of gain, could ever be traced in his character. He was wont to fay, that "true glory and a zeal for the public good never dwelt where felf-intereft reigned." Rohan had always a particular regard for Henry the Fourth: "Truly (faid he, fometimes after the death of that prince) when I think of him, my heart is ready to break. A wound received in his prefence would have afforded me more fatisfaction than now to gain a battle. I would have valued an encomium from him in this art, of which he was the greateft mafter of his time, more than the united praifes of all the commanders now living." He wrote feveral interefting performances: 1. The Interefts of Princes, printed at Cologne in 1666, in 12mo: in which work he fully examines the public interefts of all the princes of Europe. 2. The Perfect General, or an abridgement of the wars from Cæfar's Commentaries, in 12mo. In this he makes it appear, that a knowledge of the tactics of the ancients might be of much ufe to the moderns. 3. A Treatife on the Corruption of the ancient Militia. 4. A Treatife on the Government of the Thirteen Provinces. 5. Memoirs; the beft edition of which is in 2 vols. 12mo. They contain the hiftory of France from 1610 to 1629. 6. A Collection of fome Political Difcourfes on State Affairs, from 1612 to 1629, 8vo Paris, 1644, 1693, 1755; with the Memoirs and Letters of Henry Duke de Rohan relative to the war of La Valteline 3 vols. 12mo, Geneva, 1757. This was the firft edition which appeared of thefe curious memoirs: We owe it to the great attention and diligence of M. le Baron de Zurlauben, who publifhed them from different authentic manufcripts. He likewife ornamented this edition with geographical, hiftorical, and genealogical notes, and a preface, which contains an abridged, but highly interefting life, of the duke de Rohan, author of the memoirs. The abbé Pérau has alfo written a life of him which occupies the 21ft and 22d volumes of the Hiftory of the Illuftrious Men of France. Some want of fpirit might be excufed in the detail of wars finifhed upwards of 140 years ago; yet the memoirs of the duke de Rohan ftill afford confiderable pleafure in the perufal. He tells his ftory with humour, with fufficient exactnefs, and in fuch a ftyle as procures the confidence of the reader.

ROHAULT (James), a celebrated Cartefian philofopher, was the fon of a merchant of Amiens, where he was born in 1620. He became well fkilled in the mathematics, and taught them at Paris, where he became acquainted with M. Clerfelier, an advocate, who gave him his daughter in marriage. Rohault alfo taught philofophy in the fame city with uncommon applaufe. He there improved the arts, and gave excellent lectures to the artifts and workmen. He died at Paris in 1675. He wrote, in French, 1. A treatife on Natural Philofophy. 2. The Elements of the Mathematics. 3. A Treatife on Mechanics, which is very curious. 4. Philofophical Converfations; and other works. His Phyfics have been tranflated into Latin, by Dr. Samuel Clarke, with notes, in which the Cartefian errors are corrected upon the Newtonian fyftem.

ROLANDRA, in botany: A genus of the polygamia fegregata order, belonging to the fyngenefia clafs of plants; and in the natural method ranking under the 49th order, *Compofitæ*. The common calyx confifts of diftinct *flofculi*, between each of which are fhort *fquamæ*, the whole forming a round head. The partial calyx is bivalved. The corolla is fmall and funnel-fhaped, the tube fmall as a thread, the *laciniæ* fhort and acute. The ftamina are five; the ftyle bifid. It has no other feed veffel except the partial calyx, which contains a long three-fided feed. Of this there is only one fpecies, viz. the Argentea; a native of the Weft Indies, and found in copfes and wafte lands.

ROLL, in manufactories, fomething wound and folded up in a cylindrical form. Few *ftuffs* are made up in rolls, except fatins, gaufes, and crapes; which are apt to break, and take plaits not eafy to be got out, if folded otherwife. Ribbons, laces, gallons, and paduas of all kinds, are alfo thus rolled. A roll of *tobacco*, is tobacco in the leaf, twifted on the mill, and wound twift over twift about a ftick or roller. A great deal of tobacco is fold in America in rolls of various weights; and it is not till its arrival in England, Spain, France, and Holland, that it is cut. A roll of *parchment*, properly denotes the quantity of 60 fkins. The ancients made all their books up in the form of rolls; and in Cicero's time the libraries confifted wholly of fuch rolls.

Roll, in law, fignifies a fchedule or parchment which may be rolled up by the hand into the form of a pipe. In thefe fchedules of parchment, all the pleadings, memorials, and acts of court, are entered and filed by the proper officer; which being done they become records of the court. Of thefe there are in the exchequer feveral kinds, as the great wardrobe roll, the cofferer's roll, the fubfidy-roll, &c. *Roll* is alfo ufed for a lift of the names of perfons in the fame condition,

or of those who have entered into the same engagement. Thus a court-roll of a manor, is that in which the names, rents, and services, of each tenant are copied and enrolled.

Calves-head Roll, a roll in the two Temples, in which every bencher is taxed yearly at 2s., every barrister at 1s. 6d., and every gentleman under the bar at 1s., to the cook and other officers of the house, in consideration of a dinner of calves-heads provided in Easter-term.

Muster-Roll, that in which are entered the soldiers of every troop company, regiment, &c. As soon as a soldier's name is written down on the roll, it is death for him to desert.

Rolls-*Office*, is an office in Chancery-lane, London, appointed for the custody of the rolls and records in chancery.

Master of the Rolls. See Master of the Rolls.

Rider-Roll, a schedule of parchment frequently sewed or added to some part of a roll or record.

Rolls *of Parliament*, are the manuscript registers or rolls of the proceedings of our ancient parliaments, which before the invention of printing were all engrossed on parchment, and proclaimed openly in every county. In these rolls are also contained a great many decisions of difficult points of law, which were frequently in former times referred to the decision of that high court.

Roll, or *Roller*, is also a piece of wood, iron, brass, &c. of a cylindrical form, used in the construction of several machines, and several works and manufactures. Thus in the *glass manufacture* they have a running-roll, which is a thick cylinder of cast brass, which serves to conduct the melted glass to the end of the table on which large looking-glasses, &c. are cast. *Founders* also use a roll to work the sand which they use in making their moulds. The presses called *calendars*, as serving to calendar stuffs withal, consist, among other essential parts, of two rollers. It is also between the two rollers that the waves are given to silks, mohairs, and other stuffs proper to be tabbied. Impressions from copper-plates are also taken by passing the plate and paper between two rollers. See *Rolling press* Printing. Rolls, in *flatting-mills*, &c. are two iron instruments of a cylindrical form, which serve to draw or stretch out plates of gold, silver, and other metals. Rolls, in *sugar works*, are two large iron barrels which serve to bruise the canes, and to express the juice. These are cast hollow, and their cavities are filled up with wood, the cylinders of which are properly the rollers.

ROLLER, in surgery, a long and narrow bandage, usually of linen-cloth, rolled round any part of the body, to keep it in, or dispose it to a state of health.

ROLLI (Paul), was born at Rome in 1687. He was the son of an architect, and a pupil of the celebrated Gravina, who inspired him with a taste for learning and poetry. An intelligent and learned English lord having brought him to London introduced him to the royal family as a master of the Tuscan language. Rolli remained in England till the death of queen Caroline his protector, and the patroness of literature in general. He returned to Italy in 1747, where he died in 1767, in the 80th year of his age, leaving behind him a very curious collection in natural history, &c. and a valuable and well chosen library. His principal works first appeared in London in 1735, in 8vo. They consist of odes in blank verse, elegies, songs, and other things, after the manner of Catullus. There is likewise, by him a Collection of Epigrams, printed at Florence in 1776, in 8vo. and preceded with his life by the abbé Fondini. What Martial said of his own Collection may be said of this, "There are few good, but many indifferent or bad, pieces in it." Rolli, however, bore the character of one of the best Italian poets of his age. During his stay in London, he procured editions of several authors of his own country. The principal of these were, the Satires of Ariosto, the Burlesque Works of Berni, Varchi, &c. 2 vols. in 8vo, which possessed considerable merit. The Decameron of Boccace, 1727, in 4to and folio; in which he has faithfully copied the celebrated and valuable edition published by the *Juntes* in 1527: and, lastly, of the elegant Lucretia of Marchetti, which after the manuscript was revised, was printed at London in 1717, in 8vo, through the influence and attention of Rolli. This edition is beautiful; but the work is thought of pernicious tendency. There are likewise, by him, translations into Italian verse of the Paradise Lost of Milton, printed at London in folio in 1735; and of the Odes of Anacreon, London 1739, in 8vo.

ROLLIN, (Charles), a justly celebrated French writer, was the son of a cutler at Paris, and was born there on the 30th of January 1661. He studied at the college Du Plessis, in which he obtained a bursary through the interest of a Benedictine monk of the White Mantle, whom he had served at table, and who discovered in him some marks of genius. Here he acquired the regard of M. Gobinet, principal of that college, who had a particular esteem for him. After having studied humanity and philosophy at the college of Du Plessis, he applied to divinity three years at the Sorbonne; but he did not prosecute this study, and never rose in the church higher than to the rank of a tonsured priest. He afterwards became professor of rhetoric in the same college; and, in 1688, succeeded Horsan, his master, as professor of eloquence, in the royal college. No man ever exercised the functions of it with greater eclat: he often made Latin orations, to celebrate the memorable events of the times; and frequently accompanied them with poems, which were read and esteemed by every body. In 1694, he was chosen rector of the university; and continued in that office two years, which was then a great mark of distinction. By virtue of his office, he spoke the annual panegyric upon Louis XIV. He made many very useful regulations in the university; and particularly revived the study of the Greek language, which was then much neglected. He substituted academical exercises in the place of tragedies; and introduced the practice which had been formerly observed, of causing the students to get by heart passages of Scripture. He was a man of indefatigable attention; and trained innumerable persons, who did honour to the church, the state, and the army. The first president Portail was pleased one day to reproach Rollin in a jocular strain, as if he exceeded even himself in doing business: to whom Rollin replied, with that plainness and sincerity which was natural to him, "It becomes you well, Sir, to reproach me with this; it is this habit of labour in me which has distinguished you in the place of advocate-general, which has raised you to that of first president: you owe the greatness of your fortune to me."

Upon the expiration of the rectorship, cardinal Noailles engaged him to superintend the studies of his nephews, who were in the college of Laon; and in this office he was agreeably employed, when, in 1699, he was with great reluctance made coadjutor to the principal of the college of Beauvais. This college was then a kind of a desert, inhabited by very few students, and without any manner of discipline; but Rollin's great reputation and industry soon re-peopled it, and made it that flourishing society it has ever since continued. In this situation he continued till 1712; when the war between the Jesuits and the Jansenists drawing towards a crisis, he fell a sacrifice to the prevalence of the former. Father le Tellier, the king's confessor, a furious agent of the Jesuits, infused into his master prejudices against Rollin, whose connections

with cardinal de Noailles would alone have fufficed to have made him a Janfenift; and on this account he loft his fhare in the principality of Beauvais. No man, however, could have loft lefs in this than Rollin, who had every thing left him that was neceffary to make him happy; retirement, books, and enough to live on. He now began to be employed upon Quinctilian; an author he juftly valued, and faw neglected not without uneafinefs. He retrenched in him whatever he thought rather curious than ufeful for the inftruction of youth; he placed fummaries or contents at the head of each chapter; and he accompanied the text with fhort felect notes. His edition appeared in 1715, in 2 vols. 12mo, with an elegant preface, fetting forth his method and views.

In 1710, the univerfity of Paris, willing to have a head fuitable to the importance of their interefts in the then critical conjuncture of affairs, chofe Rollin again rector: but he was difplaced in about two months by a lettre de cachet. The univerfity had prefented to the parliament a petition, in which it protefted againft taking any part in the adjuftment of the late difputes; and their being congratulated in a public oration by Rollin on this ftep, occafioned the letter which ordered them to choofe a rector of more moderation. Whatever the univerfity might fuffer by the removal of Rollin, the public was probably a gainer; for he now applied himfelf to compofe his treatife upon the Manner of Studying and Teaching the Belles Lettres, which was publifhed, two volumes in 1726, and two more in 1728, 8vo.

This work has been juftly efteemed for the fentiments of religion which animate its author, whofe zeal for the public good prompted him to felect the choiceft paffages of Greek and Latin authors. The ftyle is fufficiently elegant, but the language on fome occafions is not remarkable for delicacy; and in the book altogether there is neither much order nor depth. The author has indeed fpoken of common things agreeably, and has fpoken as an orator on fubjects which demanded the inveftigation of the philofopher. One can fcarcely reduce any thing in him to principles.—For example, the three fpecies of eloquence; the fimple, the temperate, and the fublime, can fcarcely be underftood from him when we read that the one refembles a frugal table; the fecond, a beautiful ruin, with green wood growing on its bank; and the third, thunder and an impetuous river which overthrows every thing that oppofes it.

The work, however, has been exceedingly fuccefsful, and juftly fo; and its fuccefs encouraged its author to undertake another work of equal ufe and entertainment; his *Hiftoire Ancienne*, &c. or "Ancient Hiftory of the Egyptians, Carthaginians, Affyrians, Babylonians, Medes and Perfians, Macedonians, and Greeks," which he finifhed in 13 vols. 8vo. and publifhed between 1730 and 1738. M. Voltaire, after having obferved that Rollin was "the firft member of the univerfity of Paris who wrote French with dignity and correctnefs," fays of this work, that "though the laft volumes, which were written in too great a hurry, are not equal to the firft, it is neverthelefs the beft compilation that has yet appeared in any language; becaufe it is feldom that compilers are eloquent, and Rollin was remarkably fo." This is perhaps faying too much. There are indeed in this work fome paffages very well handled; but they are only fuch as he had taken from the ancient authors, in doing juftice to whom he was always very happy. The reader will eafily difcover in this work the fame attachment to religion, the fame defire for the public good, and the fame love of virtue, which appears in that on the Belles Lettres. But it is to be lamented that his chronology is neither exact nor correfponding; that he ftates facts inaccurately; that he has not fufficiently examined the exaggerations of ancient hiftorians; that he often interrupts the moft folemn narrations with mere trifles; that his ftyle is not uniform; and this want of uniformity arifes from his borrowing from writers of a modern date 40 or 50 pages at a time. Nothing can be more noble and more refined than his reflections; but they are ftrewed with too fparing a hand, and want that lively and laconic turn on account of which the hiftorians of antiquity are read with fo much pleafure. He tranfgreffes the rule which he himfelf had eftablifhed in his Treatife on Studies. "The precepts which have a refpect to manners (fays he) ought, in order to make an impreffion, to be fhort and lively, and pointed like a dart. That is the moft certain method of making them enter and remain on the mind." There is a vifible negligence in his diction with regard to grammatical cuftom, and the choice of his expreffions, which he does not choofe at all times with fufficient tafte, although, on the whole, he writes well, and has preferved himfelf free from many of the faults of modern authors. While the laft volumes of his Ancient Hiftory were printing, he publifhed the firft of his Roman Hiftory; which he lived to carry on through the eighth and into part of the ninth, to the war againft the Cimbri, about 70 years before the battle of Actium. Mr. Crevier, the worthy difciple of Rollin, continued the hiftory to the battle of Actium, which clofes the tenth volume; and has fince completed the original plan of Rollin, in 16 vols. 12mo, which was to bring it down from the foundation of the city to the reign of Conftantine the Great. This hiftory had not fo great fuccefs as his Ancient Hiftory had. Indeed it is rather a moral and hiftorical difcourfe than a formal hiftory; for the author does little more than point out fome more remarkable events, while he dwells with a fort of prolixity on thofe parts which furnifh him a free field for moralizing. It is alternately diffufe and barren; and the greateft advantage of the work is, that there are feveral paffages from T. Livy tranflated with great elegance into French. He alfo publifhed A Latin Tranflation of moft of the Theological Writings relative to the Difputes of the Times in which he lived. Rollin was one of the moft zealous adherents of deacon Pâris; and before the inclofure of the cemetery of St. Medard, this diftinguifhed character might have been often feen praying at the foot of his tomb. This he confeffes in his Letters. He publifhed alfo Leffer Pieces; containing different Letters, Latin Harangues, Difcourfes, Complimentary Addreffes, &c. Paris 1771, 2 vols. 12mo. A collection which might have been contained in one volume, by keeping in only the beft pieces. It is notwithftanding valuable for fome good pieces which it contains, for the favourable opinion which it exhibits of folid probity, found reafon, and the zeal of the author for the progrefs of virtue and the prefervation of tafte. The Latin of Rollin is very correct, and much after the Ciceronian ftyle, and embellifhed with moft judicious thoughts and agreeable images. Full of the reading of the ancients, from which he brought quotations with as much propriety as plenty, he expreffed himfelf with much fpirit and excellence. His Latin poems deferve the fame eulogium.

This excellent perfon died in 1741. He had been named by the king a member of the academy of infcriptions and belles lettres in 1701: but as he had not then brought the college of Beauvais into repute, and found he had more bufinefs upon his hands than was confiftent with a decent attendance upon the functions of an academician, he begged the privileges of a veteran, which were honourably granted him. Neverthelefs, he maintained his connections with the academy, attended their affemblies as often as he could, laid the plan of his ancient hiftory before them, and demanded an

cademician for his cenſor. Rollin was a man of an admirable compoſition; very ingenious, conſummate in polite learning, of rigid morals, and eminently pious. He was rather too religious; his religion carrying him into the territories of ſuperſtition; and he wanted nothing but a mixture of the philoſophic in his nature to make him a very perfect character. Nothing could be more benign, more pacific, more ſweet, more moderate, than Rollin's temper. He ſhowed, it muſt be owned, ſome zeal for the cauſe of Janſeniſm; but in all other reſpects he was exceedingly moderate. The celebrated poet Rouſſeau conceived ſuch a veneration for him, that he came out of baniſhment incognito to Paris, on purpoſe to viſit him and pay his reſpects to him. He looked upon his hiſtories, not only as the beſt models of the hiſtoric kind, but as a complete ſyſtem of politics and morals, and a moſt inſtructive ſchool for princes as well as ſubjects to learn all their duties in.

Inſtead of bluſhing at the lowneſs of his birth, Rollin on no occaſion heſitated to ſpeak of it. "It is from the Cyclops's ſhop (ſays he, in a Latin epigram to one of his friends, to whom he had ſent a ſmall ſword) that I have taken my flight towards Parnaſſus." He was not, however, without ſome ſhare of vanity, eſpecially at hearing mention made of his writings, of which the well-timed praiſes of his adherents had given him a very high opinion. He ſpoke without any diſſimulation what he thought; and his opinions were leſs the effect of preſumption than of openneſs of heart. He was one of thoſe men who are vain without any mixture of pride. Rollin ſpoke pretty well; but he had a greater readineſs of writing than ſpeaking; and much more ſatisfaction might be derived from his works than from his converſation. His name became famous throughout Europe; ſeveral princes ſought the honour of his friendſhip. The duke of Cumberland and the prince-royal of Pruſſia (afterwards king) were among the liſt of his admirers. This monarch honoured him with ſeveral letters; in one of which he pays him the following compliment—"Men of your character are fit companions for kings." As to the literary merit of this author, it was, we ſuſpect, too much extolled in his own time, and has been too much undervalued in ours.

ROLLING, the motion by which a ſhip rocks from ſide to ſide like a cradle, occaſioned by the agitation of the waves. Rolling, therefore, is a ſort of revolution about an imaginary axis paſſing through the centre of gravity of a ſhip: ſo that the nearer the centre of gravity is to the keel, the more violent will be the rolling motion; becauſe the centre about which the vibrations are made is placed ſo low in the bottom, that the reſiſtance made by the keel to the volume of water which it diſplaces in rolling, bears very little proportion to the force of the vibration above the centre of gravity, the radius of which extends as high as the maſt-heads. But if the centre of gravity is placed higher above the keel, the radius of vibration will not only be diminiſhed, but an additional force to oppoſe the motion of rolling will be communicated to that part of the ſhip's bottom which is below the centre of gravity. So far as relates to the effect of rolling, when produced by the quality or ſtowage of the ballaſt, and to the manner by which it may be prevented, viz. a change of the quantity or diſpoſition of the ballaſt, we ſhall endeavour to explain under the article TRIM. It may, however, be neceſſary to remark that the conſtruction of the ſhip's bottom may alſo contribute to diminiſh this movement conſiderably. Many fatal diſaſters have happened to ſhips ariſing from a violent rolling; as the loſs of the maſts, looſening of the cannon, and ſtraining violently on the decks and ſides, ſo as to weaken the ſhip to a great degree. See PITCHING.

ROLLING-*Preſs*. See *Rolling*-PRESS.

ROLLING-*Tackle*, a pulley or purchaſe faſtened to that part of a ſail-yard which is to the windward of the maſt, in order to confine the yard cloſe down to the leeward when the ſail is furled. It is uſed to prevent the yard from having a great friction againſt the maſt in a high ſea, which would be equally pernicious to both.

ROLLO, the conqueror of Normandy, was a Norwegian duke, baniſhed from his country by Harold Harfagre, who conquered Norway in 870, on account of the piracies he exerciſed. He firſt retired with his fleet among the iſlands of the Hebrides to the north-weſt of Scotland, whither the flower of the Norwegian nobility had fled for refuge ever ſince Harold had become maſter of the whole kingdom. He was there received with open arms by thoſe warriors, who, eager for conqueſt and revenge, waited only for a chief to undertake ſome glorious enterpriſe. Rollo ſetting himſelf at their head, and ſeeing his power formidable, ſailed towards England, which had been long as it were a field open on all ſides to the violence of the northern nations. But the great Alfred had ſome years before eſtabliſhed ſuch order in his part of the iſland, that Rollo, after ſeveral fruitleſs attempts, deſpaired of forming there ſuch a ſettlement as ſhould make him amends for the loſs of his own country. He pretended, therefore, to have had a ſupernatural dream, which promiſed him a glorious fortune in France, and which ſerved at leaſt to ſupport the ardour of his followers. The weakneſs of the government in that kingdom, and the confuſion in which it was involved, were ſtill more perſuaſive reaſons to inſure them of ſucceſs. Having therefore ſailed up the Seine to Rouen, he immediately took that capital of the province, then called *Neuſtria*, and making it his magazine of arms, he advanced up to Paris, to which he laid ſiege in form. This war at length ended in the entire ceſſion of Neuſtria, which Charles the Simple was obliged to give up to Rollo and his Normans in order to purchaſe a peace. Rollo received it in perpetuity to himſelf and his poſterity, as a feodal duchy dependant on the crown of France. A deſcription of the interview between Charles and this new duke gives us a curious picture of the manners of theſe Normans (as they were called by foreigners); for the latter would not take the oath of fealty to his ſovereign lord any other way than by placing his hands within thoſe of the king; and abſolutely refuſed to kiſs his feet, as cuſtom then required. It was with great difficulty he was prevailed on to let one of his warriors perform this ceremony in his ſtead; but the officer to whom Rollo deputed this ſervice, ſuddenly raiſed the king's foot ſo high, that he overturned him on his back; a piece of rudeneſs which was only laughed at: to ſuch a degree were the Normans feared, and Charles deſpiſed.

Soon after, Rollo was perſuaded to embrace Chriſtianity, and he was baptized with much ceremony by the archbiſhop of Rouen in the cathedral of that city. As ſoon as he ſaw himſelf in full poſſeſſion of Normandy, he exhibited ſuch virtues as rendered the province happy, and deſerved to make his former outrages forgotten. Religious, wiſe, and liberal, this captain of pirates became, after Alfred, the greateſt and moſt humane prince of his time.

ROMAN, in general, ſomething belonging to the city of Rome. See ROME.

KING OF THE ROMANS, in modern hiſtory, is a prince elected to be ſucceſſor to the reigning emperor of Germany.

ROMANCE, in literature, a fabulous relation of certain adventures deſigned for the entertainment and inſtruction of the readers, and differing from the *novel* as it always exhibits actions great, dangerous, and generally extravagant. Many authors of the firſt name have written on the ancient *romance*.

It has exercifed the pen of Hurd, of Warburton, and of fome ladies, who have not thought it any derogation to the fenfibility of their fex to unite antiquarian refearch with the cultivation of the *belles lettres*. We have not, however, feen any where fo concife, juft, and elegant an account of the origin and progrefs of *romances* as in D'Ifraeli's Curiofities of Literature. "Romance (fays this writer) has been elegantly defined the offspring of fiction and love. Men of learning have amufed themfelves with tracing the epocha of romances. In this refearch they have difplayed more ingenuity than judgment; and fome have fancied that it may have exifted as far back as the time of Ariftotle; Dearchus, one of his difciples, having written feveral works of this amufing fpecies.

"Let us, however, be fatisfied in deriving it from the Theagenes and Chariclea of Heliodorus, a bifhop who lived in the 4th century, and whofe work has been lately tranflated. This elegant prelate was the Grecian Fenelon*. Beautiful as thefe compofitions are when the imagination of the writer is fufficiently ftored with accurate obfervations on human nature, in their birth, like many of the fine arts, they found in the zealots of religion men who oppofed their progrefs. However Heliodorous may have delighted thofe who were not infenfible to the felicities of a fine imagination, and to the enchanting elegancies of ftyle, he raifed himfelf, among his brother ecclefiaftics, enemies; who at length fo far prevailed, that it was declared by a fynod, that his performance was dangerous to young perfons, and that if the author did not fupprefs it he muft refign his bifhopric. We are told he preferred his romance to his bifhopric. Even fo late as in Racine's time, it was held a crime to perufe thefe unhallowed pages. He informs us, that the firft effufions of his mufe were in confequence of ftudying that ancient romance, which his mafter obferving him to devour with the keennefs of a famifhed man, he fnatched it from his hands and flung it in the fire; a fecond copy experienced the fame fate. What could Racine do? He bought a third, and took the precaution of devouring it fecretly till he got it by heart; after which he offered it to his mafter with a fmile to burn, if he chofe, like the others.

"The decifion of thefe bigots was founded in their opinion of the immorality of fuch works. They alleged, that the writers paint too warmly to the imagination, addrefs themfelves too forcibly to the paffions; and in general, by the freedom of their reprefentations, hover on the borders of indecency. This cenfure is certainly well-founded. Many of the old romances, and even of the dramas acted in Scotland two centuries ago, are fuch as common proftitutes would in this age think indecent. But we are at prefent concerned with the origin of romances.

"The learned Fleury thinks that they were not known till the 12th century, and gives as their original the hiftory of the dukes of Normandy. Verdier, whofe opinion is of no great weight, fays the invention of romance was owing to the Normans of France; and that thefe fictions being originally written in the old Norman language, they were intitled *Normances*; the name was afterwards altered to that of *Romances*. The Spaniards, who borrowed them from the French, called them *Romanzes*, which alfo did the Italians.

"Dom Rivet, one of the learned affociates of the congregation of St. Maur, authors of the Literary Hiftory of France, fixes their origin in the 10th century. He fays that the moft ancient romance known was one which appeared in the middle of that century, under the title of *Philomena*, or *the Beloved*. This romance contains the pretended exploits of Charlemagne before Narbonne. At Touloufe, he tells us, they have preferved a copy of the Philomena in its original language; that is to fay, the Romaunt or polifhed; fuch as was then fpoken at court. They preferred this language to the Latin, which was then that of the common people, but vitiated with their corruptions.

"So far have we travelled on the road of conjecture: we fhall now turn into the path of fact. It is certain that thefe compofitions derive their name from the language in which they were firft written. Abbé Irail has given us the character of the earlieft romances, which we fhall tranfcribe; for to add to what is well expreffed, however it may pleafe the vanity of a writer, feldom tends to the gratification of the reader.

'The firft romances were a monftrous affemblage of hiftories, in which truth and fiction were equally blended, but all without probability; a compofition of amorous adventures, and all the extravagant ideas of chivalry. The incidents are infinitely multiplied; deftitute of connection, of order, and art. Thefe are the ancient and miferable romances which Cervantes, in his celebrated fatirical romance of Don Quixote, has covered with an eternal ridicule.'

"It is, however, from thefe productions rather in their improved ftate, that poets of all nations have drawn their richeft inventions. The agreeable wildnefs of that fancy which characterifed the eaftern nations was caught by the crufaders. When they returned home, they mingled in their own the cuftoms of each country. The Saracens, who were men like themfelves, becaufe they were of another religion, and were therefore their enemies, were pictured under the tremendous form of *Paynim Giants*. The credulous reader of that day followed with trembling anxiety the *Red crofs Knight*. It was thus that fiction embellifhed religion, and religion invigorated fiction. Such incidents have enlivened the cantos of Ariofto, and adorned the epic of Taffo. Spenfer is the child of their creation; and it is certain that we are indebted to them for fome of the bold and ftrong touches of Milton."

Other circumftances however have been affigned as the fources of thefe extravagant fictions. "Caftles were erected to repulfe the vagrant attacks of the Normans; and in France (from the year 768 to 987) thefe places became fatal to the public repofe. The petty defpots who raifed thefe caftles, pillaged whoever paffed, and carried off the females who pleafed them. Rapine, of every kind, was the privilege of lords! Mezeray obferves, that it is from thefe circumftances romancers have invented their tales of knights-errant, monfters, and giants.

"De Saint Foix, in his Hiftorical Effays on this fubject, thus expreffes himfelf: 'Women and girls were not in greater fecurity when they paffed by abbeys. The monks fuftained an affault rather than relinquifh their prey: if they faw themfelves lofing ground, they brought to their walls the relics of fome faint. Then it generally happened that the affailants, feized with awful veneration, retired, and dared not to purfue their vengeance. This is the origin of the enchanters, of the enchantments, and of the enchanted caftles, defcribed in romances.'

* An ingenious and learned friend inquires, 'Is not the romance of the Golden Afs, by Apuleius, to be confidered as an earlier fpecimen than that of Heliodorus?' To this our author has no objection; but he would not warrant *any* romance to be the *firft* that ever was written. It is thus that fome writers, more learned than fagacious, have difcovered the firft inventor of epiftolary correfpondence. A lady receives this honour: fuch learning is defperate! From the Afiatic Refearches and other publications on Oriental literature, we are led to believe, that the native country of romance is the eaft; where it feems to have flourifhed in all its extravagant grandeur from time immemorial.

" To these may be added what the author of Northern Antiquities, vol. i. p. 243, writes, that ' as the walls of the castles ran winding round them, they often called them by a name which signified *serpents* or *dragons*; and in these were commonly secured the women and young maids of distinction, who were seldom safe at a time when so many bold warriors were rambling up and down in search of adventures. It was this custom which gave occasion to ancient romancers, who knew not how to describe any thing simply, to invent so many fables concerning princesses of great beauty guarded by dragons.'

" The Italian romances of the 14th century were spread abroad in great numbers. They formed the polite literature of the day. But if it is not permitted to authors freely to express their ideas, and give full play to the imagination, these works must never be placed in the study of the rigid moralist. They indeed pushed their indelicacy to the verge of grossness, and seemed rather to seek than to avoid scenes which a modern would blush to describe. They (to employ the expression of one of their authors) were not ashamed to name what God had created. Cinthio, Bandello, and others, but chiefly Boccacio, rendered libertinism agreeable, by the fascinating charms of a polished style and a luxuriant imagination.

" This however must not be admitted as an apology for immoral works; for poison is still poison, even when it is delicious. Such works were, and still continue to be, the favourites of a nation which is stigmatised for being prone to illicit pleasures and impure amours. They are still curious in their editions, and are not parsimonious in their price for what they call an uncastrated copy. There are many Italians, not literary men, who are in possession of an ample library of these old novelists.

" If we pass over the moral irregularities of these romances, we may discover a rich vein of invention, which only requires to be released from that rubbish which disfigures it to become of an invaluable price. The Decamerons, the Hecatommiti, and the Novellas of these writers, made no inconsiderable figure in the little library of our Shakespeare. Chaucer is a notorious imitator and lover of them; his Knight's Tale is little more than a paraphrase of Boccacio's Teseoide. Fontaine has caught all their charms with all their licentiousness. From such works, these great poets, and many of their contemporaries, frequently borrowed their plots; not uncommonly kindled at their flame the ardour of their genius; but bending too submissively to their own peculiar taste, or that of their age, in extracting the ore, they have not purified it of the alloy.

" We must now turn our contemplation to the French romances of the last century. They were then carried to a point of perfection, which as romances they cannot exceed. To this the Astrea of D'Urfé greatly contributed. It was followed by the illustrious Bassa, the great Cyrus, Clelia, &c. which, though not adapted to the present age, gave celebrity to their authors. Their style, as well as that of the Astrea, is diffuse and insipid. Zaide (attributed by some to Segrais, but by Huet to Madame La Fayette) and The Princess of Cleves are translated, and, though they are masterpieces of the kind, were never popular in our country, and are little adapted to its genius.

" It is not surprising that romances have been regarded as pernicious to good sense, morals, taste, and literature. It was in this light they were considered by Boileau; because a few had succeeded, a crowd imitated their examples. Gomherville and Scudery, and a few more, were admired; but the satirist dissolved the illusion. This he did most effectually by a dialogue, in which he ridicules those citizens of a certain district, whose characters were concealed in these romances, under the names of Brutus, Horatius Cocles, Lucretius, and Clelia. This dialogue he only read to his friends, and did not give it for a long time to the public, as he esteemed mademoiselle de Scudery: but when at length it was published, it united all the romance writers against our satirist.

" From romances, which had now exhausted the patience of the public, sprung novels. They attempted to allure attention by this inviting title, and reducing their works from ten to two volumes. The name of romance disgusted; and they substituted those of histories, lives, memoirs, and adventures. In these works (observes Irail) they quitted the unnatural incidents, the heroic projects, the complicated and endless intrigues, and the exertion of noble passions; heroes were not now taken from the throne, they were sought for even amongst the lowest ranks of the people. On this subject I shall just observe, that a novel is a very dangerous poison in the hand of a libertine; it may be a salutary medicine in that of a virtuous writer." See Novel.

ROMAGNA, a province of Italy, in the pope's territories, bounded on the north by the Ferrarese, on the south by Tuscany and the duchy of Urbino, on the east by the Gulph of Venice, and on the west by the Bolognese and a part of Tuscany. It is fertile in corn, wine, oil, fine fruits, and pastures. It has also mines, mineral waters, and salt-works, which make its principal revenue. Ravenna is the capital town.

ROMANIA, a province of Turkey in Europe, bounded on the north by Bulgaria, on the east by the Black Sea, on the south by the Archipelago and the sea of Marmora, and on the west by Macedonia and Bulgaria; being 200 miles in length and 150 in breadth. It was formerly called *Thrace*, and is the principal and largest of all the provinces the Turks possess in Europe. It is a fruitful country in corn and pastures, and there are mines of silver, lead, and alum. It is divided into three great governments or sangiacates; namely, Kirkel, of which Philipoli is the capital; Galipoli, whose capital is of the same name; and Byzantium, or Byzia, or Viza, of which Constantinople is the capital. The Turks bestow the name of *Romelia* on all the territories they possess in Europe.

ROMANO (Giulio), a famous painter, was the disciple of Raphael, who had such an affection for him, that he appointed him, with John Francis Penni, his heir. His conceptions were more extraordinary and more elevated than even those of his master, but not so natural. He was wonderful in the choice of attitudes; but did not perfectly understand the lights and shades, and is frequently harsh and ungraceful. The folds of his draperies, says Du Fresnoy, are neither beautiful nor great, easy nor natural, but all extravagant, like the fantastical habits of comedians. He was, however, superior to most painters, by his profound knowledge of antiquity; and, by conversing with the works of the most excellent poets, particularly Homer, he made himself master of the qualifications necessarily required in a great designer. Giulio Romano was also well skilled in architecture. He was employed by cardinal de Medicis, who was afterwards pope under the name of *Clement* VII.; and afterwards went to Mantua, whither he was invited by Frederic Gonzaga, marquis of that city, in order to avoid his being justly punished for his having drawn at Rome the designs of 20 obscene plates, engraved by Mark Antony, to which Aretine added the same number of sonnets. Giulio Romano embellished the city of Mantua with many of his performances both in painting and architecture; and died in that city in 1545, at 54 years of age, much regretted by the marquis, who had an extraordinary friendship for him.

ROME, a city of Italy, and at one time capital of the

world; founded by Romulus in the year 748 before Christ; situated on seven hills, on the side of the Tiber. The names of the hills were Palatinus, Capitolinus, Aventinus, Janiculus, Cœlius, Esquilinus, and Quirinalis. At this time it is the residence of the pope, and the capital of his dominions, situated in the province called *Campagna*. It contains 81 parishes, 200,000 inhabitants, including strangers, 2817 priests, 3847 monks, 1910 nuns, 1665 students, and 1470 paupers. The streets are large and handsome, but not kept in good repair. It is divided into fourteen quarters or wards, called riones, in which are found a great number of beautiful squares, superb palaces, and magnificent churches; the gates are for the most part triumphal arches. It is ten miles in circumference, but this extent comprehends gardens and uninhabited places, and defended by the castle of St. Angelo. 1. In the Rione di Monte is the celebrated church of St. Giovanni in Laterano, dedicated to St. John in the 7th century, and raised on the ruins of a palace built by Constantine in the year 324. Near this church is the baptistery of Constantine, celebrated for its ornaments, its antiquity, painting, columns, and statues. Before the church is an obelisk, constructed at Thebes, in Upper Egypt, and brought down the Nile to Alexandria, from whence, by the order of Constantius, it was conveyed to Rome; it is of red granite, and loaded with hieroglyphics; the height is 204 palms, and the weight upwards of 1,300,000 pounds. In this ward also are found the Scala Santa, a square sanctuary, where are 28 marble steps, which they say were brought from the palace of Pilate at Jerusalem. The palace of the Lateran, one of the most superb buildings in Rome, is at present appropriated to the employment of 250 poor girls in different kinds of work; the church of St. Stephen, called the Round, from its form, which was an ancient temple of Faunus, supported by sixty pillars of granite, or marble of Paros; the church of the Holy Cross of Jerusalem, built by Constantine, celebrated for its relics, its magnificent columns of granite, and beautiful paintings; the ruins of a temple dedicated to Venus and Cupid; the monastery of St. Eusebius, built on the ruins of the baths and palace of Gordianus; the church of St. Laurence; the church of St. Mary Major, built in the year 352, in which are found the magnificent chapels of Sixtus V, and the Borghese family, numerous mausolea, marble columns, statues, and relics: Trajan's pillar, one of the most beautiful monuments of ancient Rome, and, perhaps, in the world; its height is 217 palms, including the pedestal; the lower diameter is 16 palms, and the upper 14 and a half, adorned with bas reliefs, in which are 2500 human figures: the remains of the baths of Titus, of temples dedicated to Concord, to Peace, to Jupiter Tonans, to Jupiter Stator, with many other churches, palaces, and monuments of antiquity. 2. In the Rione di Trevi is found the church of the Twelve Apostles, first built in the reign of Constantine, and rebuilt by Clement XI, celebrated for its pictures and architecture; this ward likewise contains a church, dedicated to our Lady of Loretto, adorned with Corinthian pillars and the most beautiful statues; the church of St. Mary in Trivio, built or repaired by Belisarius; the churches of St. Vincent, of Anastasius, St. Silvester, St. Susanna, and many superb palaces. 3. The Rione de Colonna contains the churches of St. Andre, St. Silvester in Capite, St. Mary in Aquiro, St. Mary Magdalen, St. Laurence in Lucina, &c.; the Piazza di Colonna is large, of which the buildings are handsome; in this square is a fountain, and a marble column of Antoninus, constructed in the time of Commodus, and all of marble; the diameter of the pillar is 21 palms, and the height 177; on the summit is the statue of St. Paul, 19 palms in height; the bas relief represents the wars of Marcus Aurelius; in this ward is the great hall of justice; the house of the missionaries, whither all ecclesiastics of Rome retire for ten days before they receive holy orders; with several palaces and monuments of antiquity. 4. The Rione di Campo di Marzo contains the ancient Campus Martius; in this are found several beautiful churches and magnificent palaces; among other buildings is the Clementine college, founded for the natives of Illyricum by pope Clement VIII, and now appropriated to the Dalmatians; the obelisks of Augustus and Sesostris, which, after being long neglected, were erected by pope Benedict XIV. 5. The Rione de Ponte takes its name from the bridge of St. Angelo; in it are found a college for 100 students, Hungarians and Germans; the church of St. Apollinarius, constructed on the ruins of a temple dedicated to Apollo; the church of St. Simon and Jude; of our Lady of Peace, built to fulfil a vow of Sixtus IV, for the peace of Italy, and repaired by Alexander II; with some others, and several palaces. 6. The Rione di Parione occupies a part of the Flaminian Circus; it contains the beautiful church of St. Nicolas; near which is the Piazza di Navonne, in the centre of which is a fountain, executed by Bernini, representing the Danube, the Ganges, the Nile, and the Plata, sitting on a rock, which supports an obelisk, and pours out the waters by large streams; it incloses a cavern, from which a lion and a horse seem advancing to drink: the design is bold, and the sculpture excellent: the obelisk is of red granite, 73 palms in height, and full of Egyptian characters; the church of St. Agnes is an elegant building, in which is a magnificent mausoleum of Innocent X; the church of St. James, of Spain; the statue of Pasquin, now mutilated, so celebrated for bons mots and satirical placards affixed to it, from hence called *Pasquinades*; the beautiful church of St. Mary in Vallicella, in the neighbourhood of which the fathers of the oratory reside; with several other churches and palaces. 7. The Rione della Regola, near the Tiber, contains the Farnese Palace, in which is seen the celebrated colossal statue of Hercules, and many others; this palace was built by Michael Angelo, with the stone taken from Vespasian's amphitheatre; the gallery was painted by Hannibal Caracci; the Monte della Pieta, established in the year 1539, for the purpose of lending money on pledges without interest; the church of St. Paul a la Regola, St. Mary in Monticelli, &c. 8. The Rione di St. Eustachio contains the beautiful church of St. Charles aux Catinari, in which, among many others, is a beautiful picture representing the death of St. Anne; the church of St. Andre de la Valle, which contains some excellent paintings; the college de Sapienza is, perhaps, the most celebrated in the universe; this magnificent building was begun under Leo X, from the design of Michael Angelo; the architecture is of a noble simplicity; the church is remarkable for a triangular form, the decoration grand, with a perfect harmony between the plan, elevation, and cupola; the palace of Justiniani, adorned with a great number of bas reliefs and antique statues; many of them found on the spot on which were the baths of Nero, and the palace is now erected; the Theatre d'Argentina, and many other palaces, antiquities, and churches. 9. The Rione della Pigna contains the Piazza della Rotondo, in which is a beautiful fountain of white marble, ornamented with an obelisk and dolphins, which spout out the water. This ward is named from the celebrated structure called, by the ancients, Pantheon, now a church dedicated to all the saints by Gregory IV, and named Rotondo; it is 200 palms in height, and 218 in diameter; behind it are the remains of the baths of Agrippa; the Roman College is a vast and superb edifice, built in the time of Gregory XIV, for the study of the languages and sciences; here is kept the musæum of Father Kircher, and the library is well furnished; the church of St. Maria della Sopra Minerva, so called from a temple of Minerva which anciently stood there; in the church of Ignatius are some beautiful

paintings, and the tomb of Gregory XIV; the church dedicated to Jesus is a superb building, and the inside majestic; the paintings are admirable; the mausoleum of cardinal Bellarmine near the grand altar is adorned with the statues of Wisdom and Religion; among the chapels, the most beautiful are those of S. Francis Xavier and St. Ignatius, the last especially is astonishingly magnificent; the church of St. Stephen du Cacco, built on the ruins of a temple of Serapis. 10. The Rione di Campitelli, or du Capitole; this ward contains the Capitolinus Mountain, the Palatinus, and part of Mount Cœlius; the church of St. Mary in Campitelli, rebuilt in the year 1656 by the people of Rome; the ancient Capitol is destroyed, and the Campidoglio is erected on the place where it stood, the ascent to which is by a flight of steps: the architect was Michael Angelo. Here are found many beautiful statues and pictures, by the most celebrated masters; the Tarpeian rock is now called Monte Caprino; the remains of the temple of Jupiter Tonans; the church of St. Peter in Carcere; part of a prison constructed by Ancus Martius; the ruins of a temple of Concord; the church of our Lady of Consolation; the church of St. Sebastian, built in the ancient Hippodrome. In this ward is found likewise the Coliseum, a superb building, constructed at the command of Vespasian by the Jews brought from Jerusalem, and destined for the combats of gladiators and public spectacles; it was 2338 palms in circumference; the outside was composed of four orders of architecture, and all round was a double portico, ornamented with statues, part of which yet remain; the inside is pulled down, and in the centre is a church, with 13 oratories round the arena; near it is the arch of Constantine, erected by the senate and people of Rome; St. Mary de la Navicella, an ancient church, rebuilt after the designs of Raphael, &c. 11. The Rione di St. Angelo; the church of St. Angelo, which gives name to the ward, was built in the eighth century; near it is the theatre of Marcellus, built by Augustus, and capable of holding 30,000 spectators; the palace of Savelli, and the palace of Mattei, celebrated for the pictures and statues which they contain; and many others. 12. The Rione di Ripa, on the side of the river; this ward includes the Aventine Mountain, and the island of St. Bartholomew, inhabited at the time of the expulsion of the Tarquins, and then called Tiberina and Lycania; the church of St. Bartholomew was founded on the ruins of an ancient temple of Esculapius. This island is joined to the rest of the city by two bridges, one of which was anciently called Cestius, the other Fabricius; the church of St. Nicolas in Carcere, built near the common prison; St. George in Valebro; the arches of Septimus Severus, and Janus; St. Mary in Cosmedin, built by the earliest Christians on the ruins of a temple of Modesty; St. Paul, without the walls, is a patriarchal church, and, next to St. Peter, one of the largest in Rome, built by Constantine; the immense ruins of the baths of Caracalla, in which it is said 3000 persons might bathe at one time; the grand circus; the tomb of Cestius; the catacombs or vaults dug in the stone or solid earth, and used for depositing of the dead in this ward. 13. The Rione di Transtevere is on the other side of the Tiber, and includes the Mountain Janiculus; in the church of St. Peter in Montorio is the celebrated picture of the transfiguration, by Raphael, by some thought to be the most perfect painting that exists; the hospital of St. Michael, which serves as a house of industry, a prison and a house of correction; in this part were Cæsar's Gardens; the baths of Severus; the Naumachium of Augustus; the temple of Fortune; and here now are several seats and villas, as the Villa Corsini, the Villa Panfili, one of the largest and most magnificent in Rome, and the whole being six miles in circumference; the Farnesine is a pleasure-house of the king of Naples, the palace is beautiful, and the gardens along the river extensive; the church of St. Mary in Transtevere was founded in the year 224; there are several others. The Rione di Borgo, or Rione du Vatican; this, too, is beyond the Tiber, and is joined to the rest of the city by means of the bridge of St. Angelo, anciently Pons Œlius; in it is the castle of St. Angelo, anciently Moles Adriani, from its founder; it is of a circular form, and exceedingly strong: here the papal crown is kept, and prisoners of state are confined; it communicates with the Vatican by a long covered gallery; the Vatican is a vast irregular palace, built at several times, and is said to contain upwards of 4400 apartments, many of them painted by the most eminent masters; the library is composed of the ancient collections of the popes and several princes, and contains, it is said, upwards of 40,000 manuscripts. The church of St. Peter is the chef-d'œuvre of Italy, the largest and most beautiful church in the world. It was projected by Nicholas V: Julius II. laid the first stone in the year 1506; but the whole building was not finished till the next century; it is said to cover 20 acres, and to have cost upwards of one million sterling. The original artist was Bramante, but the greater part was from the plan of Michael Angelo, who raised the cupola; Maderni finished it in the year 1621. Lon. 30. 9. Ferro. N. lat. 41. 54.

ROMNEY, a town of the county of Kent. It is one of the cinque-port towns, and is seated on a marsh of the same name, famous for feeding cattle; but the air is very unhealthy. It was once a large and populous place, but the retiring of the sea has reduced it very much; however, it sends two members to parliament.

ROMORENTIN, a town of France, in the department of Loir and Cher and late province of Blaisois, with a castle, on the brook Morentin, which loses itself in the Saudre. On one of its gates is inscribed *Roma Minor*; but there is nothing to justify this appellation. On the contrary, were it not for its manufactures of serges and cloths, which are very good, this place would be scarcely known. It is 45 miles east of Tours, and 100 south by west of Paris. E. lon. 1. 47. N. lat. 47. 22.

ROMPEE, or ROMPU, in heraldry, is applied to ordinaries that are represented as broken; and to chevrons, bends, or the like, whose upper points are cut off.

ROMULUS, the founder and first king of Rome.

RONCIGLIONE, is a town of Italy, in the ecclesiastical state, and patrimony of St. Peter, in E. lon. 13. N. lat. 42. 12. It is a small place, but had a pretty good trade, and was one of the richest in the province while it belonged to the dukes of Parma, which was till 1649, when pope Innocent X. became master of it, and it has ever since continued in the possession of his successors.

RONDELETIA, in botany: a genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is funnel-shaped; the capsule bilocular, inferior, and polyspermous, roundish and crowned.

RONA, one of the Hebrides islands, is reckoned about 20 leagues distant from the north-east point of Ness in Lewis—about a mile long, and half a mile broad. It has a hill in the west part, and is only visible from Lewis in a fair summer's day. There is a chapel in the island dedicated to St. Ronan, fenced with a stone wall round it. This church the natives take care to keep very neat and clean, and sweep it every day. There is an altar in it, on which there lies a big plank of wood about 10 feet long. Every foot has a hole in it, and in every hole is a stone, to which the natives ascribe several virtues; one of them is singular (as they say) for promoting speedy delivery to a woman in travail. The inhabitants are extremely ignorant, and very superstitious. See *Martin's Description*.

RONSARD (Peter de) was born at the castle of Poissoniere in Vendomois in 1524. He was descended of a noble family, and was educated at Paris in the college of Navarre. Academical pursuits not suiting his genius, he left college, and became page to the duke of Orleans, who resigned him to James Stuart, king of Scots, married to Magdalene of France. Ronsard continued in Scotland with king James upwards of two years, and afterwards went to France, where he was employed by the duke of Orleans in several negotiations. He accompanied Lazarus de Baif to the diet of Spires. Having from the conversation of this learned man imbibed a passion for the belles-lettres, he studied the Greek language with Baif's son under Dorat. It is reported of Ronsard, that his practice was to study till two o'clock in the morning; and when he went to bed, to awaken Baif, who resumed his place. The muses possessed in his eyes an infinity of charms; and he cultivated them with such success, that he acquired the appellation of the *Prince of the Poets* of his time. Henry II. Francis II. Charles IX. and Henry III. loaded him with favours. Having gained the first prize of the *Jeux Floraux*, they thought the reward promised below the merit of the work, and the reputation of the poet. The city of Toulouse caused a Minerva of massy silver of considerable value to be made and sent to him. This present was accompanied with a decree, declaring him *The French Poet*, by way of distinction. Ronsard afterwards made a present of his Minerva to Henry II. and this monarch appeared as much elated with this mark of the poet's esteem for him, as the poet himself could have been had he received the present from his sovereign. Mary, the beautiful and unfortunate queen of Scots, who was equally sensible of his merit with the Toulonese, gave him a very rich set of table-plate, among which was a vessel in the form of a rose-bush, representing Mount Parnassus, on the top of which was a Pegasus with this inscription:

A Ronsard, l'Apollon de la source des muses.

From the above two anecdotes of him may easily be inferred the reputation in which he was held, and which he continued to keep till Malherbe appeared. His works possess both invention and genius; but his affectation of everywhere thrusting in his learning, and of forming words from the Greek, the Latin, and the different provincialisms of France, has rendered his versification disagreeable, and often unintelligible.

Ronsard, dit Despréaux, par une autre méthode,
Reglant tout, brouilla tout, fit un art à sa mode;
Et toutefois long temps eut un heureux destin;
Mais sa muse, en François parlant Grec et Latin,
Vit dans l'âge suivant, par un retour grotesque,
Tomber de ses grands mots le faste pédantesque.

He wrote hymns, odes, a poem called the *Franciad*, eclogues, epigrams, sonnets, &c. In his odes he takes bombast for poetical raptures. He wishes to imitate Pindar; and by labouring too much for lofty expressions, he loses himself in a cloud of words. He is obscure and harsh to the last degree: faults which he might easily have avoided by studying the works of Marot, who had before he wrote brought French poetry very near to perfection. "Marot's turn and style of composition are such (says Bruyere), that he seems to have written after Ronsard: there is hardly any difference, except in a few words, between Marot and us. Ronsard, and the authors his contemporaries, did more disservice than good to style: they checked its course in the advances it was making towards perfection, and had like to have prevented its ever attaining it. It is surprising that Marot, whose works are so natural and easy, did not make Ronsard, who was fired with the strong enthusiasm of poetry, a greater poet than either Ronsard or Marot." But what could be expected from a man who had so little taste, that he called Marot's works 'a dunghill from which rich grains of gold by industrious working might be drawn?' As a specimen of our author's intolerable and ridiculous affectation of learning, which we have already censured, Boileau cites the following verse of Ronsard to his mistress: *Estes-vous pas ma seule entelechie?* 'are not you my only entelechia?' Now *entelechia* is a word peculiar to the peripatetic philosophy, the sense of which does not appear to have ever been fixed. Hermalaus Barbarus is said to have had recourse to the devil, in order to know the meaning of this new term used by Aristotle; but he did not gain the information he wanted, the devil, probably to conceal his ignorance, speaking in a faint and whispering sort of voice. What could Ronsard's mistress therefore, or even Ronsard himself, know of it; and what can excuse in a man of real genius the low affectation of using a learned term, because in truth nobody could understand it. He has, however, some pieces not destitute of real merit; and there are perhaps few effusions of the French muse more truly poetical than his *Four Seasons of the Year*, where a most fertile imagination displays all its riches.

Ronsard, though it is doubtful whether he ever was in orders, held several benefices in commendam; and he died at Saint Cosme-les-Tours, one of these, December 27, 1585, being then 61 years of age. He appeared more ridiculous as a man than as a poet: he was particularly vain. He talked of nothing but his family and his alliances with crowned heads. In his panegyrics, which he addresses to himself without any ceremony, he has the vanity to pretend, that from *Ronsard* is derived the word *Rosignol*, to denote both a musician and a poet together. He was born the year after the defeat of Francis I. before Pavia: "Just as heaven (said he) wished to indemnify France for the losses it had sustained at that place." He blushed not to tell of his intrigues. All the ladies sought after him; but he never said that any of them gave him a denial of their favours. His immoderate indulgence in pleasure, joined to his literary labours, served to hasten his old age. In his 50th year he was weak and valetudinary, and subject to attacks of the gout. He retained his wit, his vivacity, and his readiness at poetic composition, to his last moments. Like all those who aspire after public esteem, he had a great number of admirers and some enemies. Though Melin de Saint-Gelais railed at him continually, Rabelais was the person whom he most dreaded. He took always care to inform himself where that jovial rector of Meudon went, that he might not be found in the same place with him. It is reported, that Voltaire acted a similar part with regard to Peron, of whose extemporary sallies and *bon mots* he was much afraid. Ronsard's poems appeared in 1567 at Paris in 6 vols. 4to, and in 1604 in 10 vols. 12mo.

ROOD, a quantity of land equal to 40 square perches, or the fourth part of an acre.

ROOF, expresses the covering of a house or building, by which its inhabitants or contents are protected from the injuries of the weather. It is perhaps the essential part of a house, and is frequently used to express the whole. To *come under a person's roof*, is to enjoy his protection and society, to dwell with him. *Tectum* was used in the same sense by the Romans. To be within our walls rather expresses the being in our possession: a roof therefore is not only an essential part of a house, but it even seems to be its characteristic feature. The Greeks, who have perhaps excelled all nations in taste, and who have given the most perfect model of architectonic ordonnance within a certain limit, never erected a building which did not exhibit this part in the distinctest manner; and though they borrowed much of their model from the orientals, as will be evident to any who compares their architecture with the ruins of Persepolis, and of the tombs in the mountains of Sciras, they added that form of roof which their own climate taught them was ne-

ceffary for fheltering them from the rains. The roofs in Perfia and Arabia are flat, but thofe of Greece are without exception floping. It feems therefore a grofs violation of the true principles of tafte in architecture (at leaft in the regions of Europe), to take away or to hide the roof of a houfe; and it muft be afcribed to that rage for novelty which is fo powerful in the minds of the rich. Our anceftors feemed to be of a very different opinion, and turned their attention to the ornamenting of their roofs as much as any other part of a building. They fhowed them in the moft confpicuous manner, running them up to a great height, broke them into a thoufand fanciful fhapes, and ftuck them full of highly dreffed windows. We laugh at this, and call it Gothic and clumfy; and our great architects, not to offend any more in this way, conceal the roof altogether by parapets, baluftrades, and other contrivances. Our forefathers certainly did offend againft the maxims of true tafte, when they enriched a part of a houfe with marks of elegant habitation, which every fpectator muft know to be a cumberfome garret: but their fucceffors no lefs offend, who take off the cover of the houfe altogether, and make it impoffible to know whether it is not a mere fkreen or colonnade we are looking at.

The architect is anxious to prefent a fine object, and a very fimple outline difcuffes all his concerns with the roof. He leaves it to the carpenter, whom he frequently puzzles (by his arrangements) with coverings almoft impoffible to execute. Indeed it is feldom that the idea of a roof is admitted by him into his great compofitions; or if he does introduce it, it is from mere affectation, and we may fay pedantry. A pediment is frequently ftuck up in the middle of a grand front, in a fituation where a roof cannot perform its office; for the rain which is fuppofed to flow down its fides muft be received on the top of the level buildings which flank it. This is a manifeft incongruity. The tops of dreffed windows, trifling porches, and fometimes a projecting portico, are the only fituations in which we fee the figure of a roof correfpond with its office. Having thus loft fight of the principle, it is not furprifing that the draughtsman (for he fhould not be called architect) runs into every whim: and we fee pediment within pediment, a round pediment, a hollow pediment, and the greateft of all abfurdities, a broken pediment. Nothing could ever reconcile us to the fight of a man with a hat without its crown, becaufe we cannot overlook the ufe of a hat.

But when one builds a houfe, ornament alone will not do. We muft have a cover; and the enormous expenfe and other great inconveniences which attend the concealment of this cover by parapets, baluftrades, and fcreens, have obliged architects to confider the pent roof as admiffible, and to regulate its form. Any man of fenfe, not under the influence of prejudice, would be determined in this by its fitnefs for anfwering its purpofe. A high pitched roof will undoubtedly fhoot off the rains and fnows better than one of a lower pitch. The wind will not fo eafily blow the dropping rain in between the flates, nor will it have fo much power to ftrip them off. A high pitched roof will exert a fmaller thruft on the walls, both becaufe its ftrain is lefs horizontal, and becaufe it will admit of lighter covering. But it is more expenfive, becaufe there is more of it. It requires a greater fize of timbers to make it equally ftrong, and it expofes a greater furface to the wind.

There have been great changes in the pitch of roofs: our forefathers made them very high, and we make them very low. It does not, however, appear that this change has been altogether the effect of principle. In the fimple unadorned habitations of private perfons, every thing comes to be adjufted by an experience of inconveniences which have refulted from too low pitched roofs; and their pitch will always be nearly fuch as fuits the climate and covering. Our architects, however, go to work on different principles. Their profeffed aim is to make a beautiful object. The fources of the pleafures arifing from what we call *tafte* are fo various, fo complicated, and even fo whimfical, that it is almoft in vain to look for principle in the rules adopted by our profeffed architects. We cannot help thinking, that much of their practice refults from a *pedantic* veneration for the beautiful productions of Grecian architecture. Such architects as have written on the principles of the art in refpect of proportions, or what they call the ORDONNANCE, are very much puzzled to make a chain of reafoning; and the moft that they have made of the Greek architecture is, that it exhibits a nice adjuftment of ftrength and ftrain. But when we confider the extent of this adjuftment, we find that it is wonderfully limited. The whole of it confifts of a bafement, a column, and an entablature; and the entablature, it is true, exhibits fomething of a connection with the framework and roof of a wooden building; and we believe that it really originated from this in the hands of the orientals, from whom the Greeks certainly borrowed their forms and their combinations. We could eafily fhow in the ruins of Perfepolis, and among the tombs in the mountains (which were long prior to the Greek architecture), the fluted column, the bafe, the Ionic and Corinthian capital, and the Doric arrangement of lintels, beams, and rafters, all derived from unqueftionable principle. The only addition made by the Greeks was the pent roof; and the changes made by them in the fubordinate forms of things are fuch as we fhould expect from their exquifite judgment of beauty.

But the whole of this is very limited; and the Greeks, after making the roof a chief feature of a houfe, went no further, and contented themfelves with giving it a flope fuited to their climate. This we have followed, becaufe in the milder parts of Europe we have no cogent reafon for deviating from it; and if any architect fhould deviate greatly in a building where the outline is exhibited as beautiful, we fhould be difgufted; but the difguft, though felt by almoft every fpectator, has its origin in nothing but habit. In the profeffed architect or man of education, the difguft arifes from pedantry: for there is not fuch a clofe connection between the form and ufes of a roof as fhall give precife determinations; and the mere form is a matter of indifference.

We fhould not therefore reprobate the high-pitched roofs of our anceftors, particularly on the continent. It is there where we fee them in all the extremity of the fafhion, and the tafte is by no means exploded as it is with us. A baronial caftle in Germany and France is feldom rebuilt in the pure Greek ftyle, or even like the modern houfes in Britain; the high pitched roofs are retained. We fhould not call them Gothic, and ugly becaufe Gothic, till we fhow their principle to be falfe or taftelefs. Now we apprehend that it will be found quite the reverfe; and that though we cannot bring ourfelves to think them beautiful, we ought to think them fo. The conftruction of the Greek architecture is a transference of the practices that are neceffary in a wooden building to a building of ftone. To this the Greeks have adhered, in fpite of innumerable difficulties. Their marble quarries, however, put it in their power to retain the proportions which habit had rendered agreeable. But it is next to impoffible to adhere to thefe proportions with freeftone or brick, when the order is of magnificent dimenfions. Sir Chriftopher Wren faw this; for his mechanical genius was equal to his tafte. He compofed the front of St. Paul's church in London of two orders, and he coupled his columns; and ftill the lintels which form the architrave are of fuch length that they could carry no additional weight, and he was obliged to trufs them behind. Had he made but one order, the architrave could not have carried its own weight. It is impoffible to execute a Doric entablature of this fize in brick. It is attempted in a very noble front, the Academy of Arts in St. Peterfburgh. But the architect was obliged to make the mutules and other

projecting members of the corniche of granite, and many of them broke down by their own weight.

Here is furely an error in principle. Since ftone is the chief material of our buildings, ought not the members of ornamented architecture to be refinements on the effential and unaffected parts of a fimple ftone-building. There is almoft as much propriety in the architecture of India, where a dome is made in imitation of a lilly or other flower inverted, as in the Greek imitation of a wooden building. The principles of mafonry, and not of carpentry, fhould be feen in our architecture, if we would have it according to the rules of juft tafte. Now we affirm that this is the characteriftic feature of what is called the Gothic architecture. In this no dependence is had on the tranfverfe ftrength of ftone. No lintels are to be feen; no extravagant projections. Every ftone is preffed to its neighbours, and none is expofed to a tranfverfe ftrain. The Greeks were enabled to execute their coloffal buildings only by ufing immenfe blocks of the hardeft materials. The Norman mafon could raife a building to the fkies without ufing a ftone which a labourer could not carry to the top on his back. Their architects ftudied the principles of equilibrium; and having attained a wonderful knowledge of it, they indulged themfelves in exhibiting remarkable inftances. We call this falfe tafte, and fay that the appearance of infecurity is the greateft fault. But this is owing to our habits; our thoughts may be faid to run in a wooden train, and certain fimple maxims of carpentry are familiar to our imagination; and in the careful adherence to thefe confifts the beauty and fymmetry of the Greek architecture. Had we been as much habituated to the equilibrium of preffure, this apparent infecurity would not have met our eye: we fhould have perceived the ftrength, and we fhould have relifhed the ingenuity.

The Gothic architecture is perhaps intitled to the name of rational architecture, and its beauty is founded on the characteriftic diftinction of our fpecies. It deferves cultivation: not the pitiful, fervile, and unfkilled copying of the monuments; this will produce incongruities and abfurdities equal to any that have crept into the Greek architecture: but let us examine with attention the nice difpofition of the groins and fpaundrels; let us ftudy the tracery and knots, not as ornaments, but as ufeful members; let us obferve how they have made their walls like honey-combs, and admire their ingenuity as we pretend to admire the inftinct infufed by the Great Architect into the bee. All this cannot be underftood without mechanical knowledge; a thing which few of our profeffional architects have any fhare of. Thus would architectonic tafte be a mark of fkill; and the perfon who prefents the defign of a building would know how to execute it, without committing it entirely to the mafon and carpenter.

Thefe obfervations are not a digreffion from our fubject. The fame principles of mutual preffure and equilibrium have a place in roofs and many wooden edifices; and if they had been as much ftudied as the Normans and Saracens feem to have ftudied fuch of them as were applicable to their purpofes, we might have produced wooden buildings as far fuperior to what we are familiarly acquainted with, as the bold and wonderful churches ftill remaining in Europe are fuperior to the timid productions of our ftone architecture. The ceintres ufed in building the bridge of Orleans and the corn-market of Paris, are late inftances of what may be done in this way. The laft mentioned is a dome of 200 feet diameter, built of fir planks; and there is not a piece of timber in it more than nine feet long, a foot broad, and three inches thick.

The Norman architects frequently roofed with ftone. Their wooden roofs were in general very fimple, and their profeffed aim was to difpenfe with them altogether. Fond of their own fcience, they copied nothing from a wooden building, and ran into a fimilar fault with the ancient Greeks. The parts of their buildings which were neceffarily of timber, were made to imitate ftone-buildings; and Gothic ornament confifts in cramming every thing full of arches and fpaundrels. Nothing elfe is to be feen in their timber works, nay even in their fculpture. Look at any of the maces or fceptres ftill to be found about the old cathedrals; they are filver fteeples.

But there appears to have been a rivalfhip in old times between the mafons and the carpenters. Many of the baronial halls are of prodigious width, and are roofed with timber: and the carpenters appeared to have borrowed much knowledge from the mafons of thofe times, and their wide roofs are frequently conftructed with great ingenuity. Their aim, like the mafons, was to throw a roof over a very wide building, without employing great logs of timber. We have feen roofs 60 feet wide, without having a piece of timber in them above 10 feet long and 4 inches fquare. The Parliament-Houfe and Tron-Church of Edinburgh, the great hall of Tarnaway caftle near Elgin, are fpecimens of thofe roofs. They are very numerous on the continent. Indeed Britain retains few monuments of private magnificence. Ariftocratic ftate never was fo great with us; and the rancour of our civil wars gave moft of the performances of the carpenter to the flames. Weftminfter-hall exhibits a fpecimen of the falfe tafte of the Norman roofs. It contains the effential parts indeed, very properly difpofed; but they are hidden, or intentionally covered, with what is conceived to be ornamental; and this is an imitation of ftone arches, crammed in between flender pillars which hang down from the principal frames, truffes, or rafters. In a pure Norman roof, fuch as Tarnaway hall, the effential parts are exhibited as things underftood, and therefore relifhed. They are refined and ornamented; and it is here that the inferior kind of tafte or the want of it may appear. And here we do not mean to defend all the whims of our anceftors; but we affert that is no more neceffary to confider the members of a roof as things to be concealed like a garret or privy, than the members of a ceiling, which form the moft beautiful part of the Greek architecture. Should it be faid that a roof is only a thing to keep off the rain, it may be anfwered, that a ceiling is only to keep off the duft, or the floor to be trodden underfoot, and that we fhould have neither copartments in the one nor inlaid work or carpets on the other. The ftructure of a roof may therefore be exhibited with propriety, and made an ornamental feature. This has been done even in Italy. The church of St. Maria Maggiore in Rome and feveral others are fpecimens: but it muft be acknowledged, that the forms of the principal frames of thefe roofs, which refemble thofe of our modern buildings, are very unfit for agreeable ornament. As we have already obferved, our imaginations have not been made fufficiently familiar with the principles, and we are rather alarmed than pleafed with the appearance of the immenfe logs of timber which form the couples of thefe roofs, and hang over our heads with every appearance of weight and danger. It is quite otherwife with the ingenious roofs of the German and Norman architects. Slender timbers, interlaced with great fymmetry, and thrown by neceffity into figures which are naturally pretty, form altogether an object which no carpenter can view without pleafure. And why fhould the gentleman refufe himfelf the fame pleafure of beholding fcientific ingenuity?

The roof is in fact the part of the building which requires the greateft degree of fkill, and where fcience will be of more fervice than in any other part. The architect feldom knows much of the matter, and leaves the tafk to the carpenter. The carpenter confiders the framing of a great roof as the touchftone of his art; and nothing indeed tends fo much to fhow his judgment and his fertility of refource.

It muft therefore be very acceptable to the artift to have a

clear view of the principles by which this difficult problem may be folved in the beft manner, fo that the roof may have all the ftrength and fecurity that can be wifhed for, without an extravagant expenfe of timber and iron. We have faid that mechanical fcience can give great affiftance in this matter. We may add that the framing of carpentry, whether for roofs, floors, or any other purpofe, affords one of the moft elegant and moft fatisfactory applications which can be made of mechanical fcience to the arts of common life. Unfortunately the practical artift is feldom poffeffed even of the fmall portion of fcience which would almoft infure his practice from all rifk of failure; and even our moft experienced carpenters have feldom any more knowledge than what arifes from their experience and natural fagacity. The moft approved author in our language is Price in his Britifh Carpenter. Mathurin Jouffe is in like manner the author moft in repute in France; and the publications of both thefe authors are void of every appearance of principle. It is not uncommon to fee the works of carpenters of the greateft reputation tumble down, in confequence of miftakes from which the moft elementary knowledge would have faved them.

Having fpoken fully of roofs under ARCHITECTURE, we fhall here conclude; taking, however, fome notice of what we have already commended by the name of *Norman roofs*. We call them *Norman*, becaufe they were frequently executed by that people foon after their eftablifhment in Italy and other parts of the fouth of Europe, and became the prevailing tafte in all the great baronial caftles. Their architects were rivals to the Saracens and Moors, who about that time built many Chriftian churches; and the architecture which we now call Gothic feems to have arifen from their joint labours.

The principle of a *Norman roof* is extremely fimple. The rafters all butted on joggled king pofts AF, BG, CH, &c. (pl. 2, fig. 1.), and braces or ties were then difpofed in the intervals. In the middle of the roof HB and HD are evidently ties in a ftate of extenfion, while the poft CH is compreffed by them. Towards the walls on each fide, as between B and F, and between F and L, they are braces, and are compreffed. The ends of the pofts were generally ornamented with knots of flowers, emboffed globes, and the like, and the whole texture of the trufs was exhibited and dreffed out.

This conftruction admits of employing very fhort timbers; and this very circumftance gives greater ftrength to the trufs, becaufe the angle which the brace or tie makes with the rafter is more open. We may alfo perceive that all thruft may be taken off the walls. If the pieces AF, BF, LF, be removed, all the remaining diagonal pieces act as ties, and the pieces directed to the centre act as ftruts; and it may alfo be obferved, that the principle will apply equally to a ftraight or flat roof or to a floor. A floor fuch as *a b c*, having the join in two pieces *a b*, *b c*, with a ftrut *b d*, and two ties, will require a much greater weight to break it than if it had a continued joift *a c* of the fame fcantling. And, laftly, a piece of timber acting as a tie is much ftronger than the fame piece acting as a ftrut: for in the latter fituation it is expofed to bending, and when bent it is much lefs able to withftand a very great ftrain. It muft be acknowledged, however, that this advantage is balanced by the great inferiority of the joints in point of ftrength. The joint of a tie depends wholly on the pins; for this reafon ties are never ufed in heavy works without ftrapping the joints with iron. In the roofs we are now defcribing, the diagonal pieces of the middle part only act purely as ties, while thofe towards the fides act as ftruts or braces. Indeed they are feldom of fo very fimple conftruction as we have defcribed, and are more generally conftructed like the fketch in fig. 2. having two fets of rafters AB, *a b*, and the angles are filled up with thin planks, which give great ftiffnefs and ftrength. They have alfo a double fet of purlins, which connect the different truffes. The roof being thus divided into fquares, other purlins run between the middle points E of the rafters. The rafter is fupported at E by a check put between it and the under rafter. The middle point of each fquare of the roof is fupported and ftiffened by four braces, one of which fprings from *e*, and its oppofite from the fimilar part of the adjoining trufs. The other two braces fpring from the middle points of the lower purlins, which go horizontally from *a* and *b* to the next trufs, and are fupported by planks in the fame manner as the rafters. By this contrivance the whole becomes very ftiff and ftrong.

Much of what has been faid on this fubject may be applied to the conftruction of wooden bridges and the centres for turning the arches of ftone-bridges.

ROOFING, the materials of which the roof of a houfe is compofed. See the foregoing article.

ROOK, in ornithology. See CORVUS. Rooks are very deftructive of corn, efpecially of wheat. They fearch out the lands where it is fown, and watching them more carefully than the owners, they perceive when the feed firft begins to fhoot up its blade; this is the time of their feeding on it. They will not be at the pains of fearching for it at random in the fown land, for that is more trouble than fo fmall a grain will requite them for; but as foon as thefe blades appear, they are by them directed, without lofs of time or pains, to the places where the grains lie; and in three or fours days time they will root up fuch vaft quantities, that a good crop is often thus deftroyed in embryo. After a few days the wheat continuing to grow, its blades appear green above ground; and then the time of danger from thefe birds is over; for then the feeds are fo far robbed of their mealy matter, that they are of no value to that bird, and it will no longer give itfelf the trouble to deftroy them.

Wheat that is fown fo early as to fhoot up its green blades before the harveft is all carried in, is in no danger from thefe birds; becaufe while it is in a ftate worth their fearching for, the fcattered corn in the harveft fields is eafier come at, and they feed wholly on this, neglecting the fown grain. But as this cannot always be done, the farmers, to drive away thefe ravenous and mifchievous birds, dig holes in the ground and ftick up the feathers of rooks in them, and hang up dead rooks on fticks in feveral parts of the fields: but all this is of very little ufe; for the living rooks will tear up the ground about the feathers, and under the dead ones, to fteal the feeds. A much better way than either is to tear feveral rooks to pieces, and to fcatter the pieces over the fields; but this lafts but a little while, for the kites and other birds of prey foon carry off the pieces and feed upon them. A gun is a good remedy while the perfon who has it is prefent; but as foon as he is gone, they will return with redoubled vigour to the field and tear up every thing before them.

The beft remedy the farmer has is to watch well the time of the corn's being in the condition in which they feed upon it; and as this lafts only a few days, he fhould keep a boy in conftant pay to watch the field from day-break till the dufk of the evening.

Every time they fettle upon the ground to fly over it, the boy is to holloa, and throw up a dead rook into the air: this will always make them rife; and by degrees they will be fo tired of this conftant difturbance, that they will feek out other places of preying, and will leave the ground even before the corn's being unfit for them. The reafon of their rifing at the toffing up of their dead fellow creature is, that they are a bird extremely apprehenfive of danger, and they are always alarmed when one of their comrades rifes. They take this for the rifing of an outbird, and all fly off at the fignal.

ROOKE (Sir GEORGE), a gallant naval commander, born of an ancient and honourable family in Kent, in 1650. His merit raifed him by regular fteps to be vice-admiral of the blue: in which ftation he ferved in the battle of La Hogue, on the 22d of May 1692; when it was owing to his vigorous behaviour,

that the laſt ſtroke was given on that important day, which threw the French entirely into confuſion. But the next day he obtained ſtill more glory; for he had orders to go into La Hogue, and burn the enemy's ſhips as they lay there. There were 13 large men of war, which had crowded as far up as poſſible; and the tranſports, tenders, and ammunition ſhips, were diſpoſed in ſuch a manner that it was thought impoſſible to burn them. Beſides, the French camp was in ſight, with all the French and Iriſh troops that were to have been employed in the invaſion of England; and ſeveral batteries were raiſed on the coaſt, well provided with heavy artillery. The vice-admiral made the neceſſary preparations for obeying his orders, but found it impoſſible to carry in the ſhips of his ſquadron: he therefore ordered his light frigates to ply in cloſe to the ſhore; and having manned out all his boats, went himſelf to give directions for the attack, burnt that very night ſix three-deck ſhips, and the next day ſix more, from 76 to 60 guns; together with moſt of the tranſports and ammunition veſſels; and this under the fire of all the batteries juſt mentioned, and in ſight of all the French and Iriſh troops: yet this bold action coſt the lives of no more than ten men. The vice-admiral's behaviour on this occaſion appeared ſo great to king William, that having no opportunity at that time of promoting him, he ſettled a penſion of 1000l. per annum on him for life; and afterwards going to Portſmouth to view the fleet, went on board Mr. Rooke's ſhip, dined with him, and then conferred on him the honour of knighthood, he having a little before made him vice-admiral of the red.

In conſequence of other ſervices he was in 1694 raiſed to the rank of admiral of the blue: towards the cloſe of the next year he was admiral of the white; and was alſo appointed admiral and commander in chief in the Mediterranean.

During king William's reign, ſir George was twice elected member for Portſmouth; and upon the acceſſion of queen Anne in 1702, he was conſtituted vice admiral and lieutenant of the admiralty of England, as alſo lieutenant of the fleets and ſeas of this kingdom. Upon the declaration of war againſt France, he was ordered to command a fleet ſent againſt Cadiz, the duke of Ormond having the command of the land forces. On his paſſage home, receiving an account that the galleons, under the eſcort of a ſtrong French ſquadron, were got into the harbour of Vigo, he reſolved to attack them; and on the 11th of October came before the harbour of Rondondello, where the French commander had neglected nothing neceſſary for putting the place into the beſt poſture of defence. But notwithſtanding this, a detachment of 15 Engliſh and 10 Dutch men of war, of the line of battle, with all the fire ſhips, were ordered in; the frigates and bomb veſſels followed; the great ſhips moved after them, and the army landed near Rondondello. The whole ſervice was performed under ſir George's directions, with admirable conduct and bravery; for, in ſhort, all the ſhips were deſtroyed or taken, prodigious damage done to the enemy, and vaſt wealth acquired by the allies. For this action ſir George received the thanks of the houſe of Commons, a day of thankſgiving was appointed both by the queen and the States General, and ſir George was promoted to a ſeat in the privy council; yet, notwithſtanding this, the houſe of Lords reſolved to inquire into his conduct at Cadiz. But he ſo fully juſtified himſelf that a vote was paſſed, approving his behaviour.

In the ſpring of the year 1704, ſir George commanded the ſhips of war which convoyed King Cha. III. of Spain to Liſbon. In July, he attacked Gibraltar; when, by the bravery of the Engliſh ſeamen, the place was taken on the 24th, though the town was extremely ſtrong, well furniſhed with ammunition, and had 100 guns mounted, all facing the ſea and the narrow paſſes to the land: an action which was conceived and executed in leſs than a week; though it has ſince endured ſieges of many months continuance, and more than once baffled the united forces of France and Spain. This brave officer being at laſt obliged, by the prevalence of party ſpirit, to quit the ſervice of his country, retired to his ſeat in Kent; where he ſpent the remainder of his days as a private gentleman.

He was thrice married; and by his ſecond lady, Mrs. Luttrell, left one ſon. He died January 24, 1708-9, in his 58th year, and was buried in Canterbury cathedral, where a monument is erected to his memory. In his private life he was a good huſband and a kind maſter, lived hoſpitably towards his neighbours, and left behind him a moderate fortune; ſo moderate, that when he came to make his will, it ſurpriſed thoſe who were preſent; but ſir George aſſigned the reaſon in a few words—"I do not leave much (ſaid he), but I leave what was honeſtly gotten; it never coſt a ſailor a tear, or the nation a farthing."

ROOM, a chamber, parlour, or other apartment in a houſe. See Architecture and Ventilation.

ROOT, among botaniſts, denotes that part of a plant which imbibes the nutritious juices of the earth, and tranſmits them to the other parts. See Plant and Radix.

Colours extracted from Roots. See Colour-*Making*.

Root, in algebra and arithmetic, denotes any number which, multiplied by itſelf once or oftener, produces any other number, and is called the *ſquare*, *cube*, *biquadrate*, &c. *root*, according to number of multiplication. Thus, 2 is the ſquare-root of 4; the cube-root of 8; the biquadrate-root of 16, &c.

ROPE, is a word too familiar to need a definition; and we need ſay no more than that it is only applied to a conſiderable collection of twiſted fibres. Smaller bands are called lines, ſtrings, cords; and it is not applied with great propriety even to thoſe, unleſs they are compoſed of ſmaller things of the ſame kind twiſted together. Two hay-bands twiſted together would be called a *rope*. All the different kinds of this manufacture, from a fiſhing-line or whip-cord to the cable of a firſt rate ſhip of war, go by the general name of Cordage.

Ropes are made of every ſubſtance that is ſufficiently fibrous, flexible, and tenacious, but chiefly of the barks of plants. The Chineſe and other orientals even make them of the ligneous parts of ſeveral plants, ſuch as certain bamboos and reeds, the ſtems of the aloes, the fibrous covering of the cocoa nut, the filaments of the cotton pod, and the leaves of ſome graſſes, ſuch as the ſparte (*Lygeum*, Linn.) The aloe (*Agave*, Linn.) and the ſparte exceed all others in ſtrength. But the barks of plants are the moſt productive of fibrous matter fit for this manufacture. Thoſe of the Linden tree (*Tilia*), of the willow, the bramble, the nettle, are frequently uſed: but hemp and flax are of all others the beſt; and of theſe the hemp is preferred, and employed in all cordage exceeding the ſize of a line, and even in many of this denomination.

Hemp is very various in its uſeful qualities. Theſe are great ſtrength, and the length and fineneſs of the fibre. Being a plant of very greedy growth, it ſucks up much of the unaltered juices of the ſoil, and therefore differs greatly according to its ſoil, climate, and culture. The beſt in Europe comes to us through Riga, to which port it is brought from very diſtant places ſouthward. It is known by the name of *Riga rein* (that is, clean) hemp. Its fibre is not the longeſt (at leaſt in the dreſſed ſtate in which we get it) of all others, but it is the fineſt, moſt flexible, and ſtrongeſt. The next to this is ſuppoſed to be the Peterſburgh braak hemp. Other hemps are eſteemed nearly in the following order:—Riga outſhot, Peterſburgh outſhot, hemp from Koningſbergh, Archangel, Sweden, Memel. *Chucking* is a name given to a hemp that comes from various places, long in the fibre, but coarſe and harſh, and its ſtrength is inferior to hemps which one would think weaker. Its texture is ſuch, that it does not admit ſplitting with the hatchel ſo as to be more completely dreſſed. It is therefore kept in its coarſe form, and uſed for inferior cordage. It is however a good and ſtrong hemp,

but will not make fine work. There are doubtless many good hemps in the southern parts of Europe, but little of them is brought to our market. Codilla, half clean, &c. are portions of the above-mentioned hemps, separated by the dressing, and may be considered as broken fibres of those hemps.

Only the first qualities are manufactured for the rigging of the royal navy and for the ships of the East India company.

ROPE-MAKING is an art of very great importance: and there are few that better deserve the attention of the intelligent observer. Hardly any art can be carried on without the assistance of the rope-maker. Cordage makes the very sinews and muscles of a ship; and every improvement which can be made in its preparation, either in respect to strength or pliableness, must be of immense service to the mariner, and to the commerce and the defence of nations.

We shall give a very short account of the manufacture, which will not indeed fully instruct the artificers, but will give such a view of the process as shall enable the reader to judge, from principle, of the propriety of the different parts of the manipulation, and perceive its defects, and the means of removing them.

The aim of the rope-maker is to unite the strength of a great number of fibres. This would be done in the completest manner by laying the fibres parallel to each other, and fastening the bundle at the two ends: but this would be of very limited use, because the fibres are short, not exceeding three feet and a half at an average. They must therefore be entangled together, in such a manner that the strength of a fibre shall not be able to draw it out from among the rest of the bundle. This is done by twisting or twining them together, which causes them mutually to compress each other. When the fibres are so disposed in a long skain, that their ends succeed each other along its length, without many of them meeting in one place, and this skain is twisted round and round, we may cause them to compress each other to any degree we please, and the friction on a fibre which we attempt to pull out may be more than its cohesion can overcome. It will therefore break. Consequently if we pull at this twisted skain, we shall not separate it by drawing one parcel out from among the rest, but the whole fibres will break; and if the distribution of the fibres has been very equable, the skain will be nearly of the same strength in every part. If there is any part where many ends of fibres meet, the skain will break in that part.

We know very well that we can twist a skain of fibres so very hard, that it will break with any attempt to twist it harder. In this state all the fibres are already strained to the utmost of their strength. Such a skain of fibres can have no strength. It cannot carry a weight, because each fibre is already strained in the same manner as if loaded with as much weight as it is able to bear. What we have said of this extreme case is true in a certain extent of every degree of twist that we give the fibres. Whatever force is actually exerted by a twisted fibre, in order that it may sufficiently compress the rest to hinder them from being drawn out, must be considered as a weight hanging on that fibre, and must be deduced from its absolute strength of cohesion, before we can estimate the strength of the skain. The strength of the skain is the remainder of the absolute strength of the fibres, after we have deduced the force employed in twisting them together.

From this observation may be deduced a fundamental principle in rope-making, that all twisting, beyond what is necessary for preventing the fibres from being drawn out without breaking, diminishes the strength of the cordage, and should be avoided when in our power. It is of importance to keep this in mind.

It is necessary then to twist the fibres of hemp together, in order to make a rope; but we should make a very bad rope if we contented ourselves with twisting together a bunch of hemp sufficiently large to withstand the strains to which the rope is to be exposed. As soon as we let it go out of our hands, it would untwist itself, and be again a loose bundle of hemp; for the fibres are strained, and they are in a considerable degree elastic; they contract again, and thus untwist the rope or skain. It is necessary to contrive the twist in such a manner, that the tendency to untwist in one part may act against the same tendency in another and balance it. The process, therefore, of rope-making is more complicated.

The first part of this process is SPINNING of ROPE-YARNS. This is done in various ways, and with different machinery, according to the nature of the intended cordage. We shall confine our description to the manufacture of the larger kinds, such as are used for the standing and running rigging of ships.

An alley or walk is inclosed for the purpose, about 200 fathoms long, and of a breadth suited to the extent of the manufacture. It is sometimes covered above. At the upper end of this ROPE-WALK is set up the spinning-wheel, of a form resembling that in pl. 2 fig. 1. The band of this wheel goes over several rollers called WHIRLS, turning on pivots in brass holes. The pivots at one end come through the frame, and terminate in little hooks. The wheel being turned by a winch, gives motion in one direction to all those whirls. The spinner has a bundle of dressed hemp round his waist, with the two ends meeting before him. The hemp is laid in this bundle in the same way that women spread the flax on the distaff. There is great variety in this; but the general aim is to lay the fibres in such a manner, that as long as the bundle lasts there may be an equal number of the ends at the extremity, and that a fibre may never offer itself double or in a bight. The spinner draws out a proper number of fibres, twists them with his fingers, and having got a sufficient length detached, he fixes it to the hook of a whirl. The wheel is now turned and the skain is twisted, becoming what is called a ROPE-YARN, and the spinner walks backwards DOWN the rope-walk. The part already twisted draws along with it more fibres out of the bundle. The spinner aids this with his fingers, supplying hemp in due proportion as he walks away from the wheel, and taking care that the fibres come in equally from both sides of his bundle, and that they enter always with their ends, and not by the middle, which would double them. He should also endeavour to enter every fibre at the heart of the yarn. This will cause all the fibres to mix equally in making it up, and will make the work smooth, because one end of each fibre is by this means buried among the rest, and the other end only lies outward; and this, in passing through the grasp of the spinner, who presses it tight with his thumb and palm, is also made to lie smooth. The greatest fault that can be committed in spinning is to allow a small thread to be twisted off from one side of the hemp, and then to cover this with hemp supplied from the other side: for it is evident that the fibres of the central thread make very long spirals, and the skin of fibres which covers them must be much more oblique. This covering has but little connection with what is below it, and will easily be detached. But even while it remains, the yarn cannot be strong; for on pulling it, the middle part, which lies the straightest, must bear all the strain, while the outer fibres that are lying obliquely, are only drawn a little more parallel to the axis. This defect will always happen if the hemp be supplied in a considerable body to a yarn that is then spinning small. Into whatever part of the yarn it is made to enter, it becomes a sort of loosely connected wrapper. Such a yarn, when untwisted a little, will have the appearance of fig. 2. while a good yarn looks like fig. 3. A good spinner therefore endeavours always to supply the hemp in the form of a thin flat skain with his left hand, while his right is employed in grasping firmly the yarn that is twining off, and in holding it tight from the whirl, that it may not run into loops or KINKS

It is evident, that both the arrangement of the fibres and the degree of twiſting depend on the ſkill and dexterity of the ſpinner, and that he muſt be inſtructed, not by a book, but by a maſter. The degree of twiſt depends on the rate of the wheel's motion, combined with the retrograde walk of the ſpinner.

We may ſuppoſe him arrived at the *lower* end of the walk, or as far as is neceſſary for the intended length of his yarn. He calls out, and another ſpinner immediately detaches the yarn from the hook of the whirl, gives it to another, who carries it aſide to the reel, and this ſecond ſpinner attaches his own hemp to the whirl hook. In the mean time, the firſt ſpinner keeps faſt hold of the end of his yarn; for the hemp, being dry, is very elaſtic, and if he were to let it go out of his hand it would inſtantly untwiſt, and become little better than looſe hemp, He waits, therefore, till he ſees the reeler begin to turn the reel, and he goes ſlowly up the walk, keeping the yarn of an equal tightneſs all the way, till he arrives at the wheel, where he waits with his yarn in hand till another ſpinner has finiſhed his yarn. The firſt ſpinner takes it off the whirl hook, joins it to his own, that it may follow it on the reel, and begins a new yarn.

Rope-yarns, for the greateſt part of the large rigging, are from a quarter of an inch to ſomewhat more than a third of an inch in circumference, or of ſuch a ſize that 160 fathoms weigh from $3\frac{1}{2}$ to 4 pounds when white. The different ſizes of yarns are named from the number of them contained in a ſtrand of a rope of three inches in circumference. Few are ſo coarſe that 16 will make a ſtrand of Britiſh cordage; 18 is not unfrequent for cable yarns, or yarns ſpun from harſh and coarſe hemp; 25 is, we believe, the fineſt ſize which is worked up for the rigging of a ſhip. Much finer are indeed ſpun for ſounding lines, fiſhing lines, and many other marine uſes, and for the other demands of ſociety. Ten good ſpinners will work up above 600 weight of hemp in a day; but this depends on the weather. In very dry weather the hemp is very elaſtic, and requires great attention to make ſmooth work. In the warmer climates the ſpinner is permitted to moiſten the rag with which he graſps the yarn in his right hand for each yarn. No work can be done in an open ſpinning walk in rainy weather, becauſe the yarns would not take on the tar, if immediately tarred, and would rot if kept on the reel for a long time.

The ſecond part of the proceſs is the converſion of the yarns into what may with propriety be called a rope, cord, or line. That we may have a clear conception of the principle which regulates this part of the proceſs, we ſhall begin with the ſimpleſt poſſible caſe, the union of two yarns into one line. This is not a very uſual fabric for rigging, but we ſelect it for its ſimplicity.

When hemp has been ſplit into very fine fibres by the hatchel, it becomes exceedingly ſoft and pliant, and after it has lain for ſome time in the form of fine yarn it may be unreeled and thrown looſe, without loſing much of its twiſt. Two ſuch yarns may be put on the whirl of a ſpinning wheel, and thrown, like flaxen yarn, ſo as to make ſewing thread. It is in this way, indeed, that the ſailmaker's ſewing thread is manufactured; and when it has been kept on the reel, or on balls or bobbins, for ſome time, it retains its twiſt as well as its uſes require. But this is by no means the caſe with yarns ſpun for great cordage. The hemp is ſo elaſtic, the number of fibres twiſted together is ſo great, and the diameter of the yarn (which is a ſort of lever on which the elaſticity of the fibre exerts itſelf) is ſo conſiderable, that no keeping will make the fibres retain this conſtrained poſition. The end of a rope-yarn being thrown looſe, it will immediately untwiſt, and this with conſiderable force and ſpeed. It would, therefore, be a fruitleſs attempt to twiſt two ſuch yarns together; yet the ingenuity of man has contrived to make uſe of this very tendency to untwiſt not only to counteract itſelf, but even to produce another and a permanent twiſt, which requires force to undo it, and which will recover itſelf when this force is removed. Every perſon muſt recollect that, when he has twiſted a packthread very hard with his fingers between his two hands, if he ſlackens the thread by bringing his hands nearer together, the packthread will immediately curl up, running into loops or kinks, and will even twiſt itſelf into a neat and firm cord. Familiar as this fact is, it would puzzle any perſon not accuſtomed to theſe ſubjects to explain it with diſtinctneſs. We ſhall conſider it with ſome care, not as a piece of mechanical curioſity, but as a fundamental principle in this manufacture, which will give us clear inſtructions to direct us in the moſt delicate part of the whole proceſs. And we beg the attention of the artiſts themſelves to a thing which they ſeem to have overlooked

Let $m\,d$, $n\,d$ (fig. 4.) be two yarns fixed to one point d, and let both of them be twiſted, each round its own axis, in the direction $a\,b\,c$, which will cauſe the fibres to lie in a ſcrew form, as repreſented in the figure. If the end d of the yarn $m\,d$ were at liberty to turn round the point d, it would turn accordingly, as often as the end m is turned round, and the yarn would acquire no twiſt; but being attached to ſome ſolid body it cannot turn without turning this body. It has, however, this tendency, and the body muſt be forcibly prevented from turning. If it be held faſt for a time, and then let go, it will be turned round, and it will not ſtop till it has turned as often as the end m has been twiſted, and now all the twiſt will be undone. Thus it is the tendency of the yarn $m\,d$ to untwiſt at the end d (becauſe it is kept faſt at m), which produces this motion of the body attached to it at d. What we have ſaid of the yarn $m\,d$ is equally true of the yarn $n\,d$. Both tend to turn, and will turn, the body attached at d round the common axis, in the ſame direction in which they are twiſted. Let fig. 5. be ſuppoſed a croſs ſection of the two yarns touching each other at d, and there glued to a board. The fibres of each pull obliquely, that is, they both pull away from the board, and pull laterally. The direction of this lateral pull of the fibres in the circumference of each yarn is repreſented by the little darts drawn round the circumferences. Theſe actions directly oppoſe and balance each other at d; but in the ſemicircles $o\,c\,t$, $t\,f\,o$, they evidently conſpire to turn the board round in the ſame direction. The ſame may be ſaid of the outer halves of any circles deſcribed within theſe. In the inner halves of theſe inner circles the actions of ſome fibres oppoſe each other; but in every circle there are many more conſpiring actions than oppoſing ones, and the conſpiring actions exert themſelves by longer levers, ſo that their joint momentum greatly exceeds that of the oppoſing forces. It may be demonſtrated, that if all the fibres exert equal forces, the force which tends to turn the board round the common axis is $\frac{2}{3}$ of the force employed to twiſt both the yarns.

Suppoſe then that the ſolid body to which the yarns are attached is at liberty to turn round the common axis; it cannot do this without carrying the yarns round with it They muſt, therefore, turn round each other, and thus compoſe a rope or cord $k\,l$, having its component yarns (now called *ſtrands*) lying in a direction oppoſite to that of the fibres in each ſtrand. The rope will take this twiſt, while each of the ſtrands is really untwiſting, and the motion will not ſtop till all is again in equilibrio. If the yarns had no diameter and no rigidity, their elaſtic contraction would not be balanced till the cord had made half the number of turns which had been given to that part of the yarn which is thus doubled up. But, as the yarns have a ſenſible diameter, the ſame ultimate contraction of the fibres will be expended by the twiſting of the cord in fewer turns, even if the yarns had no rigidity. The turns neceſſary for this purpoſe will be ſo much fewer, in proportion to the twiſt of the yarns, as the fibres of the yarn lie more obliquely, that is, as the yarns are

more twiſted. But further, this contractile force has to overcome the rigidity or ſtiffneſs of the yarns. This requires force merely to *bend* it into the ſcrew form; and therefore, when all is again at reſt, the fibres are in a ſtate of ſtrain, and the rope is not ſo much cloſed by doubling as it would have been had the yarns been ſofter. If any thing can be done to it in this ſtate which will ſoften the yarns, it will twiſt itſelf more up. It has therefore a *tendency* to twiſt more up; and if this be aided by an external force which will bend the ſtrands, this will happen. Beating it with a ſoft mallet will have this effect; or, if it be forcibly twiſted till the fibres are allowed to contract as much as they would have done had the yarn been perfectly ſoft, the cord will keep this twiſt without any effort; and this muſt be conſidered as its moſt perfect ſtate, in relation to the degree of twiſt originally given to the yarns. It will have no tendency to run into kinks, which is both troubleſome and dangerous, and the fibres will not be exerting any uſeleſs effort.

To attain this ſtate ſhould therefore be the aim of every part of this ſecond proceſs; and this principle ſhould be kept in view through the whole of it.

The component parts of a rope are called ſtrands, as has been already obſerved; and the operation of uniting them with a permanent twiſt is called *laying* or *cloſing*, the latter term being chiefly appropriated to cables and other very large cordage.

Lines and cordage leſs than $1\frac{1}{2}$ inches circumference are laid at the ſpinning wheel. The workman faſtens the ends of each of two or three yarns to ſeparate whirl hooks. The remote ends are united in a knot. This is put on one of the hooks of a ſwivel called the *loper*, repreſented in fig. 6. and care is taken that the yarns are of equal lengths and twiſt. A piece of ſoft cord is put on the other hook of the loper; and, being put over a pulley ſeveral feet from the ground, a weight is hung on it, which ſtretches the yarn. When the workman ſees that they are equally ſtretched, he orders the wheel to be turned in the ſame direction as when twining the yarns. This would twine them harder; but the ſwivel of the loper gives way to the ſtrain, and the yarns immediately twiſt around each other, and form a line or cord. In doing this the yarns loſe their twiſt. This is reſtored by the wheel. But this ſimple operation would make a very bad line, which would be ſlack, and would not hold its twiſt; for, by the turning of the loper, the ſtrands twiſt immediately together, to a great diſtance from the loper. By this turning of the loper the yarns are untwiſted. The wheel reſtores their twiſt only to that part of the yarns that remains ſeparate from the others, but cannot do it in that part where they are already twined round each other, becauſe their mutual preſſure prevents the twiſt from advancing. It is, therefore, neceſſary to retard this tendency to twine, by keeping the yarns apart. This is done by a little tool called the top, repreſented in fig. 7.

It is a truncated cone, having three or more notches along its ſides, and a handle called the ſtaff. This is put between the ſtrands, the ſmall end next the loper, and it is preſſed gently into the angle formed by the yarns which lie in the notches. The wheel being now turned, the yarns are more twiſted, or *hardened up*, and their preſſure on the top gives it a ſtrong tendency to come out of the angle, and alſo to turn round. The workman does not allow this till he thinks the yarns ſufficiently hardened. Then he yields to the preſſure, and the top comes away from the ſwivel, which immediately turns round, and the line begins to lay. Gradually yielding to this preſſure, the workman ſlowly comes up towards the wheel, and the laying goes on, till the top is at laſt cloſe to the wheel, and the work is done. In the mean time, the yarns are ſhortened, both by the twining of each and the laying of the cord. The weight, therefore, gradually riſes. The uſe of this weight is evidently to oblige the yarn to take a proper degree of twiſt, and not run into kinks.

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A cord or line made in this way has always ſome tendency to twiſt a little more. However little friction there may be in the loper, there is ſome, ſo that the turns which the cord has made in the laying are not enough to balance completely the elaſticity of the yarns; and the weight being appended cauſes the ſtrands to be more nearly in the direction of the axis, in the ſame manner as it would ſtretch and untwiſt a little any rope to which it is hung. On the whole, however, the twiſt of a laid line is permanent, and not like that upon thread doubled or thrown in a mill, which remains only in conſequence of the great ſoftneſs and flexibility of the yarn.

The proceſs for laying or cloſing large cordage is conſiderably different from this. The ſtrands of which the rope is compoſed conſiſt of many yarns, and require a conſiderable degree of hardening. This cannot be done by a whirl driven by a wheel-band; it requires the power of a crank turned by the hand. The ſtrands, when properly hardened, become very ſtiff, and when bent round the top are not able to tranſmit force enough for laying the heavy and unpliant rope which forms beyond it. The elaſtic twiſt of the hardened ſtrands muſt, therefore, be aſſiſted by an external force. All this requires a different machinery and a different proceſs.

At the upper end of the walk is fixed up the *tackle-board*, fig. 8. This conſiſts of a ſtrong oaken plank called a *breaſt-board*, having three or more holes in it, ſuch as A, B, C, fitted with braſs or iron plates. Into theſe are put iron cranks, called heavers, which have hooks, or forelocks, and keys, on the ends of their ſpindles. They are placed at ſuch a diſtance from each other, that the workmen do not interfere with each other while turning them round. This breaſt-board is fixed to the top of ſtrong poſts well ſecured by ſtruts or braces facing the lower end of the walk. At the lower end is another breaſt-board fixed to the upright poſts of a ſledge, which may be loaded with ſtones or other weights. Similar cranks are placed in the holes of this breaſt-board. The whole goes by the name of the *ſledge*; (ſee fig. 9.) The top neceſſary for cloſing large cordage is too heavy to be held in the hand. It therefore has a long ſtaff, which has a truck on the end. This reſts on the ground; but even this is not enough in laying great cables. The top muſt be ſupported on a carriage, as ſhown in fig. 10. where it muſt lie very ſteady, and need attendance, becauſe the maſter workman has ſufficient employment in attending to the manner in which the ſtrands cloſe behind the top, and in helping them by various methods. The top is, therefore, fixed to the carriage by laſhing its ſtaff to the two upright poſts. A piece of ſoft rope, or ſtrap, is attached to the handle of the top by the middle, and its two ends are brought back and wrapped ſeveral times tight round the rope, in the direction of its twiſt, and bound down. This is ſhown at W, and it greatly aſſiſts the laying of the rope by its friction. This both keeps the top from flying too far from the point of union of the ſtrands, and brings the ſtrands more regularly into their places.

The firſt operation is *warping* the yarns. At each end of the walk are frames called warping frames, which carry a great number of reels or winches filled with rope-yarn. The foreman of the walk takes off a yarn end from each, till he has made up the number neceſſary for his rope or ſtrand, and bringing the ends together, he paſſes the whole through an iron ring fixed to the top of a ſtake driven into the ground, and draws them through: then a knot is tied on the end of the bundle, and a workman pulls it through this ring till the intended length is drawn off the reels. The end is made faſt at the bottom of the walk, or at the ſledge, and the foreman comes back along the ſkain of yarns, to ſee that none are hanging ſlacker than the reſt. He takes up in his hand ſuch as are ſlack, and draws them tight, keeping them ſo till he reaches the upper end, where he cuts the yarns to a length, again adjuſts their tightneſs, and joins them all together in a knot, to which he fixes the hook of a tackle, the other block

of which is fixed to a firm post, called the *warping-post*. The skain is well stretched by this tackle, and then separated into its different strands. Each of these is knotted apart at both ends. The knots at their upper ends are made fast to the hooks of the cranks in the tackle-board, and those at their lower ends are fastened to the cranks in the sledge. The sledge itself is kept in its place by a tackle, by which the strands are again stretched in their places, and every thing adjusted, so that the sledge stands square on the walk, and then a proper weight is laid on it. The tackle is now cast off, and the cranks are turned at both ends, in the contrary direction to the twist of the yarns. (In some kinds of cordage the cranks are turned the same way with the spinning twist). By this the strands are twisted and hardened up; and as they contract by this operation, the sledge is dragged up the walk. When the foreman thinks the strands sufficiently hardened, which he estimates by the motion of the sledge, he orders the heavers at the cranks to stop. The middle strand at the sledge is taken off from the crank. This crank is taken out, and a stronger one put in its place at D, fig. 9. The other strands are taken off from their cranks, and all are joined on the hook which is now in the middle hole. The top is then placed between the strands, and, being pressed home to the point of their union, the carriage is placed under it, and it is firmly fixed down. Some weight is taken off the sledge. The heavers now begin to turn at both ends. Those at the tackle-board continue to turn as they did before; but the heavers at the sledge turn in the opposite direction to their former motion, so that the cranks at both ends are now turning one way. By the motion of the sledge-crank the top is forced away from the knot, and the rope begins to close. The heaving at the upper end restores to the strand the twist which they are constantly losing by the laying of the rope. The workmen judge of this by making a chalk mark on intermediate points of the strands, where they lie on the stakes which are set up along the walk for their support. If the twist of the strands is diminished by the motion of closing, they will lengthen, and the chalk mark will move away from the tackle-board: but if the twist increases by turning the cranks at the tackle-board, the strands will shorten, and the mark will come nearer to it.

As the closing of the rope advances, the whole shortens, and the sledge is dragged up the walk. The top moves faster, and at last reaches the upper end of the walk, the rope being now laid. In the mean time, the sledge has moved several fathoms from the place where it was when the laying began.

These motions of the sledge and top must be exactly adjusted to each other. The rope must be of a certain length. Therefore the sledge must stop at a certain place. At that moment the rope should be laid; that is, the top should be at the tackle-board. In this consists the address of the foreman. He has his attention directed both ways. He looks at the strands, and when he sees any of them hanging slacker between the stakes than the others, he calls to the heavers at the tackle-board to heave more upon that strand. He finds it more difficult to regulate the motion of the top. It requires a considerable force to keep it in the angle of the strands, and it is always disposed to start forward. To prevent or check this, some straps of soft rope are brought round the staff of the top, and then wrapped several times round the rope behind the top, and kept firmly down by a lanyard or bandage, as is shown in the figure. This both holds back the top and greatly assists the laying of the rope, causing the strands to fall into their places, and keep close to each other. This is sometimes very difficult, especially in ropes composed of more than three strands. It will greatly improve the laying the rope, if the top have a sharp, smooth, tapering pin of hard wood, pointed at the end, projecting so far from the middle of its smaller end, that it gets in between the strands which are closing. This supports them, and makes their closing more gradual and regular. The top, its notches, the pin, and the warp or strap, which is lapped round the rope, are all smeared with grease or soap to assist the closing. The foreman judges of the progress of closing chiefly by his acquaintance with the walk, knowing that when the sledge is abreast of a certain stake the top should be abreast of a certain other stake. When he finds the top too far down the walk, he slackens the motion at the tackle-board, and makes the men turn briskly at the sledge. By this the top is forced up the walk, and the laying of the rope accelerates, while the sledge remains in the same place, because the strands are loosing their twist, and are lengthening, while the closed rope is shortening. When, on the other hand, he thinks the top too far advanced, and fears that it will be at the head of the walk before the sledge has got to its proper place, he makes the men heave briskly on the strands, and the heavers at the sledge-crank work softly.—This quickens the motion of the sledge by shortening the strands; and by thus compensating what has been overdone, the sledge and top come to their places at once, and the work appears to answer the intention.

But this is a bad manner of proceeding. It is evident, that if the strands be kept to one degree of hardness throughout, and the heaving at the sledge be uniformly continued, the rope will be uniform. It may be a little longer or shorter than was intended, and the laying may be too hard in proportion to the twist of the strands, in which case it will not keep it; or it may be too slack, and the rope will tend to twist more. Either of these faults are discoverable by slackening the rope before it comes off the hooks, and it may then be corrected. But if the error in one place be compensated by that in another, this will not be easily seen before taking off the hooks; and if it be a large and stiff rope, it will hardly ever come to an equable state in its different parts, but will be apt to run into loops during service.

It is, therefore, of importance to preserve the uniformity throughout the whole. Mr. Du Hamel, in his great work on rope-making, proposes a method which is very exact, but requires an apparatus which is cumbersome, and which would be much in the way of the workmen. We think that the following method would be extremely easy, embarrass no one, and is perfectly exact. Having determined the proportion between the velocity of the top and sledge, let the diameter of the truck of the top carriage be to that of another truck fixed to the sledge, in the proportion of the velocity of the top to that of the sledge. Let a mark be made on the rim of each; let the man at the sledge make a signal every time that the mark on the sledge-truck is uppermost. The mark on the carriage-truck should be uppermost at the same instant; and in this way the foreman knows the state of the rope at all times without quitting his station. Thus, in making a cable of 120 fathoms, it is usual to warp the yarns 180 fathoms, and to harden them up to 140 before closing. Therefore, in the closing, the top must move 140 fathoms, and the sledge only 20. The diameter of the carriage-truck should therefore be seven times the diameter of the sledge truck.

We have hitherto proceeded on the supposition, that the twist produced by the cranks is propagated freely along the strands and along the closing rope. But this is not the case. It is almost unavoidable that the twist is greater in the neighbourhood of the crank which produces it. The strands are frequently of very considerable weight, and lie heavy on the stakes. Force is therefore necessary to overcome their friction, and it is only the overplus that is propagated beyond the stake. It is proper to lift them up from time to time, and let them fall down again, as the sawer does with his marking line. This helps the twist to run along the strand. But this is not enough for the closed rope, which is of much greater weight, and much stiffer.

When the top approaches the tackle-board, the heaving at the sledge could not cause the strands immediately behind the top to close well, without having previously produced an extravagant degree of twist in the intermediate rope. The effort of the crank

muſt therefore be aſſiſted by men ſtationed along the rope, each furniſhed with a tool called a *woolder*. This is a ſtout oak ſtick about three feet long, having a ſtrap of ſoft rope-yarn or cordage faſtened on its middle or end. The ſtrap is wrapped round the laid rope, and the workman works with the ſtick as a lever, twiſting the rope round in the direction of the crank's motion. The woolders ſhould keep their eye on the men at the crank, and make their motion correſpond with his. Thus they ſend forward the twiſt produced by the crank, without either increaſing or diminiſhing it, in that part of the rope which lies between them and the ſledge.

It is uſual before taking the rope from the hooks to heave a while at the ſledge end, in order to harden the rope a little. They do this ſo as to take it up about $\frac{1}{70}$. The propriety or impropriety of this practice depends entirely on the proportion which has been previouſly obſerved between the hardening of the ſtrands and the twiſting of the cloſing rope. It is, in all caſes, better to adjuſt theſe preciſely, and then nothing remains to be done when the top has arrived at the upper end of the walk. The making of two-ſtrand and three-ſtrand line pointed out the principle which ſhould be attended to in this caſe; namely, that the twiſt given to the rope in laying ſhould be preciſely what a perfectly ſoft rope would give to itſelf. We do not ſee any reaſon for thinking that the proportion between the number of turns given to the ſtrands and the number of turns given to the laid line by its own elaſticity, will vary by any difference of diameter. We would therefore recommend to the artiſts to ſettle this proportion by experiment. The line ſhould be made of the fineſt, ſmalleſt, and ſofteſt threads or yarn. Theſe ſhould be made into ſtrands, and the ſtrands ſhould be hardened up in the direction contrary to the ſpinning twiſt. The rope ſhould then be laid, hanging perpendicularly, with a ſmall weight on the top to keep it down, and a very ſmall weight at the end of the rope. The number of turns given to the ſtrands ſhould be carefully noticed, and the number of turns which the rope takes of itſelf in cloſing. The weight ſhould then be taken off, and the rope will make a few turns more. This whole number will never exceed what is neceſſary for the equilibrium; and we imagine it will not fall much ſhort of it. We are clearly of opinion an exact adjuſtment of this particular will tend greatly to improve the art of rope-making, and that experiments on good principles for aſcertaining this proportion would be highly valuable, becauſe there is no point about which the artiſts themſelves differ more in their opinions and practice.

The cordage, of which we have been deſcribing the manufacture, is ſaid to be HAWSER-LAID. It is not uncommon to make ropes of four ſtrands. Theſe are uſed for ſhrouds, and this cordage is therefore called SHROUD LAID cordage. A rope of the ſame ſize and weight muſt be ſmoother when it has four ſtrands, becauſe the ſtrands are ſmaller: but it is more difficult to lay cloſe. When three cylindrical ſtrands are ſimply laid together, they leave a vacuity at the axis amounting to $\frac{1}{28}$ of the ſection of a ſtrand. This is to be filled up by compreſſing the ſtrands by twiſting them. Each muſt fill up $\frac{1}{3}$ of it by changing its ſhape; and $\frac{1}{2}$ of this change is made on each ſide of the ſtrand. The greateſt change of ſhape therefore made on any one part of a ſtrand amounts only to $\frac{1}{168}$ of the ſection of the ſtrand. The vacuity between four cylinders is $\frac{3}{11}$ of one of them. This being divided into eight parts, is $\frac{1}{29}$ of a ſtrand, and is the greateſt compreſſion which any part of it has to undergo. This is nearly five times greater than the former, and muſt be more difficult to produce. Indeed it may be ſeen by looking at the figures 11. and 12. that it will be eaſier to compreſs a ſtrand into the obtuſe angle of 120 degrees than into the right angle of 90; and without reaſoning more about the matter, it appears that the difficulty will increaſe with the number of ſtrands. Six ſtrands muſt touch each other, and form an arch leaving a hollow in the middle, into which one of the ſtrands will ſlip, and then the reſt will not completely ſurround it. Such a rope would be uneven on the ſurface. It would be weak; becauſe the central ſtrand would be ſlack in compariſon of the reſt, and would not be exerting its whole force when they are juſt ready to break. We ſee then that a four-ſtrand rope muſt be more difficult to lay well than a hawſer-laid rope. With care, however, they may be laid well and cloſe, and are much uſed in the royal navy.

Ropes are made of four ſtrands, with a heart or ſtrand in the middle. This gives no additional ſtrength, for the reaſon juſt now given. Its only uſe is to make the work better and more eaſy, and to ſupport all the ſtrands at the ſame diſtance from the axis of the rope. This is of great conſequence; becauſe when they are at unequal diſtances from the axis, ſome muſt be more ſloping than others, and they will not reſiſt alike. This heart is made of inferior ſtuff, ſlack laid, and of a ſize juſt equal to the ſpace it is to fill. When a rope of this fabric has been long uſed and become unſerviceable, and is opened out, the heart is always found cut and chaffed to pieces, like very ſhort oakum. This happens as follows: When the rope is violently ſtrained, it ſtretches greatly: becauſe the ſtrands ſurround the axis obliquely, and the ſtrain draws them into a poſition more parallel to the axis. But the heart has not the obliquity of parts, and cannot ſtretch ſo much; at the ſame time, its yarns are firmly graſped by the hard ſtrands which ſurround them; they muſt therefore be torn into ſhort pieces.

The proceſs for laying a rope with a heart is not very different from that already deſcribed. The top has a hole pierced through it, in the direction of the axis. The ſkain or ſtrand intended for the heart paſſes through this hole, and is ſtretched along the walk. A boy attends it, holding it tight as it is taken into the cloſing rope. But a little attention to what has been ſaid will ſhow this method to be defective. The wick will have no more turns than the laid rope; and as it lies in the very axis, its yarns will be much ſtraighter than the ſtrands. Therefore when the rope is ſtrained and ſtretched, the wick cannot ſtretch as much as the laid ſtrands; and being firmly graſped by them it muſt break into ſhort pieces, and the ſtrands, having loſt their ſupport in thoſe places, will ſink in, and the cordage grow looſe. We ſhould endeavour to enable all to ſtretch alike. The wick therefore ſhould be twiſted in the ſame manner as the ſtrands, perhaps even a little more. It will thus communicate part of its ſtrength to the rope. Indeed it will not be ſo uniformly ſolid, and may chance to have three ſpiral vacuities. But that this does no harm, is quite evident from the ſuperior ſtrength of cable laid cordage, to be deſcribed preſently, which has the ſame vacuities. In this way are the main and fore ſtays made for ſhips of the line. They are thought ſtronger than hawſer-laid ropes, but unfit for running rigging; becauſe their ſtrands are apt to get out of their places when the rope is drawn into loops. It is alſo thought that the heart retains water, rots, and communicates its putrefaction to the ſurrounding ſtrands.

Such is the general and eſſential proceſs of rope-making. The fibres of hemp are twiſted into yarns, that they may make a line of any length, and ſtick among each other with a force equal to their own coheſion. The yarns are made into cords of permanent twiſt by laying them; and, that we may have a rope of any degree of ſtrength, many yarns are united in one ſtrand, for the ſame reaſon that many fibres were united in one yarn; and in the courſe of this proceſs it is in our power to give the rope a ſolidity and hardneſs which makes it leſs penetrable by water, which would rot it in a ſhort while. Some of theſe purpoſes are inconſiſtent with others: and the ſkill of a rope-maker lies in making the beſt compenſation; ſo that the rope may on the whole be the beſt in point of ſtrength, pliancy, and duration, that the quantity of hemp in it can produce.

There is another ſpecies of cordage in very general uſe. A

rope of two or more ſtrands may be uſed as a ſtrand, in order to compoſe a ſtill larger rope; and in this manner are cables and other ground-tackle commonly made; for this reaſon ſuch cordage is called CABLE-LAID cordage.

The proceſs of cable-laying hardly differs from that of hawſer-laying. Three ropes, in their ſtate of permanent twiſt, may be twiſted together; but they will not hold it, like fine thread, becauſe they are ſtiff and elaſtic. They muſt therefore be treated like ſtrands for a hawſer. We muſt give them an *additional* twiſt, which will diſpoſe them to lay or cloſe themſelves; and this diſpoſition muſt be aided by the workmen at the ſledge. We ſay the twiſt ſhould be an addition to their twiſt as a rope. A twiſt in the oppoſite direction will indeed give them a diſpoſition to cloſe behind the top; but this will be very ſmall, and the ropes (now ſtrands) will be exceedingly open, and will become more open in laying. The twiſt is therefore given in the direction of their twiſt as a rope, or oppoſite to that of the primary ſtrands, of which the ropes are compoſed. Theſe primary ſtrands are therefore partly untwiſted in cable-laying a rope, in the ſame manner as the yarns are untwiſted in the uſual proceſs of rope-making.

We need not inſiſt further on this part of the manufacture. The reader muſt be ſenſible that the hawſers intended for ſtrands of a cable muſt not be ſo much twiſted as thoſe intended to remain hawſers; for the twiſt given to a finiſhed hawſer is preſumed to be that which renders it moſt perfect, and it muſt be injured by any addition. The preciſe proportion, and the diſtribution of the working up between the hardening of the ſtrands and cloſing the cable, is a ſubject about which the artiſts are no better agreed than in the caſe of hawſer-laid cordage. We did not enter on this ſubject while deſcribing the proceſs, becauſe the introduction of reaſonings and principles would have hurt the ſimplicity of the deſcription. The reader being now acquainted with the different parts of the manipulation, and knowing what can be done on any occaſion, will now be able to judge of the propriety of the whole, when he learns the principle on which the ſtrength of a rope depends.

We have already ſaid that a rope yarn ſhould be twiſted till a fibre will break rather than be pulled out from among the reſt, and that all twiſting beyond this is injurious to the ſtrength of the yarn: And we advanced this maxim upon this plain conſideration, that it is needleſs to bind them cloſer together, for they will already break rather than come out; and becauſe this cloſer binding is produced only by forcible wrapping the outer fibres round the inner, and drawing the outer ones tight. Thus theſe fibres are on the ſtretch, and are ſtrained as if a weight were hung on each of them. The proceſs of laying lines, of a permanent twiſt, ſhows that we muſt do a little more. We muſt give the yarn a degree of elaſtic contractility, which will make it lay itſelf and form a line or cord which will retain its twiſt. This muſt leave the fibres of the yarns in a ſtate of greater compreſſion than is neceſſary for juſt keeping them together. But more than this ſeems to be needleſs and hurtful. The ſame maxim muſt direct us in forming a rope conſiſting of ſtrands, containing more than one yarn. A needleſs exceſs of twiſt leaves them ſtrained, and leſs able to perform their office in the rope.

It not unfrequently happens, that the workman, in order to make his ropes ſolid and firm, hardens up the ſtrands till they really break: and we believe that, in the general practice of making large hawſers, many of the outer yarns in the ſtrands, eſpecially thoſe which chance to be outermoſt in the laid rope, and are therefore moſt ſtrained, are broken during the operation.

But there is another conſideration which ſhould alſo make us give no greater twiſt in any part of the operation than is abſolutely neceſſary for the firm coheſion of the parts, and this independent of the ſtrain to which the fibres or yarns are ſubjected. Twiſting cauſes all the fibres to lie obliquely with reſpect to the axis or general direction of the rope. It may juſt happen that one fibre or one yarn ſhall keep in the axis, and remain ſtraight; all the reſt muſt be oblique, and the more oblique as they are further from the axis, and as they are more twiſted. Now it is to be demonſtrated, that when any ſtrain is given to the rope in the direction of its length, a ſtrain greater than this is actually excited on the oblique fibres, and ſo much the greater as they are more oblique; and thus the fibres which are already the weakeſt are expoſed to the greateſt ſtrains.

Let CF (fig. 13.) repreſent a fibre hanging from a hook, and loaded with a weight F, which it is juſt able to bear, but not more. This weight may repreſent the abſolute force of the fibre. Let ſuch another fibre be laid over the two pulleys A, B (fig. 14.), which are in a horizontal line AB, and let weights F and f, equal to the former, be hung on the ends of this fibre, while another weight R, leſs than the ſum of F and f, is hung on the middle point C by a hook or thread. This weight will draw down the fibre into ſuch a poſition ACB, that the three weights F, R, and f, are in equilibrio by the intervention of the fibre. We affirm that this weight R is the meaſure of the relative ſtrength of the fibre in relation to the form ACB; for the fibre is equally ſtretched in all its parts, and therefore in every part it is ſtrained by the force F. If therefore the weights F and f are held faſt, and any addition is made to the weight R, the fibre muſt break, being already ſtrained to its full ſtrength; therefore R meaſures its ſtrength in relation to its ſituation. Complete the parallelogram ACBD, and draw the diagonal CD; becauſe AB is horizontal, and AC = BC, DC is vertical, and coincides with the direction CR, by which the weight R acts. The point C is drawn by three forces, which are in equilibrio. They are therefore proportional to the ſides of a triangle, which have the ſame directions; or, the force acting in the direction CA is to that acting in the direction CR as CA to CD. The point R is ſupported by the two forces CA, CB, which are equivalent to CD; and therefore the weight F is to the weight R as CA is to CD. Therefore the abſolute ſtrengths of the two fibres AC, BC, taken ſeparately, are greater than their united ſtrengths in relation to their poſition with reſpect to CR: and ſince this proportion remains the ſame, whatever equal weights are hung on at F and f, it follows, that when any ſtrain DC is made to act on this fibre in the direction DC, it excites a greater ſtrain on the fibre, becauſe CA and CB taken together are greater than CD. Each fibre ſuſtains a ſtrain greater than the half of CD.

Now let the weight R be turned round the axis CR. This will cauſe the two parts of the fibre ACB to lap round each other, and compoſe a twiſted line or cord CR, as in fig. 15. and the parallelogram ACBD, will remain of the ſame form, by the yielding of the weights F and f, as is evident from the equilibrium of forces. The fibre will always aſſume that form which makes the ſides and diagonal in the proportion of the weights. While the fibres lap round each other, they are ſtrained to the ſame degree, that is, to the full extent of their ſtrength, and they remain in this degree of ſtrain in every part of the line or cord CR. If therefore each of the fibres has the ſtrength AB, the cord has the ſtrength DC; and if F and f be held faſt, the ſmalleſt addition to R will break the cord. The ſum of the abſolute ſtrength of the two fibres of which this thread is compoſed is to the ſum of their relative ſtrengths, or to the ſtrength of the thread, as AC + CB is to CD, or as AC is to EC.

If the weights F and f are not held faſt, but allowed to yield, a heavier weight r may be hung on at C without breaking the fibre; for it will draw it into another poſition A c B, ſuch that r ſhall be in equilibrio with F and f. Since F and f remain the ſame, the fibre is as much ſtrained as before. Therefore make $c\,a$, $c\,b$ equal to CA and CB, and complete the parallelogram $a\,c\,b\,d$. $c\,d$ will now be the meaſure of the weight r, becauſe it is the equivalent of $c\,a$ and $c\,b$. It is evident that $c\,d$ is greater

than CD, and therefore the thread formed by the lapping of the fibre in the position $a\,c\,b$ is stronger than the former, in the proportion of $a\,d$ to CD, or $c\,e$ to CE. The cord is therefore so much stronger as the fibres are more parallel to the axis, and it must be strongest of all when they are quite parallel. Bring the pulleys A, B close to each other. It is plain that if we hang on a weight R less than the sum of F and f, it cannot take down the bight of the fibre; but if equal to them, although it cannot pull it down, it will keep it down. In this case, when the fibres are parallel to each other, the strength of the cord (improperly so called) is equal to the united absolute strengths of the fibres.

It is easy to see that the length of each of the fibres which compose any part CR of this cord is to the length of the part of the cord as AC to EC; and this is the case even although they should lap round a cylinder of any diameter. This will appear very clearly to any person who considers the thing with attention. Let $a\,c$ (fig. 16.) be an indefinitely small portion of the fibre which is lapped obliquely round the cylinder, and let HKG be a section perpendicular to the axis. Draw $a\,e$ parallel to the axis, and draw $c\,e$ to the centre of the circle HKG, and $a\,\acute{c}$ parallel to $e\,c$. It is plain that $\acute{e}\,c$ is the length of the axis corresponding to the small portion $a\,c$, and that $\acute{e}\,c$ is equal to $a\,e$.

Hence we derive another manner of expressing the ratio of the absolute and relative strength; and we may say that the absolute strength of a fibre, which has the same obliquity throughout, is to its relative strength as the length of the fibre to the length of the cord of which it makes a part. And we may say that the strength of a rope is to the united absolute strength of its yarns as the length of the cord to the length of the yarns; for although the yarns are in various states of obliquity, they contribute to the strength of the cord in as much as they contribute immediately to the strength of the strands. The strength of the yarns is to that of the strands as the length of the yarns to that of the strands, and the strength of the strands is to that of the rope as the length of the first to that of the last.

And thus we see that twisting the fibres diminishes the strength of the assemblage: because their obliquity, which is its necessary consequence, enables any external force to excite a greater strain on the fibres than it could have excited had they remained parallel; and since a greater degree of twisting necessarily produces a greater obliquity of the fibres, it must more remarkably diminish the strength of the cord. Moreover, since the greater obliquity cannot be produced without a greater strain in the operation of twisting, it follows, that immoderate twisting is doubly prejudicial to the strength of cordage.

These theoretical deductions are abundantly confirmed by experiment; and as many persons give their assent more readily to a general proposition when presented as an induction from unexceptionable particulars, than when offered as the consequence of uncontroverted principles, we shall mention some of the experiments which have been made on this subject. Mr. Reaumur, one of the most zealous, and at the same time judicious, observers of nature, made the following experiments. (*Mem. Acad. Paris*, 1711.)

1. A thread, consisting of 832 fibres of silk, each of which carried at a medium 1 dram and 18 grains, would hardly support $5\frac{1}{4}$ pounds, and sometimes broke with 5 pounds. The sum of the absolute strengths of the fibres is 1040 drams, or upwards of 8 pounds 2 ounces.

2. A skain of white thread was examined in many places. Every part of it bore $9\frac{1}{2}$ pounds, but none of it would bear 10. When twisted slack into a cord of two yarns it broke with 16 pounds.

3. Three threads were twisted together. Their mean strength was very nearly 8 pounds. It broke with $17\frac{1}{2}$, whereas it should have carried 24.

4. Four threads were twisted. Their mean strength was $7\frac{1}{2}$. It broke with $21\frac{1}{2}$ instead of 30. Four threads, whose strength was nearly 9 pounds, broke with 22 instead of 36.

5. A small and very well made hempen cord broke in different places with 58, 63, 67, 72 pounds. Another part of it was untwisted into its three strands. One of them bore $29\frac{1}{2}$, another $33\frac{1}{2}$, and the third 35; therefore the sum of their absolute strengths was 98. In another part which broke with 72, the strands which had already born this strain were separated. They bore 26, 28, and 30; the sum of which is 84.

The late admiral Sir Charles Knowles made many experiments on cordage of size. A piece of rope $3\frac{1}{2}$ inches in circumference was cut in many portions. Each of these had a fathom cut off, and it was carefully opened out. It was white, or untarred, and contained 72 yarns. They were each tried separately, and their mean strength was 90 pounds. Each corresponding piece of rope was tried apart, and the mean strength of the nine pieces was 4552 pounds. But 90 times 72 is 6480.

Nothing is more familiarly known to a seaman than the superior strength of rope-yarns made up into a skain without twisting. They call such a piece of rope a SALVAGE. It is used on board the king's ships for rolling tackles, slinging the great guns, butt-slings, nippers for holding the viol on the cable, and in every service where the utmost strength and great pliancy are wanted.

It is therefore sufficiently established, both by theory and observation, that the twisting of cordage diminishes its strength. Experiments cannot be made with sufficient precision for determining whether this diminution is in the very proportion, relative to the obliquity of the fibres, which theory points out. In a hawser the yarns lie in a great variety of angles with the axis. The very outermost yarn of a strand is not much inclined to the axis of the rope: for the inclination of this yarn to the axis of its own strand nearly compensates for the inclination of the strand. But then the opposite yarn of the same strand, the yarn that is next the axis of the rope lies with an obliquity, which is the sum of the obliquities of the strand and of the yarn. So that all the yarns which are really in the axis of the rope are exceedingly oblique, and, in general, the inside of the rope has its yarns more oblique than the outside. But in a laid rope we should not consider the strength as made up of the strengths of the yarns; it is made up of the strengths of the strands: For when the rope is violently stretched, it untwists as a rope, and the strands are a little more twisted; so that they are resisting as strands, and not as yarns. Indeed, when we consider the process of laying the rope, we see that it must be so. We know, from what has been already said, that the three strands would carry more when parallel than when twisted into a rope, although the yarns would then be much more oblique to the axis. The chief attention therefore should be turned to the making the most perfect strands.

We are fully authorised to say that the twist given to cordage should be as moderate as possible. We are certain it diminishes the strength, and that the appearance of strength which its superior smoothness and hardness gives is fallacious. But a certain degree of this is necessary for its duration. If the rope is laid too slack, its parts are apt to open when it happens to be catched in short loops at its going into a pulley, &c. in which case some of the strands or yarns are apt to kink and break. It also becomes too pervious to water, which soak and rots it. To prevent these and other such inconveniences, a considerable degree of firmness or hardness is necessary; and in order to give the cordage this appearance of superior strength, the manufacturer is disposed to exceed.

Mr. Du Hamel made many experiments in the royal dock-yards in France, with a view to aſcertain what is the beſt degree of twiſt. It is uſual to work up the yarns to $\frac{2}{3}$ of their length. Mr. Du Hamel thought this too much, and procured ſome to be worked up only to $\frac{3}{4}$ of the length of the yarns. The ſtrength of the firſt, by a mean of three experiments, was 4321, and that of the laſt was 5187.

He cauſed three ropes to be made from the ſame hemp, ſpun with all poſſible equability, and in ſuch proportion of yarn that a fathom of each was of the ſame weight. The rope which was worked up to $\frac{2}{3}$ bore 4098 pounds; that which was worked up to $\frac{3}{4}$ bore 4850; and the one worked up to $\frac{4}{5}$ bore 6205. In another trial the ſtrengths were 4250, 6753, and 7397. Theſe ropes were of different ſizes.

He had influence enough, in conſequence of theſe experiments, to get a conſiderable quantity of rigging made of yarns worked up only to $\frac{3}{4}$ of their length, and had them uſed during a whole campaign. The officers of the ſhips reported that this cordage was about $\frac{1}{4}$ lighter than the ordinary kind; nearly $\frac{1}{8}$ ſlenderer, ſo as to give leſs hold to the wind, was therefore more ſupple and pliant, and ran eaſier through the blocks, and did not run into kinks; that it required fewer hands to work it, in the proportion of two to three; and that it was at leaſt $\frac{1}{4}$ ſtronger. And they ſaid that it did not appear to have ſuffered more by uſing than the ordinary cordage, and was fit for another campaign.

Mr. Du Hamel alſo made experiments on other fabrics of cordage, which made all twiſting unneceſſary, ſuch as ſimply laying the yarn in ſkains, and then covering it with a worming of ſmall line. This he found greatly ſuperior in ſtrength, but it had no duration, becauſe the covering opened in every ſhort bending, and was ſoon fretted off. He alſo covered them with a woven coat in the manner practiſed for houſe furniture. But this could not be put on with ſufficient tightneſs, without an enormous expenſe, after the manner of a horſe-whip. Small ropes were woven ſolid, and were prodigiouſly ſtrong. But all theſe fabrics were found too ſoft and pervious to water, and were ſoon rendered unſerviceable. The ordinary proceſs of rope-making therefore muſt be adhered to; and we muſt endeavour to improve it by diminiſhing the twiſt as far as is compatible with the neceſſary ſolidity.

In purſuance of this principle, it is ſurely adviſeable to lay ſlack all ſuch cordage as is uſed for ſtanding rigging, and is never expoſed to ſhort bendings. Shrouds, ſtays, backſtays, pendants, are in this ſituation, and can eaſily be defended from the water, by tarring, ſerving, &c.

The ſame principle alſo directs us to make ſuch cordage of four ſtrands. When the ſtrands are equally hardened, and when the degree of twiſt given in the laying is preciſely that which is correſpondent to the twiſt of the ſtrands, it is demonſtrable that the ſtrands are lying leſs obliquely to the axis in the four-ſtrand cordage, and ſhould therefore exert greater force. And experience fully confirms this. Mr. Du Hamel cauſed two very ſmall hawſers to be made, in which the ſtrands were equally hardened. One of them had three ſtrands, and the other ſix with a heart. They were worked up to the ſame degree. The firſt broke with 865 pounds, and the other with 1325. Several compariſons were made, with the ſame precautions, between cordage of three and of four ſtrands, and in them all the four-ſtrand cordage was found greatly ſuperior; and it appeared that a heart judiciouſly put in not only made the work eaſier and moſt perfect to the eye, but alſo increaſed the ſtrength of the cordage.

It is ſurely unreaſonable to refuſe credit to ſuch an uniform courſe of experiment, in which there is no motive for impoſition, and which is agreeable to every clear notion that we can form on this complicated ſubject; and it argues a conſiderable preſumption in the profeſſional artiſts to oppoſe the vague notions which they have of the matter, to the calm reflections and minute examination of every particular by a man of good underſtanding, who had no intereſt in miſleading them.

The ſame principles will explain the ſuperiority of cable-laid cordage. The general aim in rope-making is to make every yarn bear an equal ſhare of the general ſtrain, and to put every yarn in a condition to bear it. But if this cannot be done, the next thing aimed at is, to put the yarns in ſuch ſituations that the ſtrains to which they are expoſed in the uſe of the rope may be proportioned to their ability to bear it. Even this point cannot be attained, and we muſt content ourſelves with an approach towards it.

The greateſt difficulty is to place the yarns of a large ſtrand agreeably to thoſe maxims. Suppoſing them placed with perfect regularity round the yarn which is in the middle, they will lie in the circumferences of concentric circles. When this whole maſs is turned equally round this yarn as an axis, it is plain that they will all keep their places, and that the middle yarn is ſimply twiſted round its axis, while thoſe of the ſurrounding circles are lapped round it in ſpirals, and that theſe ſpirals are ſo much more oblique as the yarns are further from the axis. Suppoſe the ſledge kept faſt, ſo that the ſtrand is not allowed to ſhorten. The yarns muſt all be ſtretched, and therefore ſtrained; and thoſe muſt be the moſt extended which are the furtheſt from the middle yarn. Now allow the ſledge to approach. The ſtrand contracts in its general length, and thoſe yarns contract moſt which were moſt extended. The remaining extenſion is therefore diminiſhed in all; but ſtill thoſe which are moſt remote from the middle are moſt extended, and therefore moſt ſtrained, and have the ſmalleſt remainder of their abſolute force. Unfortunately they are put into the moſt unfavourable ſituations, and thoſe which are already moſt ſtrained are left the moſt oblique, and have the greateſt ſtrain laid on them by any external force. But this is unavoidable: their greateſt hurt is the ſtrains they ſuſtain in the manufacture. When the ſtrand is very large, as in a nine-inch hawſer, it is almoſt impoſſible to bring the whole to a proper firmneſs for laying without ſtraining the outer yarns to the utmoſt, and many of them are broken in the operation.

The reader will remember that a two-ſtrand line was laid or cloſed merely by allowing it to twiſt itſelf up at the ſwivel of the loper; and that it was the elaſticity ariſing from the twiſt of the yarn which produced this effect: and he would probably be ſurpriſed when we ſaid, that, in laying a larger rope, the ſtrands are twiſted in a direction oppoſite to that of the ſpinning. Since the tendency to cloſe into a rope is nothing but the tendency of the ſtrands to untwiſt, it would ſeem natural to twiſt the ſtrands as the yarns were twiſted before. This would be true, if the elaſticity of the fibres in a yarn produced the ſame tendency to untwiſt in the ſtrand that it does in the yarn. But this is not the caſe. The contraction of one of the outer yarns of a ſtrand tends to pull the ſtrand backward round the axis of the ſtrand: but the contraction of a fibre of this yarn tends to turn the yarn round its own axis, and not round the axis of the ſtrand. It tends to untwiſt the yarn, but not to untwiſt the ſtrand. It tends to untwiſt the ſtrand only ſo far as it tends to contract the yarn. Let us ſuppoſe the yarn to be ſpun up to one-half the length of the fibres. The contracting power of this yarn will be only one-half of the force exerted by the fibres: therefore, whatever is the force neceſſary for cloſing the rope properly, the fibres of the yarns muſt be exerting twice this force. Now let the ſame yarn, ſpun up to one-half, be made up in a ſtrand, and let the ſtrand be twiſted in the oppoſite direction to the ſpinning, till it has acquired the ſame elaſticity fit for laying. The yarns are untwiſted—ſuppoſe to three-fourths of the length of the fibres. They are now exerting only four-thirds of the force neceſſary for laying, that is, two-

thirds of what they were obliged to exert in the other caſe; and thus we have ſtronger yarns when the ſtrands are equally ſtrained. But they require to be more ſtrained than the other; which, being made of more twiſted yarn, ſoon acquire the elaſticity fit for laying. But ſince the elaſticity which fits the ſtrand for laying does not increaſe ſo faſt as the ſtrain on the fibres of the yarn which produces it, it is plain, that when each has acquired that elaſticity which is proper for laying, the ſtrands made of the ſlack-twiſted yarn are the ſtrongeſt; and the yarns are alſo the ſtrongeſt; and being ſofter, the rope will cloſe better.

Experience confirms all this; and cordage, whoſe ſtrands are twiſted in the oppoſite direction to the twiſt of ſpinning, are found to be ſtronger than the others in a proportion not leſs than that of 7 to 6.

Such being the difficulty of making a large ſtrand, and its defects when made, we have fallen on a method of making great cordage by laying it twice. A hawſer-laid rope, ſlack ſpun, little hardened in the ſtrands, and ſlack laid, is made a ſtrand of a large rope called a *cable* or *cablet*. The advantages of this fabric are evident. The ſtrands are reduced to one-third or one-fourth of the diameter which they would have in a hawſer of the ſame ſize. Such ſtrands cannot have their yarns lying very obliquely, and the outer yarns cannot be much more ſtrained than the inner ones. There muſt therefore be a much greater equality in the whole ſubſtance of cable-laid cordage, and from this we ſhould expect ſuperior ſtrength.

Accordingly, their ſuperiority is great, not leſs than in the proportion of 13 to 9, which is not far from the proportion of 4 to 3. A cable is more than a fourth part, but is not a third part, ſtronger than a hawſer of the ſame ſize or weight.

They are ſeldom made of more than three hawſers of three ſtrands each, though they are ſometimes made of three four-ſtranded hawſers, or of four three-ſtranded. The firſt of theſe two is preferred, becauſe four ſmall ſtrands can be laid very cloſe; whereas it is difficult to lay well four hawſers, already become very hard.

The ſuperiority of a cable-laid cordage being attributed entirely to the greater perfection of the ſtrands, and this ſeeming to ariſe entirely from their ſmallneſs, it was natural to expect ſtill better cordage by laying cables as the ſtrands of ſtill larger pieces. It has been tried, and with every requiſite attention. But although they have always equalled, they have not decidedly excelled, common cables of the ſame weight; and they require a great deal more work. We ſhall not therefore enter upon the manipulations of this fabric.

There is only one point of the mechanical proceſs of rope-making which we have not conſidered minutely; and it is an important one, viz. the diſtribution of the total ſhortening of the yarns between the hardening of the ſtrands and the laying the rope. This is a point about which the artiſts are by no means agreed. There is certainly a poſition of the ſtrands of a laid rope which puts every part in equilibrio; and this is what an elaſtic but perfectly ſoft rope (were ſuch a thing poſſible) would aſſume. But this cannot be diſcovered by any experiments made on large or even on firm cordage; and it may not be thought ſufficiently clear, that the proportion which would be diſcovered by the careful fabrication of a very ſmall and ſoft line is the ſame that will ſuit a cordage of any diameter. We muſt proceed much on conjecture; and we cannot ſay that the arguments uſed by the partiſans of different proportions are very convincing.

The general practice, we believe, is to divide the whole of the intended ſhortening of the yarns, or the working up, into three parts, and to employ two of theſe in hardening the ſtrands, and the remaining third in cloſing the hawſer.

Mr. Du Hamel thinks, that this repartition is injudicious, and that the yarns are too much ſtrained, and the ſtrands rendered weak. He recommends to invert this proportion, and to ſhorten one-third in the hardening of the ſtrands, and two-thirds in laying the hawſer. But if the ſtrain of the yarns only is conſidered, one ſhould think that the outſide yarn of a ſtrand will be more ſtrained in laying, in proportion to the yarn of the ſame ſtrand, that is, in the very axis of the rope. We can only ſay, that if a very ſoft line is formed in this way, it will not keep its twiſt. This ſhows that the turns in laying were more than what the elaſticity or hardening of the ſtrands required. The experiments made on ſoft lines always ſhowed a tendency to take a greater twiſt when the lines were made in the firſt manner, and a tendency to loſe their twiſt when made in Mr. Du Hamel's manner. We imagine that the true proportion is between theſe two extremes, and that we ſhall not err greatly if we halve the total ſhortening between the two parts of the proceſs. If working up to two-thirds be inſiſted upon, and if it be really too much, Mr. Du Hamel's repartition may be better, becauſe part of this working will quickly go off when the cordage is uſed. But it is ſurely better to be right in the main point, the total working up, and then to adjuſt the diſtribution of it ſo that the finiſhed cordage ſhall preciſely keep the form we have given to it.

There muſt be the ſame uncertainty in the quadruple diſtribution of the working up a cable. When a cable has its yarns ſhortened to two-thirds, we believe the ordinary practice has been, 1ſt, To warp 180 fathoms; 2d, To harden up the ſtrands 30 fathoms; 3d, To lay or cloſe up thirteen fathoms; 4th, To work up the hawſers nine fathoms; 5th, To cloſe up eight fathoms. This leaves a cable of 120. Since Mr. Du Hamel's experiments have had an influence at Rochefort, the practice has been to warp 190, to harden up 38, to lay up 12, to work up the hawſers 10, and then to cloſe up ſix; and when the cable is finiſhed, to ſhorten it two fathoms more, which our workmen call *throwing the turn well up*. This leaves a cable of 122 fathoms.

As there ſeems little doubt of the ſuperiority of cordage ſhortened one-fourth over cordage ſhortened one-third, the following diſtribution may be adopted: Warp 190 fathoms, harden up 12, lay up 11, work up the hawſers 12, and cloſe up 12 more, which will leave a cable of 143.

There is another queſtion about which the artiſts are divided in their opinions, viz. the ſtrains made uſe of during the operation. This is produced by the weight laid on the ſledge. If this be too ſmall, the ſtrands will not be ſufficiently tightened, and will run into kinks. The ſledge will come up by ſtarts; and a ſmall inequality of twiſt in the ſtrands will throw it aſkew. The top will not run well without a conſiderable preſſure to throw it from the cloſing point, and therefore the cordage will neither cloſe fairly nor firmly; on the other hand, it is evident, that the ſtrain on the ſtrands is a complete expenditure of ſo much of their force, and it may be ſo great as to break them. Theſe are the extreme poſitions. And we think that it may be fairly deduced from our principles, that as great a ſtrain ſhould be laid on the ſtrands as will make good work, that is, as will enable the rope to cloſe nearly and completely, but no more. But can any general rule be given for this purpoſe?

The practice at Rochefort was to load the ſledge till its weight and load were double the weight of the yarns when warped 180 fathoms. A ſix-inch hawſer will require about a ton. If we ſuppoſe the friction one-third of the weight; the ſtrain on each ſtrand will be about two hundred and a quarter weight. Mr. Du Hamel thinks this too great a load, and propoſes to put only five-fourths or three-ſeconds of the weight of the cordage; and ſtill leſs if a ſhorter piece be warped, becauſe it does not require ſo much force to throw the twiſt from the two cranks to the middle of the ſtrand. We ſhall only ſay, that ſtronger

ropes are made by heavy loading the carriage, and working up moderately, than by greater ſhortening, and a lighter load: but all this is very vague.

The reader will naturally aſk, after this account of the manufacture, what is the general rule for computing the ſtrength of cordage? It cannot be expected to be very preciſe. But if ropes are made in a manner perfectly ſimilar, we ſhould expect the ſtrength to be in proportion to the area of their ſection; that is, to the ſquare of their diameters or circumferences, or to the number of equal threads contained in them.

Nor does it deviate far from this rule; yet Mr. Du Hamel ſhows, from a range of experiments made on all cordage of $3\frac{1}{2}$ inch circumference and under, that the ſtrength increaſes a little faſter than the number of equal threads. Thus he found that ropes of

9 threads	bore 1014 pounds, inſtead of	946
12	1564	1262
18	2148	1893

We cannot pretend to account for this. We muſt alſo obſerve, that the ſtrength of cordage is greatly improved by making them of yarn ſpun fine. This requires finely dreſſed hemp; and being more ſupple, the fibres lie cloſe, and do not form ſuch oblique ſpirals. But all hemp will not ſpin equally fine. Every ſtalk ſeems to conſiſt of a certain number of principal fibres, which ſplit more eaſily into a ſecond ſet, and theſe more difficultly into a third ſet, and ſo on. The ultimate fineneſs, therefore, which a reaſonable degree of dreſſing can give to hemp, bears ſome proportion, not indeed very preciſe, to the ſize of the ſtalk. The Britiſh and Dutch uſe the beſt hemp, ſpin their yarn the fineſt, and their cordage is conſiderably ſtronger than the French, much of which is made of their own hemp, and others of a coarſe and harſh quality.

The following rule for judging of the weight which a rope will bear is not far from the truth. It ſuppoſes them rather too ſtrong; but it is ſo eaſily remembered that it may be of uſe.

Multiply the circumference in inches by itſelf, and take the fifth part of the product, it will expreſs the tons which the rope will carry. Thus, if the rope have 6 inches circumference, 6 times 6 is 36, the fifth of which is $7\frac{1}{5}$ tons; apply this to the rope of $3\frac{1}{5}$, on which Sir Charles Knowles made the experiments formerly mentioned, $3\frac{1}{5} \times 3\frac{1}{5} = 10{,}25$, $\frac{1}{5}$ of which is 2,05 tons, or 4592 pounds. It broke with 4550.

This may ſuffice for an account of the mechanical part of the manufacture. But we have taken no notice of the operation of tarring; and our reaſon was, that the methods practiſed in different rope-works are ſo exceedingly different, that we could hardly enumerate them, or even give a general account of them. It is evidently proper to tar in the ſtate of twine or yarn, this being the only way that the hemp could be uniformly penetrated. The yarn is made to wind off one reel, and having paſſed through a veſſel containing hot tar, it is wound up on another reel; and the ſuperfluous tar is taken off by paſſing through a hole ſurrounded with ſpongy oakum: or it is tarred in ſkains or hauls, which are drawn by a capſtern through the tar-kettle, and through a hole formed of two plates of metal, held together by a lever loaded with a weight.

It is eſtabliſhed beyond a doubt, that tarred cordage when new is weaker than white, and that the difference increaſes by keeping. The following experiments were made by Mr. Du Hamel at Rochefort on cordage of three inches (French) in circumference, made of the beſt Riga hemp.

	White.	*Tarred.*
	August 8, 1741.	
Broke with	4500 pounds.	3400 pounds.
	4900	3300
	4800	3250
	April 25, 1743.	
	4600	3500
	5000	3400
	5000	3400
	Sept. 3, 1746.	
	3800	3000
	4000	2700
	4200	2800

A parcel of white and tarred cordage was taken out of a quantity which had been made February 12, 1746. It was laid up in the magazines, and compariſons were made from time to time as as follows:

	White bore.	*Tarred bore.*	*Differ.*
1746 April 14,	2645 pounds.	2312 pounds.	333
1747 May 18,	2762	2155	607
1747 Oct. 21,	2710	2050	660
1748 June 19,	2575	1752	823
1748 Oct. 2,	2425	1837	588
1749 Sep. 25,	2917	1865	1052

Mr. Du Hamel ſays, that it is decided by experience, 1. That white cordage in continual ſervice is one-third more durable than tarred. 2. That it retains its force much longer while kept in ſtore. 3. That it reſiſts the ordinary injuries of the weather one-fourth longer.

We know this one remarkable fact. In 1758 the ſhrowds and ſtays of the Sheer hulk at Portſmouth dock-yard were overhauled, and when the worming and ſervice were taken off, they were found to be of white cordage. On examining the ſtore-keeper's books, they were found to have been formerly the ſhrowds and rigging of the Royal William, of 110 guns, built in 1715, and rigged in 1716. She was thought top-heavy and unfit for ſea, and unrigged and her ſtores laid up. Some few years afterwards, her ſhrowds and ſtays were fitted on the Sheer hulk, where they remained in conſtant and very hard ſervice for about 30 years, while every tarred rope about her had been repeatedly renewed. This information we received from Mr. Brown, boatſwain of the Royal William during the war 1758, &c.

Why then do we tar cordage? We thus render it more unpliant, weaker, and leſs durable. It is chiefly ſerviceable for cables and ground tackle, which muſt be continually wetted and even ſoaked. The reſult of careful obſervation is, 1. That white cordage, expoſed to be alternately very wet and dry, is weaker than tarred cordage. 2. That cordage which is ſuperficially tarred is conſtantly ſtronger than what is tarred throughout, and it reſiſts better the alternatives of wet and dry. *N. B.* The ſhrowds of the Sheer hulk were well tarred and blacked, ſo that it was not known that they were of white cordage.

Tar is a curious ſubſtance, miſcible completely with water. Attempts were made to anoint cordage with oils and fats which do not mix with water. This was expected to defend them from its pernicious effects. But it was diſtinctly found that theſe matters made the fibres of hemp glide ſo eaſily on each other, that it was hardly poſſible to twiſt them permanently. Before they graſped each other ſo hard that they could not be drawn, they were ſtrained almoſt to breaking.

Attempts have been made to increaſe the ſtrength of cordage by tanning. But although it remains a conſtant practice in the manufacture of nets, it does not appear that much addition, either of ſtrength or durability, can be given to cordage by this means. The trial has been made with great care, and by perſons fully able to conduct the proceſs with propriety. But it is found that the yarns take ſo long time in drying, and are ſo much hurt by drying ſlowly, that the room required for a conſiderable rope-work would be immenſe; and the improvement

of the cordage is but trifling, and even equivocal. Indeed tanning is a chemical procefs, and its effect depends entirely on the nature of the materials to which the tan is applied. It unqueftionably condenfes, and even ftrengthens, the fibre of leather: but for any thing that we know *à priori*, it may deftroy the cohefion of hemp and flax; and experiment alone could decide the queftion. The refult has been unfavourable; but it does not follow from this that a tan cannot be found which fhall produce on the texture of vegetables effects fimilar to what oak-bark and other aftringents produce on the animal fibre or membrane. It is well known that fome dyes increafe the ftrength of flax and cotton, notwithftanding the corrofion which we know to be produced by fome of the ingredients. This is a fubject highly worth the attention of the chemift and the patriot.

Rope *Dancer*. See *Rope*-Dancer.

Rope-*Yarn*, among failors, is the yarn of any rope untwifted, but commonly made up of junk; its ufe is to make finnet, mats, &c.

ROQUET. See Rocket.

RORIDULA, in botany: a genus of the monogynia order, belonging to the pentandria clafs of plants. The corolla is pentapetalous; the calyx pentaphyllous; the capfule trivalved; the antheræ fcrotiform at the bafe.

ROSA, the rose: a genus of the polygamia order, belonging to the icofandria clafs of plants; and in the natural method ranking under the 35th order, *Senticofæ*. There are five petals; the calyx is urceolated, quinquefid, cornous, and ftraitened at the neck The feeds are numerous, hifpid, and affixed to the infide of the calyx. The forts of rofes are very numerous; and the botanifts find it very difficult to determine with accuracy which are fpecies and which are varieties, as well as which are varieties of the refpective fpecies. On this account Linnæus, and fome other eminent authors, are inclined to think that there is only one real fpecies of rofe, which is the *rofa canina*, or "dog-rofe of the hedges," &c. and that all the other forts are accidental varieties of it. However, according to the prefent Linnæan arrangement, they ftand divided into 14 fuppofed fpecies, each comprehending varieties, which in fome forts are but few, in others numerous. The fuppofed fpecies and their varieties, according to the arrangement of modern botanifts, are as follow:

1. The *canina*, canine rofe, wild dog-rofe of the hedges, or hep-tree, grows five or fix feet high, having prickly ftalks and branches, pinnated, five- or feven-lobed leaves, with aculeated foot-ftalks, fmooth pedunculi, oval fmooth germina, and fmall fingle flowers. There are two varieties, red-flowered and white-flowered. They grow wild in hedges abundantly all over the kingdom; and are fometimes admitted into gardens, a few to increafe the variety of the fhrubbery collection.

2. The *alba*, or common white-rofe, grows five or fix feet high, having a green ftem and branches, armed with prickles, hifpid pedunculi, oval fmooth germina, and large white flowers. The varieties are,—large double white rofe—dwarf fingle white rofe—maidens-blufh white rofe, being large, produced in clufters, and of a white and blufh red colour.

3. The *Gallica*, or Gallican rofe, &c. grows from about three or four to eight or ten feet high, in different varieties; with pinnated, three-, five-, or feven-lobed leaves, and large red and other coloured flowers in different forts. This fpecies is very extenfive in fuppofed varieties, bearing the above fpecific diftinction, feveral of which have been formerly confidered as diftinct fpecies, but are now ranged among the varieties of the Gallican rofe, confifting of the following noted varieties:

Common red officinal rofe, grows erect, about three or four feet high, having fmall branches, with but few prickles, and large fpreading half-double deep-red flowers—Rofa mundi (rofe of the world) or ftriped red rofe, is a variety of the common red rofe, growing but three or four feet high, having large fpreading femi-double red flowers, beautifully ftriped with white—and deep red. York and Lancafter variegated rofe, grows five, fix, or eight feet high, or more; bearing variegated red flowers, confifting of a mixture of red and white; alfo frequently difpofed in elegant ftripes, fometimes in half of the flower, and fometimes in fome of the petals.—Monthly rofe, grows about four or five feet high, with green very prickly fhoots; producing middle-fized, moderately-double, delicate flowers, of different colours in the varieties. The varieties are, common red-flowered monthly rofe—blufh-flowered—white-flowered—ftripe-flowered. All of which blow both early and late, and often produce flowers feveral months in the year, as May, June, and July; and frequently again in Auguft or September, and fometimes, in fine mild feafons, continue till November or December: hence the name *monthly rofe*.—Double virgin-rofe, grows five or fix feet high, having greenifh branches with fcarce any fpines: and with large double pale-red and very fragrant flowers.—Red damafk-rofe, grows eight or ten feet high, having greenifh branches, armed with fhort aculea; and moderately-double, fine foft red, very fragrant flowers.—White damafk-rofe, grows eight or ten feet high, with greenifh very prickly branches, and whitifh-red flowers, becoming gradually of a whiter colour.—Blufh Belgic rofe, grows three or four feet high, or more; having greenifh prickly branches, five- or feven-lobed leaves, and numerous, very double, blufh-red flowers, with fhort petals, evenly arranged.—Red Belgic rofe, having greenifh and red fhoots and leaves, and fine double deep-red flowers.—Velvet rofe, grows three or four feet high, armed with but few prickles; producing large velvet-red flowers, comprifing femi-double and double varieties, all very beautiful rofes.—Marbled rofe, grows four or five feet high, having brownifh branches, with but few prickles; and large, double, finely-marbled, red flowers.—Red-and-yellow Auftrian rofe, grows five or fix feet high, having flender reddifh branches, armed with fhort brownifh aculea; and with flowers of a reddifh copper-colour on one fide, the other fide yellow. This is a curious variety, and the flowers affume a fingularly agreeable appearance.—Yellow Auftrian rofe, grows five or fix feet high, having reddifh very prickly fhoots; and numerous bright-yellow flowers.—Double yellow rofe, grows fix or feven feet high; with brownifh branches, armed with numerous large and fmall yellowifh prickles; and large very double yellow flowers.—Frankfort rofe, grows eight or ten feet high, is a vigorous fhooter, with brownifh-branches thinly armed with ftrong prickles; and produces largifh double purplifh-red flowers, that blow irregularly, and have but little fragrance.

4. The *centifolia*, or hundred-leaved red rofe, &c. grows from about three or four to fix or eight feet high, in different forts, all of them hifpid and prickly; pinnated three- and five-lobed leaves; and large very double red flowers, having very numerous petals, and of different fhades in the varieties. The varieties are,—common Dutch hundred-leaved rofe, grows three or four feet high, with erect greenifh branches, but moderately armed with prickles; and large remarkably double red flowers, with fhort regularly arranged petals.—Blufh hundred-leaved rofe, grows like the other, with large very double pale-red flowers.—Provence rofe, grows five or fix feet, with greenifh-brown prickly branches, and very large double globular red flowers, with large petals folding over one another, more or lefs in the varieties.—The varieties are, common red Provence rofe, and pale Provence rofe; both of which having larger and fomewhat loofer petals than the following fort.—Cabbage Provence rofe; having the petals clofely folded over one another like cabbages.—Dutch cabbage rofe, very large, and cabbages tolerably.—Childing Provence rofe—Great royal rofe, grows fix or eight feet high,

producing remarkably large, fomewhat loofe, but very elegant flowers.—All thefe are large double red flowers, fomewhat globular at firft blowing, becoming gradually a little fpreading at top, and are all very ornamental fragrant rofes.—Mofs Provence rofe, fuppofed a variety of the common rofe; grows erectly four or five feet high, having brownifh ftalks and branches, very clofely armed with fhort prickles, and double crimfon red flowers; having the calyx and upper part of the peduncle furrounded with a rough moffy-like fubftance, effecting a curious fingularity. This is a fine delicate rofe, of a high fragrance, which, together with its moffy calyx, renders it of great eftimation as a curiofity.

5. The *cinnamomea,* or cinnamon rofe, grows five or fix feet high, or more, with purplifh branches thinly aculeated; pinnated five- or feven-lobed leaves, having almoft inermous petioles, fmooth pedunculi, and fmooth globular germina; with fmall purplifh-red cinnamon-fcented flowers early in May. There are varieties with double flowers.

6. The *Alpina,* or Alpine inermous rofe, grows five or fix feet high, having fmooth or unarmed reddifh branches, pinnated feven-lobed fmooth leaves, fomewhat hifpid pedunculi, oval germina, and deep-red fingle flowers; appearing in May. This fpecies. as being free from all kind of armature common to the other forts of rofes, is efteemed as a fingularity; and from this property is often called the *virgin rofe.*

7. The *Carolina,* or Carolina and Virginia rofe, &c. grows fix or eight feet high, or more, having fmooth reddifh branches, very thinly aculeated; pinnated feven-lobed fmooth leaves, with prickly foot-ftalks; fomewhat hifpid pedunculi, globofe hifpid germen, and fingle red flowers in clufters, appearing moftly in Auguft and September. The varieties are, dwarf Pennfylvania rofe, with fingle and double red flowers.—American pale-red rofe. This fpecies and varieties grow naturally in different parts of North America; they effect a fine variety in our gardens, and are in eftimation for their late-flowering property, as they often continue in blow from Auguft until October; and the flowers are fucceeded by numerous red berry-like heps in autumn, caufing a variety all winter.

8. The *villofa,* or villofe apple-bearing rofe, grows fix or eight feet high, having ftrong erect brownifh fmooth branches; aculeated fparfedly-pinnated feven-lobed villofe or hairy leaves, downy underneath, with prickly foot-ftalks, hifpid peduncles, a globular prickly germen; and large fingle red flowers, fucceeded by large round prickly heps, as big as little apples. This fpecies merits admittance into every collection as a curiofity for the fingularity of its fruit, both for variety and ufe; for, having a thick pulp of an agreeable acid relifh, this is often made into a tolerably good fweetmeat.

9. The *pimpinellifolia,* or burnet-leaved rofe, grows about a yard high, aculeated fparfedly; fmall neatly pinnated feven-lobed leaves, having obtufe folioles and rough petioles, fmooth peduncles, a globular fmooth germen, and fmall fingle flowers. There are varieties with red flowers—and with white flowers. They grow wild in England, &c. and are cultivated in fhrubberies for variety.

10. The *fpinofiffima,* or moft fpinous, dwarf burnet-leaved rofe, commonly called *Scotch rofe,* grows but two or three feet high, very clofely armed with fpines; fmall neatly pinnated feven-lobed leaves, with prickly foot-ftalks, prickly pedunculi, oval fmooth germen, and numerous fmall fingle flowers, fucceeded by round dark-purple heps. The varieties are, common white-flowered—red-flowered—ftriped-flowered—marble-flowered. They grow naturally in England, Scotland, &c. The firft variety rifes near a yard high, the others, but one or two feet, all of which are fingle-flowered; but the flowers, being numerous all over the branches, make a pretty appearance in the collection.

11. The *eglanteria,* eglantine rofe, or fweet brier, grows five or fix feet high, having green branches, armed with ftrong fpines fparfedly; pinnated feven-lobed odoriferous leaves, with acute folioles and rough foot-ftalks, fmooth pedunculi, globular fmooth germina, and fmall pale-red flowers. The varieties are, common fingle-flowered—femi double-flowered—double-flowered—blufh double-flowered—yellow-flowered. This fpecies grows naturally in fome parts of England and Switzerland. It claims culture in every garden for the odoriferous property of its leaves; and fhould be planted in the borders, and other compartments contiguous to walks, or near the habitation, where the plants will impart their refrefhing fragrance very profufely all around; and the young branches are excellent for improving the odour of nofegays and bowpots.

12. The *mofchata,* or mufk-rofe, fuppofed to be a variety only of the ever-green mufk-rofe, has weak fmooth green ftalks and branches, rifing by fupport from fix to eight or ten feet high or more, thinly armed with ftrong fpines; pinnated feven-lobed fmooth leaves, with prickly foot-ftalks; hifpid peduncles; oval hifpid germen; and all the branches terminated by large umbellate clufters of pure-white mufk-fcented flowers in Auguft, &c.

13. The *fempervirens,* or evergreen mufk rofe, hath a fomewhat trailing ftalk and branches, rifing by fupport five or fix feet high or more, having a fmooth bark armed with prickles; pinnated five-lobed fmooth fhining evergreen leaves, with prickly petioles, hifpid pedunculi, oval hifpid germen; and all the branches terminated by clufters of pure-white flowers of a mufky fragrance; appearing the end of July and in Auguft. The fempervirent property of this elegant fpecies renders it a curiofity among the rofy tribe; it alfo makes a fine appearance as a flowering fhrub. There is one variety, the deciduous mufk-rofe above mentioned. This fpecies and variety flower in Auguft, and is remarkable for producing them numeroufly in clufters, continuing in fucceffion till October or November.

The above 13 fpecies of rofa, and their refpective varieties, are of the fhrub kind; all deciduous, except the laft fort, and of hardy growth, fucceeding in any common foil and fituation, flowering annually in great abundance from May to October, in different forts; though the general flowering feafon for the principal part of them is June and July: but in a full collection of the different fpecies, the blow is continued in conftant fucceffion feveral months, even fometimes from May till near Chriftmas; producing their flowers univerfally on the fame year's fhoots, rifing from thofe the year before, generally on long pedunculi each terminated by one or more rofes, which in their characteriftic ftate confift each of five large petals and many ftamina; but in the doubles, the petals are very numerous; and in fome forts, the flowers are fucceeded by fruit ripening to a red colour in autumn and winter, from the feed of which the plants may be raifed: but the moft certain and eligible mode of propagating moft of the forts is by fuckers and layers; and by which methods they may be increafed very expeditioufly in great abundance.

The white and red rofes are ufed in medicine. The former diftilled with water yields a fmall portion of a butyraceous oil, whofe flavour exactly refembles that of the rofes themfelves. This oil and the diftilled water are very ufeful and agreeable cordials. Thefe rofes alfo, befides the cordial and aromatic virtues which refide in their volatile parts, have a mild purgative one, which remains entire in the decoction after diftillation. The red rofe, on the contrary, has an aftringent and gratefully corroborating virtue.

ROSA (Salvator), an admirable painter, born at Naples in 1614. He was firft inftructed by Francefco Francazano, a kinfman: but the death of his father reduced him to fell drawings fketched upon paper for any thing he could get; one of

which happening to fall into the hands of Laſtane, he took him under his protection, and enabled him to enter the ſchool of Spagnoletto, and to be taught moreover by Daniel Falcone, a diſtinguiſhed painter of battles at Naples. Salvator had a fertile imagination. He ſtudied nature with attention and judgment; and always repreſented her to the greateſt advantage: for every tree, rock, cloud, or ſituation, that enters into his compoſition, ſhows an elevation of thought that extorts admiration. He was equally eminent for painting battles, animals, ſea or land ſtorms; and he executed theſe different ſubjects in ſuch taſte as renders his works readily diſtinguiſhable from all others. His pieces are exceedingly ſcarce and valuable; one of the moſt capital is that repreſenting Saul and the witch of Endor, which was preſerved at Verſailles. He died in 1673; and as his paintings are in few hands, he is more generally known by his prints; of which he etched a great number. He painted landſcapes more than hiſtory; but his prints are chiefly hiſtorical. The capital landſcape of this maſter at Chiſwick is a noble picture. However, he is ſaid to have been ignorant of the management of light, and to have ſometimes ſhaded faces in a diſagreeable manner. He was however a man of undoubted genius; of which he has given frequent ſpecimens in his works. A roving diſpoſition, to which he is ſaid to have given full ſcope, ſeems to have added a wildneſs to all his thoughts. We are told that he ſpent the early part of his life in a troop of banditti; and that the rocky deſolate ſcenes in which he was accuſtomed to take refuge, furniſhed him with thoſe romantic ideas in landſcape, of which he is ſo exceedingly fond, and in the deſcription of which he ſo greatly excels. His *robbers*, as his detached figures are commonly called, are ſuppoſed alſo to have been taken from the life.

Salvator Roſa is ſufficiently known as a painter; but until now we never heard of him as a muſician. Among the muſical manuſcripts purchaſed at Rome by Dr. Burney was a muſic-book of Salvator, in which are many airs and cantatas of different maſters, and eight entire cantatas written, ſet, and tranſcribed by this celebrated painter himſelf. From the ſpecimen of his talents for muſic here given, we make no ſcruple of declaring, that he had a truer genius for this ſcience, in point of melody, than any of his predeceſſors or cotemporaries: there is alſo a ſtrength of expreſſion in his verſes, which ſets him far above the middle rank as a poet. Like moſt other artiſts of real original merit, he complains of the ill uſage of the world, and the difficulty he finds in procuring a bare ſubſiſtence.

ROSACEA. See Gutta *Roſacea*.

ROSACEOUS, among botaniſts, an appellation given to ſuch flowers as are compoſed of ſeveral petals or leaves diſpoſed in a ſort of circular form, like thoſe of a roſe.

ROSAMOND, daughter of Walter lord Clifford, was a young lady of exquiſite beauty, fine accompliſhments, and bleſſed with a moſt engaging wit and ſweetneſs of temper. She had been educated, according to the cuſtom of the times, in the nunnery of Godſtow; and the popular ſtory of her is as follows: Henry II. ſaw her, loved her, declared his paſſion, and triumphed over her honour. To avoid the jealouſy of his queen Elinor, he kept her in a wonderful labyrinth at Woodſtock, and by his connection with her had William Longſword earl of Saliſbury, and Geoffrey biſhop of Lincoln. On Henry's abſence in France, however, on account of a rebellion in that country, the queen found means to diſcover her; and though ſtruck with her beauty, ſhe recalled ſufficient reſentment to poiſon her. The queen, it is ſaid, diſcovered her apartment by a thread of ſilk; but how ſhe came by it is differently related. This popular ſtory is not however ſupported by hiſtory; ſeveral writers mention no more of her, than that the queen ſo vented her ſpleen on Roſamond as that the lady lived not long after. Other writers aſſert that ſhe died a natural death; and the ſtory of her being poiſoned is thought to have ariſen from the figure of a cup on her tomb. She was buried in the church of Godſtow, oppoſite to the high altar, where her body remained till it was ordered to be removed with every mark of diſgrace by Hugh biſhop of Lincoln, in 1191. She was, however, by many conſidered as a ſaint after her death, as appears from an inſcription on a croſs which Leland ſays ſtood near Godſtow:

> *Qui meat hac oret, ſignum ſalutis adoret,*
> *Utque ſibi detur veniam. Roſamunda precetur.*

And alſo by the following ſtory: Roſamond, during her reſidence at her bower, made ſeveral viſits to Godſtow; where being frequently reproved for the life ſhe led, and threatened with the conſequences in a future ſtate, ſhe always anſwered, that ſhe knew ſhe ſhould be ſaved; and, as a token to them, ſhowed a tree which ſhe ſaid would be turned into a ſtone when ſhe was with the ſaints in heaven. Soon after her death this wonderful metamorphoſis happened, and the ſtone was ſhown to ſtrangers at Godſtow till the time of the Diſſolution.

ROSARY, among the Roman Catholics. See Chaplet.

ROSBACH, a town of Germany, in Saxony, famous for a victory obtained here by the king of Pruſſia over the French, on November 5, 1757, in which 10,000 of the French were killed or taken priſoners, with the loſs of no more than 500 Pruſſians.

ROSCHILD, a town of Denmark, in the iſle of Zealand, with a biſhop's ſee and a ſmall univerſity. It is famous for a treaty concluded here in 1658; and in the great church there are ſeveral tombs of the kings of Denmark. It is ſeated at the bottom of a ſmall bay, in E. lon. 12. 20. N. lat. 55. 40.

ROSCOMMON, a county of Ireland, in the province of Connaught, bounded on the weſt by the river Suc, on the eaſt by the Shannon, on the north by the Curlew mountains, on the ſouth and ſouth-eaſt by the King's county and part of Galway. Its length is 35 miles, its breadth 28. The air of the county, both on the plains and mountains, is healthy; the ſoil yields plenty of graſs with ſome corn, and feeds numerous herds of cattle. The Curlew mountains on the north are very high and ſteep; and, till a road with great labour and difficulty was cut through them, were impaſſable.

Roscommon, which gives the title of earl to the family of Dillon, and name to the county, though not large, is both a parliamentary borough and the county town.

ROSCOMMON (Wentworth Dillon, earl of), a celebrated poet of the 17th century, was the ſon of James Dillon earl of Roſcommon; and was born in Ireland, under the adminiſtration of the firſt earl of Strafford, who was his uncle, and from whom he received the name of *Wentworth* at his baptiſm. He paſſed his infancy in Ireland; after which the earl of Strafford ſent for him into England, and placed him at his own ſeat in Yorkſhire, under the tuition of Dr. Hall, afterwards biſhop of Norwich, who inſtructed him in Latin, without teaching him the common rules of grammar, which he could never retain in his memory, and yet he learnt to write in that language with claſſical elegance and propriety. On the earl of Strafford's being impeached, he went to complete his education at Caen in Normandy; and after ſome years travelled to Rome, where he became acquainted with the moſt valuable remains of antiquity, and in particular was well ſkilled in medals, and learned to ſpeak Italian with ſuch grace and fluency, that he was frequently taken for a native. He returned to England ſoon after the Reſtoration, and was made captain of the band of penſioners; but a diſpute with the lord privy-ſeal, about a part of his eſtate,

obliged him to reſign his poſt, and reviſit his native country, where the duke of Ormond appointed him captain of the guards. He was unhappily very fond of gaming; and as he was returning to his lodgings from a gaming-table in Dublin, he was attacked in the dark by three ruffians, who were employed to aſſaſſinate him. The earl defended himſelf with ſuch reſolution, that he had diſpatched one of the aggreſſors, when a gentleman paſſing that way took his part, and diſarmed another, on which the third fought his ſafety in flight. This generous aſſiſtant was a diſbanded officer of good family and fair reputation, but reduced to poverty; and his lordſhip rewarded his bravery by reſigning to him his poſt of captain of the guards. He at length returned to London; when he was made maſter of the horſe to the ducheſs of York, and married the lady Frances, eldeſt daughter of Richard earl of Burlington, who had been the wife of colonel Courtney. He here diſtinguiſhed himſelf by his writings; and, in imitation of thoſe learned and polite aſſemblies with which he had been acquainted abroad, began to form a ſociety for refining and fixing the ſtandard of the Engliſh language, in which his great friend Mr. Dryden was a principal aſſiſtant. This ſcheme was entirely defeated by the religious commotions which enſued on king James's acceſſion to the throne. In 1683 he was ſeized with the gout; and being too impatient of pain, he permitted a bold French empiric to apply a repelling medicine, in order to give him preſent relief; which drove the diſtemper into his bowels, and in a ſhort time put a period to his life, in January 1684. He was buried with great pomp in Weſtminſter-abbey.

His poems, which are not numerous, are in the body of Engliſh poetry collected by Dr. Johnſon. His "Eſſay on Tranſlated Verſe," and his tranſlation of "Horace's Art of Poetry," have great merit. Waller addreſſed a poem to his lordſhip upon the latter, when he was 75 years of age. "In the writings of this nobleman we view (ſays Fenton) the image of a mind naturally ſerious and ſolid; richly furniſhed and adorned with all the ornaments of art and ſcience: and thoſe ornaments unaffectedly diſpoſed in the moſt regular and elegant order. His imagination might probably have been more fruitful and ſprightly, if his judgment had been leſs ſevere; but that ſeverity (delivered in a maſculine, clear, ſuccinct ſtyle) contributed to make him ſo eminent in the didactical manner, that no man, with juſtice, can affirm he was ever equalled by any of our nation, without confeſſing at the ſame time that he is inferior to none. In ſome other kinds of writing his genius ſeems to have wanted fire to attain the point of perfection; but who can attain it? He was a man of an amiable diſpoſition, as well as a good poet; as Pope, in his 'Eſſay on Criticiſm,' hath teſtified in the following lines:

——Roſcommon not more learn'd than good,
With manners generous as his noble blood;
To him the wit of Greece and Rome was known,
And every author's merit but his own."

We muſt allow of Roſcommon, what Fenton has not mentioned ſo diſtinctly as he ought, and what is yet very much to his honour, that he is perhaps the only correct writer in verſe before Addiſon; and that, if there are not ſo many or ſo great beauties in his compoſitions as in thoſe of ſome contemporaries, there are at leaſt fewer faults. Nor is this his higheſt praiſe; for Pope has celebrated him as the only moral writer of king Charles's reign:

Unhappy Dryden! in all Charles's days,
Roſcommon only boaſts unſpotted lays.

Of Roſcommon's works, the judgment of the public ſeems to be right. He is elegant, but not great; he never labours after exquiſite beauties, and he ſeldom falls into groſs faults. His verſification is ſmooth, but rarely vigorous, and his rhymes are remarkably exact. He improved taſte, if he did not enlarge knowledge, and may be numbered among the benefactors to Engliſh literature.

ROSE, in botany. See Rosa.

Eſſence of Roses. See Roses *Ottar*.

Rose *of Jericho*, ſo called becauſe it grows in the plain of Jericho, though it did not originally grow there. It has perhaps been ſo named by travellers who did not know that it was brought from Arabia Petræa. Roſe buſhes are frequently found in the fields about Jericho; but they are of a ſpecies much inferior to thoſe ſo much extolled in Scripture, the flowers of which ſome naturaliſts pretend to have in their cabinets.

"The roſe ſhrub of Jericho (ſays Mariti) is a ſmall plant, with a buſhy root, about an inch and a half in length. It has a number of ſtems which diverge from the earth: they are covered with few leaves; but it is loaded with flowers, which appear red when in bud, turn paler as they expand, and at length become white entirely. Theſe flowers appear to me to have a great reſemblance to thoſe of the elder-tree; with this difference, that they are entirely deſtitute of ſmell. The ſtems never riſe more than four or five inches from the ground. This ſhrub ſheds its leaves and its flowers as it withers. Its branches then bend in the middle, and, becoming entwined with each other to the top, form a kind of globe. This happens during the great heats; but during moiſt and rainy weather they again open and expand.

"In this country of ignorance and ſuperſtition, people do not judge with a philoſophical eye of the alternate ſhutting and opening of this plant: it appears to them to be a periodical miracle, which heaven operates in order to make known the events of this world. The inhabitants of the neighbouring cantons come and examine theſe ſhrubs when they are about to undertake a journey, to form an alliance, to conclude any affair of importance, or on the birth of a ſon. If the ſtems of the plants are open, they do not doubt of ſucceſs; but they account it a bad omen to ſee them ſhut, and therefore renounce their project if it be not too late.

"This plant is neither ſubject to rot nor to wither. It will bear to be tranſplanted; and thrives without degenerating in any kind of ſoil whatever."

Roses *Ottar* (or eſſential oil of), is obtained from roſes by ſimple diſtillation, and may be made in the following manner: A quantity of freſh roſes, for example 40 pounds, are put in a ſtill with 60 pounds of water, the roſes being left as they are with their calyxes, but with the ſtems cut cloſe. The maſs is then well mixed together with the hands, and a gentle fire is made under the ſtill; when the water begins to grow hot, and fumes to riſe, the cap of the ſtill is put on, and the pipe fixed; the chinks are then well luted with paſte, and cold water put on the refrigeratory at top: the receiver is alſo adapted at the end of the pipe; and the fire is continued under the ſtill, neither too violent nor too weak. When the impregnated water begins to come over, and the ſtill is very hot, the fire is leſſened by gentle degrees, and the diſtillation continued till 30 pounds of water are come over, which is generally done in about four or five hours; this roſe water is to be poured again on a freſh quantity (40 pounds) of roſes, and from 15 to 20 pounds of water are to be drawn by diſtillation, following the ſame proceſs as before. The roſe-water thus made and cohobated will be found, if the roſes were good and freſh, and the diſtillation carefully performed, highly ſcented with the roſes. It is then poured into pans either of earthen ware or of tinned metal, and left expoſed to the freſh air for the night. The ottar or eſſence will be found in the morning congealed, and ſwimming on the top of the water; this is to be carefully ſeparated and collected either with a thin ſhell or a ſkimmer, and poured into

a phial. When a certain quantity has thus been obtained, the water and fæces muſt be ſeparated from the clear eſſence, which with reſpect to the firſt will not be difficult to do, as the eſſence congeals with a ſlight cold, and the water may then be made to run off. If, after that, the eſſence is kept fluid by heat, the fæces will ſubſide, and may be ſeparated; but if the operation has been neatly performed, theſe will be little or none. The fæces are as highly perfumed as the eſſence, and muſt be kept after as much of the eſſence has been ſkimmed from the roſe-water as could be. The remaining water ſhould be uſed for freſh diſtillations, inſtead of common water, at leaſt as far as it will go.

The above is the whole proceſs, as given in the Aſiatic Reſearches by lieutenant-colonel Polier, of making genuine ottar of roſes. But attempts (he ſays) are often made to augment the quantity, though at the expenſe of the quality. Thus the raſpings of ſandal-wood, which contain a deal of eſſential oil, are uſed; but the impoſition is eaſily diſcovered, both by the ſmell, and becauſe the eſſential oil of ſandal-wood will not congeal in common cold. In other places they adulterate the ottar by diſtilling with the roſes a ſweet-ſcented graſs, which colours it of a high clear green. This does not congeal in a ſlight cold. There are numerous other modes, far more palpable, of adulteration. The quantity of eſſential oil to be obtained from roſes is very precarious, depending on the ſkill of the diſtiller, on the quality of the roſes, and the favourableneſs of the ſeaſon. The colour of the ottar is no criterion of its goodneſs, quality, or country. The calyxes by no means diminiſh the quality of ottar, nor do they impart any green colour to it. They indeed augment the quantity, but the trouble neceſſary to ſtrip them is ſuch as to prevent their being often uſed.

Rose-*Noble*, an ancient Engliſh gold coin, firſt ſtruck in the reign of Edward III. It was formerly current at 6s 8d. and ſo called becauſe ſtamped with a roſe. See Money.

Rose *Wood*. See Aspalathus.

ROSETTO, a town of Egypt, ſeated on the weſt branch of the Nile. The Egyptians call it Raſchid, and account it one of the pleaſanteſt places in the country. It has a great manufacture of ſtriped and other coarſe linens; but its chief buſineſs is the carriage of goods hence to Cairo; for all European merchandiſe is brought hither from Alexandria by ſea, and carried hence by boats to Cairo. The Europeans have their viceconſuls and factors here. It is 25 miles N. E. of Alexandria, and 100 N. W. of Cairo. E. lon. 30. 45. N. lat. 31. 30,

ROSICRUCIANS, a name aſſumed by a ſect or cabal of hermetical philoſophers; who aroſe, as it has been ſaid, or at leaſt became firſt taken notice of, in Germany, in the beginning of the fourteenth century. They bound themſelves together by a ſolemn ſecret, which they all ſwore inviolably to preſerve; and obliged themſelves, at their admiſſion into the order, to a ſtrict obſervance of certain eſtabliſhed rules. They pretended to know all ſciences, and chiefly medicine; whereof they publiſhed themſelves the reſtorers. They pretended to be maſters of abundance of important ſecrets, and, among others, that of the philoſopher's ſtone; all which they affirmed to have received by tradition from the ancient Egyptians, Chaldeans, the Magi, and Gymnoſophiſts. They have been diſtinguiſhed by ſeveral names, accommodated to the ſeveral branches of their doctrine. Becauſe they pretend to protract the period of human life, by means of certain noſtrums, and even to reſtore youth, they were called *Immortales*; as they pretended to know all things, they have been called *Illuminati*; and becauſe they have made no appearance for ſeveral years, unleſs the ſect of Illuminated which lately ſtarted up on the continent derives its origin from them, they have been called the *inviſible brothers*. Their ſociety is frequently ſigned by the letters F. R. C. which ſome among them interpret *fratres roris cocti*; it being pretended, that the matter of the philoſopher's ſtone is dew concocted, exalted, &c. Some, who are no friends to free-maſonry, make the preſent flouriſhing ſociety of free-maſons a branch of Roſicrucians; or rather the Roſicrucians themſelves, under a new name or relation, viz. as retainers to building. And it is certain, there are ſome free-maſons who have all the characters of Roſicrucians; but how the æra and original of maſonry (ſee Masonry), and that of Roſicrucianiſm, here fixed from Naudæus, who has written expreſsly on the ſubject, conſiſt, we leave others to judge.

Notwithſtanding the pretended antiquity of the Roſicrucians, it is probable that the alchemiſts, Paracelſiſts, or fire-philoſophers, who ſpread themſelves through almoſt all Europe about the cloſe of the ſixteenth century, aſſumed about this period the obſcure and ambiguous title of Roſicrucian brethren, which commanded at firſt ſome degree of reſpect, as it ſeemed to be borrowed from the arms of Luther, which were a croſs placed upon a roſe. But the denomination evidently appears to be derived from the ſcience of chemiſtry. It is not compounded, ſays Moſheim, as many imagine, of the two words *roſa* and *crux*, which ſignify roſe and croſs, but of the latter of theſe words, and the Latin *ros*, which ſignifies dew. Of all natural bodies, dew was deemed the moſt powerful diſſolvent of gold; and the croſs, in the chemical language, is equivalent to light, becauſe the figure of a croſs + exhibits, at the ſame time, the three letters of which the word *lux* or light is compounded. Now *lux* is called, by this ſect, the ſeed or menſtruum of the red dragon, or, in other words, that groſs and corporeal light which, when properly digeſted and modified, produces gold Hence it follows, if this etymology be admitted, that a Roſicrucian philoſopher is one who, by the intervention and aſſiſtance of the dew, ſeeks for light, or, in other words, the ſubſtance called the philoſopher's ſtone. The true meaning and energy of this denomination did not eſcape the penetration and ſagacity of Gaſſendi, as appears by his *Examen Philoſophiæ Fluddanæ*, ſect. 15. tom. iii. p. 261. And it was more fully explained by Renaudot, in his *Conferences Publiques*. tom. iv. p. 87.

At the head of theſe fanatics were Robert Fludd, an Engliſh phyſician, Jacob Behmen, and Michael Mayer; but if rumour may be credited, the preſent Illuminated have a head of higher rank. The common principles, which ſerve as a kind of centre of union to the Roſicrucian ſociety, are the following: They all maintain, that the diſſolution of bodies, by the power of fire, is the only way by which men can arrive at true wiſdom, and come to diſcern the firſt principles of things. They all acknowledge a certain analogy and harmony between the powers of nature and the doctrines of religion; and believe that the Deity governs the kingdom of grace by the ſame laws with which he rules the kingdom of nature; and hence they are led to uſe chemical denominations to expreſs the truths of religion. They all hold, that there is a ſort of divine energy, or ſoul, diffuſed through the frame of the univerſe, which ſome call the *argheus*, others the *univerſal ſpirit*, and which others mention under different appellations. They all talk in the moſt ſuperſtitious manner of what they call the ſignatures of things, of the power of the ſtars over all corporeal beings, and their particular influence upon the human race, of the efficacy of magic, and the various ranks and orders of demons. Theſe demons they divide into two orders, *ſylphs* and *gnomes*; which ſupplied the beautiful machinery of Pope's *Rape of the Lock*. In fine, the Roſicrucians and all their fanatical deſcendants agree in throwing out the moſt crude incomprehenſible notions and ideas, in the moſt obſcure, quaint, and unuſual expreſſions.—Moſh. Eccl. Hiſt. vol. iv. p. 266, &c. Engliſh edition, 8vo. See Behmen and Theosophists.

ROSIER. See Pilatre.

ROSIERS-aux-Salines, a town of France, in the depart-

ment of Meurthe and late province of Lorrain, famous for its salt-works. It is seated on the Meurthe, nine miles S. E. of Nanci, and 170 E. of Paris. E. lon. 6. 27. N. lat. 48. 40.

ROSKILD, formerly the royal residence and metropolis of Denmark, stands at a small distance from the Bay of Isefiord, not far from Copenhagen. In its flourishing state it was of great extent, and comprised within its walls 27 churches, and as many convents.—Its present circumference is scarcely half an English mile, and it contains only about 1620 souls. The houses are of brick, and of a neat appearance. The only remains of its original magnificence are the ruins of a palace and of the cathedral, a brick building with two spires, in which the kings of Denmark are interred. Little of the original building now remains. According to Holberg, it was constructed of wood, and afterwards built with stone, in the reign of Canute.—From an inscription in the choir, it appears to have been founded by Harold VI. who is styled king of Denmark, England, and Norway. Some verses, in barbarous Latin, obscurely allude to the principal incidents of his life; adding, that he built this church, and died in 980.—See Coxe's Travels into Poland, Russia, Sweden, and Denmark, vol. ii. p. 525.

ROSLEY-HILL, a village in Cumberland, with a fair on Whit-Monday, and every fortnight after till September 29, for horses, horned cattle, and linen cloth.

ROSMARINUS, ROSEMARY, in botany: A genus of the monogynia order, belonging to the diandria class of plants, and in the natural method ranking under the 42d order *Verticillatæ*. The corolla is unequal, with its upper lip bipartite; the filaments are long, curved, and simple, each having a small dent. There are two species, the angustifolia and latifolia, or narrow and broad leaved rosemary; of which the second has larger flowers and a stronger scent than the other. There are two varieties; one of the first sort with striped leaves, called the *silver rosemary*; and the other with yellow, whence it is called the *gold-striped rosemary*. These plants grow naturally in the southern parts of France, Spain, and Italy; where upon dry rocky soils near the sea they thrive prodigiously, and perfume the air in such a manner as to be smelt at a great distance from the land.—However, they are hardy enough to bear the cold of our ordinary winters, provided they be planted upon a poor, dry, gravelly soil, on which they will endure the cold much better than in a richer ground, where, growing more vigorously in summer, they are more apt to be injured by frost in winter; nor will they have such a strong aromatic scent as those on a dry and barren soil. They are to be propagated either by slips or cuttings.

Rosemary has a fragrant smell, and a warm pungent bitterish taste, approaching to those of lavender: the leaves and tender tops are strongest; next to those, the cup of the flower; the flowers themselves are considerably the weakest, but most pleasant. Aqueous liquors extract great share of the virtues of rosemary leaves by infusion, and elevate them in distillation; along with the water arises a considerable quantity of essential oil, of an agreeable strong penetrating smell. Pure spirit extracts in great perfection the whole aromatic flavour of the rosemary, and elevates very little of it in distillation; hence the resinous mass, left upon extracting the spirit, proves an elegant aromatic, very rich in the peculiar qualities of the plant. The flowers of rosemary give over great part of their flavour in distillation with pure spirit; by watery liquors, their fragrance is much injured; by beating, destroyed.

ROSS, a town in Herefordshire, with a market on Thursday, seated on the Wye, 12 miles S. E. of Hereford, and 115 W. by N. of London. W. lon. 2. 25. N. lat. 51. 56.

ROSS-SHIRE, a county of Scotland 70 miles long and 58 broad; bounded on the N. by Sutherlandshire and the frith of Dornoch, on the W. by the Minch, on the S. by Invernessshire, and on the E. by the frith of Murray and the county of Cromarty, which last it almost incloses. The N. W. part is mountainous and dreary; that to the E. variegated with woods, lakes, and rivers. The hills feed black-cattle, sheep, and goats. In the woods are stags, roes, and the beautiful bird called the capercailzie, or cock of the wood; it is of a bright azure colour, and almost as large as a common turkey. On the tops of the high rocky mountains is found the ptarmigan, a simple bird, not quite the size of a partridge. It is often indebted for its safety to its gray colour, which resembles the stones among which it lodges. In winter its colour changes to a pure white, like the snow, in which it often buries itself. The inhabitants of the W. and S. parts speak the Erse language, which is also understood on the E. coast, where, however, English is generally spoken.

ROSSANO, a strong and populous town of Naples, in Calabria Citeriore, with an archbishop's see. It is seated on an eminence, surrounded by rocks, three miles from the gulph of Venice, and 136 S. E. of Naples. E. lon. 16. 38. N. lat. 39. 48.

ROS-SOLIS, *Sun-dew*, an agreeable spirituous liquor, composed of burnt brandy, sugar, cinnamon, and milk-water; and sometimes perfumed with a little musk. It has its name from being at first prepared wholly of the juice of the plant ros solis, or drosera. See DROSERA.

ROSTOCK, a fortified town of Lower Saxony, in the duchy of Mecklenburg, with a university, a good harbour, a strong citadel, and an arsenal. Here are several handsome churches, and it was formerly one of the hanseatic towns. It is divided into three parts, the Old, the New, and the Middle Town. It is still imperial, under the protection of the duke of Mecklenburg, and is seated on a lake, where the River Varne falls into it, three miles from the Baltic, 12 N. of Gustrow, and 60 E. of Lubec. E. lon. 12. 15. N. lat. 54. 8.

ROSTOFF, or ROSTOW, a large town of the Russian empire, and capital of a territory of the same name, with an archbishop's see, seated on the lake Coteri, in E. lon. 40. 25. N. lat. 57. 5. The duchy of Rostoff is bounded on the N. by Jaroslow, on the E. by Sutdal, on the S. by the duchy of Moscow, and on the W. by that of Tuere.

ROSTRA, in antiquity, a part of the Roman forum, wherein orations, pleadings, funeral harangues, &c. were delivered.

ROSTRUM, literally denotes the beak or bill of a bird; and hence it has been figuratively applied to the beak or head of a ship.

ROSYCRUCIANS. See ROSICRUCIANS.

ROT, a very fatal disease incident to sheep, arising from wet seasons, and too moist pasture. It is very difficult of cure, and is attended with the singular circumstance of a kind of animals being found in the blood-vessels. See OVIS and SHEEP.

ROTA, the name of an ecclesiastical court of Rome, composed of twelve prelates, of whom one must be a German, another a Frenchman, and two Spaniards; the other eight are Italians, three of whom must be Romans, and the other five a Bolognese, a Ferraran, a Milanese, a Venetian, and a Tuscan.—This is one of the most august tribunals in Rome, which takes cognizance of all suits in the territory of the church, by appeal; as also of all matters beneficiary and patrimonial.

ROTACEÆ (from *rota*, "a wheel"), the name of the 20th order in Linnæus's Fragments of a Natural Method; consisting of plants with one flat, wheel-shaped petal, without a tube. See BOTANY.

ROTALA, in botany; a genus of the monogynia order, belonging to the triandria class of plants. The calyx is tri-

dentate; there is no corolla; the capſule is trilocular and polyſpermous.

ROTANG. See CALAMUS.

ROTATION, is a term which expreſſes the motion of the different parts of a ſolid body round an axis, and diſtinct from the progreſſive motion which it may have in its revolution round a diſtant point. The earth has a rotation round its axis, which produces the viciſſitudes of day and night; while its revolution round the ſun, combined with the obliquity of the equator, produces the varieties of ſummer and winter.

The mechaniſm of this kind of motion, or the relation which ſubſiſts between the intenſity of the moving forces, modified as it may be by the manner of application, and the velocity of rotation, is highly intereſting, both to the ſpeculative philoſopher and to the practical engineer. The preceſſion of the equinoxes, and many other aſtronomical problems of great importance and difficulty, receive their ſolutions from this quarter: and the *actual performance* of our moſt valuable machines cannot be aſcertained by the mere principles of equilibrium, but require a previous acquaintance with certain general propoſitions of rotatory motion.

It is chiefly with a view of aſſiſting the engineer that we propoſe to deliver in this place a few fundamental propoſitions; and we ſhall do it in as familiar and popular a manner as poſſible, although this may cauſe the application of them to the abſtruſe problems of aſtronomy to be greatly deficient in the elegance of which they are ſuſceptible.

When a ſolid body turns round an axis, retaining its ſhape and dimenſions, every particle is actually deſcribing a circle round this axis, and the axis paſſes through the centre of the circle, and is perpendicular to its plane. Moreover, in any inſtant of the motion, the particle is moving at right angles with the radius vector, or line joining it with *its* centre of rotation. Therefore, in order to aſcertain the direction of the motion of any particle P (pl. 3, fig. 1.), we may draw a ſtraight line PC from the particle perpendicular to the axis AB of rotation. This line will lie in the plane of the circle P *m n* of rotation of the particle, and will be its radius vector; and a line PQ drawn from the particle perpendicular to this radius vector will be a tangent to the circle of rotation, and will have the direction of the motion of this particle.

The whole body being ſuppoſed to turn together, it is evident, that when it has made a complete rotation, each particle has deſcribed a circumference of a circle, and the whole paths of the different particles will be in the ratio of theſe circumferences, and therefore of their radii; and this is true of any portion of a whole turn, ſuch as $\frac{1}{2}$, $\frac{1}{4}$, or 20 degrees, or any arch whatever; therefore the velocities of the different particles are proportional to their radii vectores, or to their diſtances from the axis of rotation.

And, laſtly, all theſe motions are in parallel planes, to which the axis of rotation is perpendicular.

When we compare the rotations of differerent bodies in reſpect of velocity, it is plain that it cannot be done by directly comparing the velocity of *any* particle in one of the bodies with that of *any* particle of the other; for, as all the particles of each have different velocities, this compariſon can eſtabliſh no ratio. But we familiarly compare ſuch motions by the number of complete turns which they make in equal times, and we ſay that the ſecond hand of a clock turns 60 times faſter than the minute hand; now this compariſon is equally juſt in any part of a turn as in the whole. While the minute hand moves round one degree, the ſecond-hand moves 60; therefore, as the length or number of feet in the line uniformly deſcribed by a body in its progreſſive motion is a proper meaſure of its progreſſive velocity, ſo the number of degrees deſcribed by *any* particle of a whirling body in the circumference of its circle of rotation, or the angle deſcribed by *any* radius vector of that body, is a proper meaſure of its velocity of rotation. And in this manner may the rotation of two bodies be compared; and the velocity is with propriety termed ANGULAR VELOCITY.

An angle is directly as the length of the circumference on which it ſtands, and inverſely as the radius of the circle, and may be expreſſed by the fraction of which the numerator is the arch, and the denominator the radius. Thus the angle PCp may be expreſſed by $\frac{\mathrm{P}p}{\mathrm{PC}}$. This fraction expreſſes the portion of the radius which is equal to the arch which meaſures the angle; and it is converted into the uſual denomination of degrees, by knowing that one degree, or the 360th part of the circumference, is $\frac{1}{57{,}296}$ of the radius, or that an arch of 57,296 degrees is equal to the radius.

When a ſolid body receives an impulſe on any one point, or when that point is any how urged by a moving force, it cannot move without the other points alſo moving. And whatever is the motion of any particle, that particle muſt be conceived as urged by a force preciſely competent to the production of that motion, by acting immediately on the particle itſelf. If this is not the particle immediately acted on by the external force, the force which really impels it is a force ariſing from the coheſion of the body. The particle immediately impelled by the external force is preſſed towards its neighbouring particles, or is drawn away from them; and, by this change of place, the connecting forces are brought into action, or are excited; they act on the particles adjoining, and change, or tend to change, their diſtances from the particles immediately beyond them; and thus the forces which connect this next ſeries of particles are alſo excited, and another ſeries of particles are made to exert their forces; and this goes on through the body till we come to the remote particle, whoſe motion we are conſidering. The forces which connect it with the adjoining ſeries of particles are excited, and the particle is moved. We frequently ſay that the external moving force is propagated through the body to the diſtant particle; but this is not accurate. The particle is really and immediately moved by the forces which connect it with thoſe adjoining. It will greatly aſſiſt our conception of the manner in which motion is thus produced in a diſtant particle, if we conſider the particles as ſo many little balls, connected with each other by ſlender ſpiral ſprings like cork-ſcrews. This would compoſe a maſs which would be compreſſible, or which could be ſtretched, &c. And if we give an impulſe to one of theſe balls, we ſhall ſet the whole aſſemblage in motion round any axis which we may ſuppoſe to ſupport it. Now any one of theſe balls is really and immediately moved by the elaſticity of the ſpiral wires which join it to its neighbours.

We are but little acquainted with the nature of theſe connecting forces. It can be learned only by the phenomena which are their effects. Theſe are various, almoſt beyond deſcription; but the mechanical philoſopher has little to do with this variety. The diſtinctions which are the immediate cauſes of fluidity, of hardneſs, ſoftneſs, elaſticity, ductility, are not of very difficult conception. There is one general fact which is ſufficient for our preſent purpoſe—the forces by which the particles of bodies act on each other are equal. This is a matter of unexcepted experience; and no other foundation can be given to it as a law of mechanical nature.

An immediate conſequence of this law is, that when two external forces A and B are in equilibrium by the intervention of a ſolid body (or rather when a ſolid body is in equilibrium between two external forces), theſe forces are equal and oppo-

ſite; for the force A is in fact in immediate equilibrium with the oppoſite forces exerted by the particle to which it is applied, and is therefore equal and oppoſite to the force reſulting from the combination of all the forces which connect that particle with the ſeries of particles immediately adjoining. This reſulting force may with propriety be called the equivalent of the forces from the combination of which it reſults. The uſe of this term will greatly abbreviate language. This firſt ſet of connecting forces conſiſts of a number of diſtinct forces correſponding to each particle of the ſeries, and each force has an equal and oppoſite force correſponding to it: therefore the compound force by which the firſt ſeries of particles acts on that to which the external force A is applied, is equal and oppoſite to the compound force which connects this firſt ſeries with the next ſeries. And the ſame thing muſt be ſaid of each ſucceeding ſeries of particles, till we come at laſt to the particle to which the external force B is immediately applied. The force exerted by this particle is equal and oppoſite to that external force; and it is equal to the compound force exerted by the ſecond ſeries of particles on that ſide; therefore the forces A and B are equal and oppoſite.

It reſults from this propoſition, that *when any number of external forces are applied to a ſolid body, and it is in equilibrio between them, they are ſuch as would be in equilibrio if they were all applied to one point.* Let the forces a A, b B, c C (fig. 2.), be applied to three particles of the ſolid body. Therefore a A is immediately in equilibrium with an equal and oppoſite force A α, reſulting from the compoſition of the force AD, which connects the particles A and B, and the force AE, which connects A with C. In like manner b B is immediately in equilibrio with B β, the equivalent of the forces BF and BG; and c C is in immediate equilibrio with the equivalent C $\varkappa$ of the forces CH and CI. We ſhall conceive it very clearly if we ſuppoſe the three forces A a, B b, C c, to be exerted by means of threads pulling at the ſolid body. The connecting parts between A and B, as alſo between A and C, are ſtretched. The lines AB and AC may be conſidered as elaſtic threads. Each thread is equally ſtretched through its whole length; and therefore if we take AD to repreſent the force with which the particle A is held back by the particle B, and if we would alſo repreſent the force with which B is held back by A, we muſt make BF equal to AD. Now the forces AD and BF are equal and oppoſite; ſo are the forces AE and CI; ſo are the forces CH and BG. Now it is evident, that if the ſix forces AD, BF, BG, CH, CI, AE, were applied to one particle, the particle would be in equilibrio; for each force is accompanied by an equal and oppoſite force: and if the force A α were applied in place of AD, AE, the equilibrium would remain, becauſe A α is equivalent to AD and AE. The ſame is true of B β and C $\varkappa$. Therefore if the three forces A α, B β, C $\varkappa$, were applied to one point, they would be in equilibrio. Conſequently if the three forces a A, b B, c C, which are reſpectively equal and oppoſite to A α B β, C $\varkappa$, are ſo applied, they will be in equilibrio. It is plain that this demonſtration may be extended to any number of forces.

We may juſt remark by the bye, that if three forces are thus in equilibrio, they are acting in one plane; and, if they are not parallel, they are really directed to one point: for any one of them muſt be equal and oppoſite to the equivalent of the other two; and this equivalent is the diagonal of a parallelogram, of which the other two are the ſides, and the diagonal and ſides of any parallelogram are in one plane; and ſince they are in one plane, and any one of them is in equilibrio with the equivalent of the other two, it muſt paſs through the ſame point with that equivalent, that is, through the point of concourſe of the other two.

Theſe very ſimple propoſitions are the foundation of the whole theory of ſtatics, and render it a very ſimple branch of mechanical ſcience. It has been made abſtruſe by our very attempts to ſimplify it. Many elaborate treatiſes have been written on the fundamental property of the lever, and in them all it has been thought next to an inſuperable difficulty to demonſtrate the equilibrium of a ſtraight lever when the parallel forces are inverſely as their diſtances from the fulcrum.

We think the demonſtrations of Archimedes, Fonſenex, D'Alembert, and Hamilton, extremely ingenious; but they only bring the mind into ſuch a ſtate of conception that it cannot refuſe the truth of the propoſition: and, except Mr. Hamilton's, they labour under the diſadvantage of being applicable only to commenſurable diſtances and forces. Mr. Vince's, in the Philoſophical Tranſactions for 1794, is the moſt ingenious of them all; and it is wonderful that it has not occurred long ago. The difficulty in them all has ariſen from the attempt to ſimplify the matter by conſidering a lever as an inflexible ſtraight line. Had it been taken out of this abſtract form, and conſidered as what it really is, a natural body, of ſome ſize, having its particles connected by equal and oppoſite forces, all difficulty would have vaniſhed.

That we may apply theſe propoſitions to explain the motion of rotation, we muſt recollect an unqueſtionable propoſition in dynamics, that the force which produces any motion is equal and oppoſite to the force which would prevent it, when applied in the ſame place and in the ſame line, or which would extinguiſh it in the ſame time in which we ſuppoſe it to be produced. Therefore the force which is excited and made to act on any particle of a body, by the action of an external force on another particle, ſo as to cauſe it to move round an axis, is equal and oppoſite to the force which, when applied to that particle in the oppoſite direction, would be in equilibrio with the external force.

The only diſtinct notion we can form of the magnitude of any moving force is the quantity of motion which it can produce by acting uniformly during ſome given time. This will be had by knowing the velocity which it will produce in a body of known bulk. Thus we know that the weight of ten pounds of matter acting on it for a ſecond will cauſe it to fall 16 feet with an uniformly accelerated motion, and will leave it in a ſtate ſuch that it would move on for ever at the rate of 32 feet in a ſecond; which we call communicating the velocity of 32 feet per ſecond. In the ſame manner, the beſt way of acquiring a diſtinct conception of the rotatory effort of a moving force, is to determine the quantity of rotatory motion which it can produce by acting uniformly during ſome known time.

Let a ſolid body turn round an axis paſſing through the point C (fig. 3.) perpendicular to the plane of this figure. Let this rotation be ſuppoſed to be produced by an external force acting in the direction FP. Let this force be ſuch, that if the body were free, that is, unconnected with any axis ſupported by fixed points, it would by acting uniformly during a ſmall moment of time, cauſe its centre of gravity G to deſcribe a line of a certain length parallel to FP. This we know to be the effect of a moving force acting on any ſolid body in free ſpace. The centre of gravity will always deſcribe a ſtraight line. Other particles may chance to move differently, if the body, beſides it progreſſive motion, has alſo a motion of rotation, as is generally the caſe. Draw GI parallel to FP, and make GI to GC as the velocity which the external force would communicate to the centre of the body (if moving freely, unconnected with a ſupported axis), to the velocity which it communicates to it in the ſame time round the axis C c. Alſo let m be the number of equal particles, or the quantity of matter in the body. Then m.GI will expreſs the quantity of motion produced by this

force, and is a proper meaſure of it as a moving force; for GI is twice the ſpace deſcribed during the given time with an uniformly accelerated motion.

But ſince the body cannot move any way but round the axis paſſing through C, the centre G will begin to move with the velocity, and in the direction, GH perpendicular to the line CG. And any particle A can only move in the direction AL, perpendicular to CA. Moreover, the velocities of the different particles are as their radii vectores; and CG is actually equal to the line GH, which expreſſes the velocity of a particle in G. Therefore CA will in like manner expreſs the velocity of the particle A. If A expreſs its quantity of matter, A·CA will expreſs its quantity of motion, and will repreſent the force which would produce it by acting uniformly during the moment of time.

We expreſſed the external moving force by $m.$ GI. Part of it is employed in exciting the force A CA, which urges the particle A. In order to diſcover what part of the external force is neceſſary for this purpoſe, draw CP perpendicular to FP. The preceding obſervations ſhow us, that the force wanted at A is equal to the force which, when applied at P in the direction FP, would balance the force A·CA applied to A in the direction LA. Therefore (by the property of the lever ACP, which is impelled at right angles at A and P) we muſt have CP to CA as the force A.CA to the balancing preſſure, which muſt be exerted at P, or at any point in the line FP. This preſſure is therefore $\frac{A \cdot CA \cdot CA}{CP}$ or $\frac{A \cdot CA^2}{CP}$. As we took $m.$ GI for the meaſure of the whole external force, GI being the velocity which it would communicate to the whole body moving in free ſpace, we may take Gi for the velocity which would be communicated to the whole body by the preſſure $\frac{A \cdot CA^2}{CP}$, and then this preſſure will be properly expreſſed by $m.$ Gi. In like manner, $m. i k$ may expreſs the portion of the external force employed in communicating to another particle B the motion which it acquires; and ſo on with reſpect to all the particles of the body.

It muſt be deſirable to ſee the manner in which the forces are really concerned in giving motion to the different particles.

Suppoſe the external force to act immediately on the external particle F. The line FC connecting this particle with the axis in C is either ſtretched or compreſſed by the effort of giving motion to a remote particle A. It is plain that, in the circumſtances repreſented in the figure, the line FC is compreſſed, and the axis is puſhed by it againſt its ſupports in the direction C$\varkappa$; and the body muſt, on this account, reſiſt in the oppoſite direction Ff. The particle A is dragged out of its poſition, and made to begin its motion in the direction AL perpendicular to AC. This cannot be, unleſs by the connection of the two lines AC, AF. A reſiſts by its inertia, and therefore both AC and AF are ſtretched by dragging it into motion. By this reſiſtance the line AC tends to contract itſelf again, and it pulls C in the direction Cc, and A in the direction Aa; and if we take Cc to repreſent the action on C, A a muſt be taken equal to it. In like manner AF is ſtretched and tends to contract, pulling F in the direction Fφ and A in the direction Aα with equal forces. Thus the particle A is pulled in the directions Aa and Aα; the particle F is pulled in the direction Fφ, and puſhed in the direction Ff; and C is pulled in the direction Cc, and puſhed in the direction C$\varkappa$. Aa and Aα have produced their equivalent AL, by which A is dragged into motion; Ff and Fφ produce their equivalent Fg, by which the external force is reſiſted, and Fg is equal and oppoſite to $m.$ Gi; the forces Cc and C$\varkappa$ produce their equivalent Cd by which the axis is preſſed on its ſupports, and this is reſiſted by an equal and oppoſite reaction of the ſupports in the direction dC. The forces therefore which excite in the body the motion A.AL are both external, viz. the impelling force g F, and the ſupporting force dC. AL therefore is not only the immediate equivalent of A a and A α, but alſo the remote equivalent of g F and d C. We may therefore aſcertain the proportion of g F (that is, of $m.$ G i) to AL (that is, of A.AC), independent of the property of the lever. g F is to AL in the ratio compounded of the ratios of g F to Fφ or A α, and of A α to AL. But we ſhall obtain it more eaſily by conſidering g F as the equivalent of AL and d C. By what has been demonſtrated above, the directions of the three forces g F, AL, and d C muſt meet in one point E, and g F muſt be equal to the diagonal t E of the parallelogram E e t ε, of which the ſides E e, E ε are reſpectively equal to AL and d C. Now t E is to E e as the ſine of the angle t e E to the ſine of the angle E t e, that is, as the ſine of CEA to the ſine of CEP, that is, as CA to CP, as we have already demonſtrated by the property of the lever. We preferred that demonſtration as the ſhorteſt, and as abundantly familiar, and as congenial with the general mechaniſm of rotatory motions. And the intelligent reader will obſerve, that this other demonſtration is nothing but the demonſtration by the lever expanded into its own elements. Having once made all our readers ſenſible of this internal proceſs of the excitement and operation of the forces which connect the particles, we ſhall not again have recourſe to it.

It is evident that the ſum of all the forces g F, or $m.$ G i, muſt be equal to the whole moving force $m.$ GI, that $m.$ P p may be $=$ $m.$ GI. That is, we muſt have $m.\ GI = \int \frac{A.CA^2}{CP}$; or, becauſe CP is given when the poſition of the line FP is given, we muſt have $m.\ GI = \frac{\int A.CA^2}{CP}$, where both A and CA are variable quantities.

This equation gives us $m.\ GI.CP = \int A.CA^2$. Now we learn in mechanics that the energy of any force applied to a lever, or its power of producing a motion round the fulcrum, in oppoſition to any reſiſtance whatever, is expreſſed by the product of the force by the perpendicular drawn from the fulcrum on the line of its direction. Therefore we may call $m.$ GI.CP the momentum, energy, or rotatory effort, of the force $m.$ GI. And in like manner $\int A.CA^2$ is the ſum of the momenta of all the particles of the body in actual rotation; and as this rotation required the momentum $m.$ GI.CP to produce it, this momentum balances, and therefore may expreſs the energy of all the reſiſtances made by the inertia of the particles to this motion of rotation. Or $\int A.CA^2$ may expreſs it. Or, take p to repreſent the quantity of matter in any particle, and r to repreſent its radius vector, or diſtance from the axis of rotation, $\int p.r^2$ will expreſs the momentum of inertia, and the equilibrium between the momentum of the external force $m.$ GI, acting in the direction FP, and the combined momenta of the inertia of all the particles of the whirling body, is expreſſed by the equation $m.\ GI.CP = \int A.CA^2, = \int pr^2$. The uſual way of ſtudying elementary mechanics gives us the habit of aſſociating the word equilibrium with a ſtate of reſt; and this has made our knowledge ſo imperfect. But there is the ſame equilibrium of the actual immediate preſſures when motion enſues from the action. When a weight A deſcending raiſes a ſmaller weight B by means of a thread paſſing over a pulley, the thread is equally ſtretched between the acting and reſiſting weights. The ſtrain on this thread is undoubtedly the immediate moving force acting on B, and the immediate reſiſting force acting on A.

The ſame equation gives us $GI = \frac{\int p \cdot r^2}{m \cdot CP}$.

Now $GI : CG = \frac{\int p \cdot r^2}{m \cdot CP} : CG, = \int p \cdot r^2 : m \cdot CP \cdot CG$; but CG repreſents the velocity of the centre. Hence we derive

this fundamental propofition $\int p \,.\, r^2 : m \,.\, CP \,.\, CG = GI : CG$; or, that $\int .\, p \,.\, r^2$ is to $m \,.\, CP \,.\, CG$ as the velocity of the body moving freely to the velocity of the centre of gravity round the axis of rotation.

Therefore the velocity of the centre is $= \frac{m.GI.CP.CG}{\int p \,.\, r^2}$.

The velocity of any point B is $= \frac{m.GI.CP.CB}{\int p r^2}$.

This fraction reprefents the length of the arch defcribed by the point B in the fame time that the body unconnected with any fixed points would have decribed GI.

Therefore the angular velocity (the arch divided by the radius) common to the whole body is $= \frac{m.GI.CP}{\int p r^2}$. It may be here afked, how this fraction can exprefs an angle? It evidently expreffes a number; for both the numerator and denominator are of the fame dimenfions, namely, furfaces. It therefore expreffes the portion of the radius which is equal to the arch meafuring the angle, fuch as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{5}{3}$, &c. And to have this angle in degrees, we have only to recollect that the radius is $= 57{,}2958$.

This angular velocity will be a maximum when the axis of rotation paffes through the centre of gravity G. For draw from any particle A the line A a perpendicular to CG, and join AG. Then $CA^2 = GA^2 + CG^2 \pm 2\,CG \times G\,a$. Therefore $\int CA^2 = \int GA^2 + \int CG^2 \pm \int 2\,CG \times G\,a, = \int GA^2 + m.\,CG^2 \pm \int 2\,CG \times G\,a$. But, by the nature of the centre of gravity, the fum of all the $+ G\,a$ is equal to that of all the $- G\,a$; and therefore $\pm \int 2\,GC \times G\,a$ is nothing; and therefore $\int CA^2 = \int GA^2 + m.\,CG^2$. Therefore $\int CA^2$ or $\int p\, r^2$ is fmalleft, and $\frac{m.\,GI.CP}{\int p\, r^2}$ is greateft when $m.\,CG^2$ is nothing, or when CG is nothing; that is, when C and G coincide.

The abfolute quantity of motion in the whirling body, or the fum of the motions of all its particles, is $\frac{m\,.\,GI.CP\,.\int p.r}{\int p\, r^2}$. For the motion of each particle is $\frac{m\,.\,GI\,.\,CP\,.\,p\,r}{\int p\, r^2}$.

The refiftance which a given quantity of matter makes to a motion of rotation is proportional to $\int p\, r^2$. For this muft be meafured by the forces, which muft be fimilarly applied in order to give it the fame angular motion or angular velocity. Thus let one external force be $m.\,GI$, and the other $m.\,\gamma\iota$.—Let both be applied at the diftance CP. Let r be the radius vector in the one body, and ρ in the other; now the angular velocities $\frac{m\,.\,GI\,.\,CP}{\int p\, r^2}$ and $\frac{m\,.\,\gamma\iota\,.\,CP}{\int p\, \rho^2}$ are equal by fuppofition. Therefore $m\,.\,GI : m\,.\,\gamma\iota = \int p\, r^2 : \int p\, \rho^2$.

As in the communication of motion to bodies in free fpace a given force always produces the fame quantity of motion; fo in the communication of motion to bodies obliged to turn round axes, a given force, applied at a given diftance from the axes, always produces the fame quantity of momentum. Whence it may eafily be deduced (and we fhall do it afterwards), that as in the communication of motion among free bodies the fame quantity of motion is preferved, fo in the communication of motion among whirling bodies the fame quantity of whirling motion is preferved.

This is a propofition of the utmoft importance in practical mechanics, and may indeed be confidered as the fundamental propofition with refpect to all machines of the rotatory kind when performing work; that is, of all machines which derive their efficacy from levers or wheels. There is a valuable fet of experiments by Mr. Smeaton in the Philofophical Tranfactions, vol. lxvi. which fully confirm it. We fhall give an example by and by of the utility of the propofition, fhowing how exceedingly imperfect the ufual theories of mechanics are which do not proceed on this principle.

With refpect to the general propofition from which all thefe deductions have been made, we muft obferve, that the demonftration is not reftricted to the time neceffary for caufing each particle to defcribe an arch equal to the radius vector. We affumed the radius vector as the meafure of the velocity merely to fimplify the notation. Both the progreffive motion of the free body and the rotation of the whirling body are uniformly accelerated, when we fuppofe the external force to act uniformly during any time whatever; and the fpaces defcribed by each motion in the fame time are in a conftant ratio. The formulæ may therefore with equal propriety reprefent the momentary accelerations in the different cafes.

It muft alfo be obferved, that it is not neceffary to fuppofe that all the particles of the body are in one plane, and that the moving force acts in a line FP lying alfo in this plane. This was tacitly allowed, merely to make the prefent inveftigation (which is addreffed chiefly to the practical mechanic) more familiar and eafy. The equilibrium between the force A × CA, which is immediately urging the particle A, and the force $m.\,GI$ employed at P or F, in order to excite that force at A, would have been precifely the fame although the lines AC and FP had been in different planes, provided only that thefe planes were parallel. This is known to every perfon in the leaft acquainted with the wheel and axle. But if the external moving force does not act in a plane parallel to the circles of rotation of the different particles, it muft be refolved into two forces, one of which is perpendicular to thefe planes, or parallel to the axis of rotation, and the other lying in a plane of rotation. And it is this laft only that we confider as the moving force; the other tends merely to pufh the body in the direction of its axis, but has no tendency to turn it round that axis. When we come to confider the rotation of a body perfectly free, it will be neceffary to attend particularly to this circumftance. But there are feveral important mechanical propofitions which do not require this.

The motion of any body is eftimated by that of its centre of gravity, as is well known. The difference between the motion of the centre of a free body and the motion of the centre of a body turning round an axis, is evidently owing to the connection which the parts of the body have with this axis, and to the action of the points of fupport on this axis. This action muft be confidered as another *external* force, combined with that which acts on the particle P, and therefore muft be fuch as, if combined with it, would produce the very motion which we obferve. That is, if we fuppofe the body unconnected with any fixed points, but as having its axis acted on by the fame forces which thefe points exert, the body would turn as we obferve it to do, the axis remaining at reft.

Therefore join I and H, and complete the parallelogram GIHK. It is plain that $m.\,GK$ muft reprefent the forces exerted by the axis on the fixed points.

If therefore GI fhould coincide with GH, and the point I with the point H, the force GK vanifhes, and the body *begins* to turn round C, without exerting any preffure on the points of fupport; and the initial motion is the fame as if the body were free. Or, the axis at C is then a *fpontaneous* axis of converfion.

That this may be the cafe, it is neceffary in the firft place, that the external force act in a direction perpendicular to CG; for GI is always parallel to FP: it being a leading propofition in dynamics, that when a moving force acts on any part whatever of a folid body, unconnected with fixed points, the centre of gravity will proceed in a ftraight line parallel to the direction

of that force. In the next place GH muſt be equal to GI; that is, $\frac{m . GI . CP.CG}{\int p\,r^2}$ is equal to GI, or $\frac{m . CP . CG}{\int p\,r^2} = 1$, and $CP = \frac{\int p\,r^2}{m.CG}$.

The equation $CP = \frac{\int p\,r^2}{m.CG}$ gives us $m . CG . CP = \int p\,r^2, = \int A . CA^2$. But it was ſhown before, that $\int A . CA^2 = \int A . GA^2 + m . CG^2$. Therefore $\int A . GA^2 = m . CG . CP - m . CG . CG, = m . CG\ (CP - CG), = m . CG . GP$. Therefore we have (for another determination of the point of impulſe P ſo as to annihilate all preſſure on the axis) $GP = \frac{\int A . GA^2}{m . CG}$. This is generally the moſt eaſily obtained, the mathematical ſituation of the centre of gravity being well known.

N. B. When $CP = \frac{\int p\,r^2}{m . CG}$, we ſhall always have the *velocity* of the centre the ſame as if the body were free, but there will always be a preſſure on the points of ſupport, unleſs FP be alſo perpendicular to CG. In other poſitions of FP the preſſure on the axis, or on its points of ſupport, will be $m . GI \times 2$ ſin. GCP.

It would be a deſirable thing in our machines which derive their efficacy from a rotatory motion, to apply the preſſures ariſing from the power and from the reſiſtance oppoſed by the work in ſuch a manner as to annihilate or diminiſh this preſſure on the ſupports of the axis of motion. Attention to this theorem will point out what may be done; and it is at all times proper, nay neceſſary, to know what are the preſſures in the points of ſupport. If we are ignorant of this, we ſhall run the riſk of our machine failing in thoſe parts; and our anxiety to prevent this will make us load it with needleſs and ill-diſpoſed ſtrength. In the ordinary theories of machines, deduced entirely from the principles of equilibrium, the preſſure on the points of ſupport (excluſive of what proceeds from the weight of the machine itſelf) is ſtated as the ſame as if the moving and reſiſting forces were applied immediately to theſe points in their own directions. But this is in all caſes erroneous; and, in caſes of ſwift motions, it is greatly ſo. We may be convinced of this by a very ſimple inſtance. Suppoſe a line laid over a pulley, and a pound weight at one end of it, and ten pounds at the other; the preſſure of the axis on its ſupport is eleven pounds, according to the uſual rule; whereas we ſhall find it only $3\frac{7}{11}$. For, if we call the radius of the pulley 1, the momentum of the moving force is $10 \times 1 - 1 \times 1, = 9$; and the momentum of inertia is $10 \times 1^2 + 1 \times 1^2 . = 11$. Therefore the angular velocity is $\frac{9}{11}$. But the diſtance CG of the centre of gravity from the axis of motion is alſo $\frac{9}{11}$, becauſe we may ſuppoſe the two weights in contact with the circumference of the pulley. Therefore the velocity of the centre of gravity is $\frac{9}{11} \times \frac{9}{11}, = \frac{81}{121}$ of its natural velocity. It is therefore diminiſhed $\frac{40}{121}$ by the figure of the axis of the pulley, and the 11 pounds preſs it with $\frac{40}{121}$ of their weight, that is with $3\frac{7}{11}$ pounds.

Since all our machines conſiſt of inert matter, which requires force to put it in motion, or to ſtop it, or to change its motion, it is plain that ſome of our natural power is expended in producing this effect; and ſince the principles of equilibrium only ſtate the proportion between the power and reſiſtance which will preſerve the machine at reſt, our knowledge of the actual performance of a machine is imperfect, unleſs we know how much of our power is thus employed. It is only the remainder which can be ſtated in oppoſition to the reſiſtance oppoſed by the work. This renders it proper to give ſome general propoſitions, which enable us to compute this with eaſe.

It would be very convenient, for inſtance, to know ſome point in which we might ſuppoſe the whole rotatory part of the machine concentrated; becauſe then we could at once tell what the momentum of its inertia is, and what force we muſt apply to the impelled point of the machine, in order to move it with the deſired velocity.

Let S, fig. 3. be this point of a body turning round the ſupported axis paſſing through C; that is, let S be ſuch a point, that if all the matter of the body were collected there, a force applied at P will produce the ſame angular velocity as it would if applied at the ſame point of the body having its natural form.

The whole matter being collected at S, the expreſſion $\frac{m.GI.CP}{\int p . r^2}$ of the angular velocity becomes $\frac{m.GI.CP}{m . CS^2}$; and theſe are equal by ſuppoſition. Therefore $\int p\ r^2 = m . CS^2$, and $CS = \sqrt{\frac{\int p\,r^2}{m}}$.

This point S has been called the CENTRE of GYRATION.

In a line or ſlender rod, ſuch as a working beam, or the ſpoke of a wheel in a machine, CS is $\sqrt{\frac{1}{3}}$ of its length.

In a circle or cylinder, ſuch as the ſolid drum of a capſtan, $CS = \sqrt{\frac{1}{2}}$ its radius, or nearly $\frac{7}{10}$. But if it turns round one of its diameters, $CS = \frac{1}{2}$ radius.

In the periphery of a circle, or rim of a wheel, CS = radius nearly.

If it turn round a diameter, $CS = \sqrt{\frac{1}{2}}$ radius. The ſurface of a ſphere, or a thin ſpherical ſhell, turning round a diameter, has $CS = \sqrt{\frac{2}{3}}$ radius, or nearly $\frac{4}{5}$ or $\frac{5}{6}$.

A ſolid ſphere turning round a diameter has $CS = \sqrt{\frac{2}{5}}$ radius, or nearly $\frac{7}{11}$. This is uſeful in the problem of the preceſſion of the equinoxes. We may obſerve by the way, that if we conſider the whirling body as a ſyſtem of ſeveral bodies with rigid or inflexible connections, we may conſider all the matter of each of theſe bodies as united in its centre of gyration, and the rotation of the whole will be the ſame; for this does not change the value of $\frac{\int p\,r^2}{m}$.

There is another way of making this correction of the motion of a machine, or allowing for the inertia of the machine itſelf, which is rather ſimpler than the one now given. We can ſuppoſe a quantity of matter collected at the point to which the moving force is applied, ſuch that its inertia will oppoſe the ſame reſiſtance to rotation that the machine does in its natural form. Suppoſe the moving force applied at P, as before, and that inſtead of the natural form of the body a quantity of matter $= \frac{\int p\,r^2}{CP}$, collected at P; the moving force will produce the ſame angular velocity as on the body, in its natural form.

For the angular velocity in this caſe muſt be $\frac{m . GI . CP}{\frac{\int p\,r^2}{CP^2} . CP^2}$, which is $= \frac{m.GI.CP}{\int p\,r^2}$, the ſame as before.

A point O may be found, at ſuch a diſtance from the axis, that if all the matter of the body were collected there, and an external force m. GI applied to it in a direction perpendicular or any how inclined to CO, it will produce the ſame angular velocity as when applied to the centre of gravity G, with the ſame inclination to the line CG.

In this caſe, the angular velocity muſt be $\frac{m.GI.CO}{m . CO^2}$, which is

$=\frac{GI}{CO}$. This muſt be equal (by ſuppoſition) to the angular velocity where the ſame force $m.GI$ is applied in the ſame inclination to G.—The angular velocity in this caſe muſt be $\frac{m.GI.CG}{\int p\,r^2}$. Therefore we have $\frac{GI}{CO}=\frac{m.GI.CG}{\int p\,r^2}$, and $\frac{CO}{GI}=\frac{\int p\,r^2}{m.GI.CG}$, and $CO=\frac{\int p\,r^2}{m.CG}$. Alſo, as in a former caſe $GO=\frac{\int A.GA^2}{m.CG}$.

This point O has ſeveral remarkable properties.

In the firſt place, it is the point of a common heavy body ſwinging round C by its gravity, where, if all its weight be ſuppoſed to be concentrated, it will perform its oſcillations in the ſame time. For while the body has its natural form, the whole force of gravity may be ſuppoſed to be exerted on its centre of gravity. When the matter of the body is collected at O, the force of gravity is concentrated there alſo; and if CG have the ſame inclination to the horizon in the firſt caſe that CO has in the ſecond, the action of gravity will be applied in the ſame angle of inclination, and the two bodies will acquire the ſame angular velocity; that is, they will deſcend from this ſituation to the vertical ſituation (that is, through an equal angle) in the ſame time. Theſe two bodies will therefore oſcillate in equal times. For this reaſon, the point O ſo taken in the line CG, which is the radius vector of the centre of inertia, that CO is equal to $\frac{\int A.CA^2}{m.CG}$, or $GO=\frac{\int A.GA^2}{m.CG}$, is called the Centre of Oscillation of the body; and a heavy point ſuſpended by a thread of the length CO is called its *equivalent* or *ſynchronous pendulum*, or the *ſimple pendulum*, correſponding to the body itſelf, which is conſidered as a *compound pendulum*, or as conſiſting of a number of ſimple pendulums, which by their rigid connection diſturb each other's motions.

That CO may be the equivalent pendulum, and O the centre of oſcillation, O muſt be in the line CG, otherwiſe it would not reſt in the ſame poſition with the body, when no force was keeping it out of its vertical poſition. The equation $CO=\frac{\int A.CA^2}{m.CG}$ only determines the diſtance of the centre of oſcillation from the centre of ſuſpenſion, or the length of the equivalent ſimple pendulum, but does not determine the preciſe point of the body occupied by the centre of oſcillation; a circumſtance alſo neceſſary in ſome caſes.

Mathematicians have determined the ſituation of this point in many caſes of frequent occurrence. Huygens, in his *Horologium Oſcillatorium*, and all the beſt writers of treatiſes of mechanics, have given the method of inveſtigation at length. The general proceſs is, to multiply every particle by the ſquare of its diſtance from the axis of ſuſpenſion, and to divide the ſum of all theſe products by the product of the whole quantity of matter multiplied by the diſtance of its centre of gravity from the ſame axis. The quotient is the diſtance of the centre of oſcillation, or the length of the equivalent ſimple pendulum: for $CO=\frac{\int p.r^2}{m.CG}$.

a. If the body be a heavy ſtraight line, ſuſpended by one extremity, CO is $\frac{2}{3}$ of its length.

b. This is nearly the caſe of a ſlender rod of a cylindrical or priſmatic ſhape. It would be exactly ſo if all the points of a tranſverſe ſection were equally diſtant from the axis of ſuſpenſion.

c. If the pendulum be an iſoſceles triangle ſuſpended by its apex, and vibrating perpendicularly to its own plane, CO is $\frac{3}{4}$ of its height.

d. This is nearly true of a very ſlender triangle (that is, whoſe height many times exceeds its baſe) ſwinging round its vertex in any direction.

e. In a very ſlender cone or pyramid ſwinging from its vertex, CO is $\frac{4}{5}$ of its height nearly.

f. If a ſphere, of which r is the radius, be ſuſpended by a thread whoſe weight may be neglected, and whoſe length is l, the diſtance between its centre of ſuſpenſion and centres of oſcillation is $a+r+\frac{2}{5}\frac{r^2}{+r}$; and the diſtance betweeen its centres of bulk and oſcillation is $\frac{2}{5}\frac{r}{a+r}$. Thus, in a common ſecond's pendulum whoſe length at London is about $39\frac{1}{8}$ inches, the centre of oſcillation will be found about $\frac{1}{100}$ of an inch below the centre of the ball, if it be two inches in diameter.

g. If the weight of the thread is to be taken into the account, we have the following diſtance between the centre of the ball and that of oſcillation, where B is the weight of the ball, a the diſtance of the point of ſuſpenſion and its centre, d the diameter of the ball, and w the weight of the thread or rod, $GO=\frac{(\frac{1}{3}w+\frac{2}{5}B)\,d^2-\frac{1}{2}w\,(ad+a^2)}{(\frac{1}{2}w+B)\,a-\frac{1}{2}dw}$; or, if we conſider the weight of the thread as an unit, and the weight of the ball as its multiple (or as expreſſed by the number of times it contains the weight of the thread), $GO=\frac{\frac{1}{6}a}{B+\frac{1}{2}}$.

As the point O, determined as above, by making $CO=\frac{\int p\,r^2}{m.CG}$, is the centre of oſcillation of the body turning round C, ſo C is the centre of oſcillation of the ſame body turning round O: for, reſuming A.CA in place of $p\,r$, we have $\int A.CA^2=m.CO.CG$. Now $\int A.CA^2=\int A.OA^2+\int A.OC^2-\int A.OC.\ 2\,O\acute{a}$, (Euclid, II. 12. 13.), or $m.CO.CG=\int A.OA^2+\int A.OC^2-\int A.OC.\ 2O\acute{a}$. But $\int A.OC^2=m.OC^2,=m.OC.OC$; and (by the nature of the centre of gravity) $\int A.OC.\ 2O\acute{a}=m.OC.\ 2\,OG$. Therefore we have $m.CO.CG=\int A.OA^2+m.OC.OC-m.OC.\ 2\,OG$; and $\int A.OA^2=m.OC.CG+m.CO.\ 2\,OG-m.CO.CO,=m.CO\,(CG+2\,OG-CO)$. But $CG+2\,OG$ is equal to $CO+OG$, and $CG+2\,OG-CO$ is equal to OG. Therefore $\int A.OA^2=m.CO.OG$, and $CO=\frac{\int A.OA^2}{m.OG}$, which is all that is wanted to make C the centre of oſcillation when O is the centre of ſuſpenſion.

If the point of ſuſpenſion, or axis of rotation, be anywhere in the circumference of a circle of which G is the centre, the point O will be in the circumference of another circle of which G is the centre: for $GO=\frac{SA.GA^2}{m.CG}$. Now $\int A.GA^2$ is a fixed quantity; and therefore while CG is conſtant, OG will alſo be conſtant.

We may alſo obſerve, that the diſtance of the axis from the centre S of gyration is a mean proportional between its diſtance from the centre G of gravity and the centre O of oſcillation: for we have ſeen $CS^2=\frac{\int p\,r^2}{m}$, and $CO=\frac{\int p-r^2}{m.CG}$, and therefore $CO.CG=\frac{\int p\,r^2}{m}=CS^2$ and $CO:CS=CS:CG$.

We ſee alſo that the diſtance CO is that at which an external force muſt be applied; ſo that there may not be any preſſure excited in the axis upon its points of ſupport, and the axis may be a ſpontaneous axis of converſion. This we learn, by comparing the value of CO with that of CP in page 113. This being the caſe, it follows, that if an external force be applied in a direction paſſing through O, perpendicularly to CO, it will

produce the ſame initial velocity of the centre as if the body were free: for as it exerts no preſſure on the points of ſupport, the initial motion muſt be the ſame as if they were not there.

If the external force be applied at a greater diſtance in the line CG, the velocity of the centre will be greater than if the body were free. In this caſe the preſſure excited in the axis will be backward, and conſequently the points of ſupport will re-act forward, and this re-action will be equivalent to another external force conſpiring with the one applied at O. Some curious conſequences may be deduced from this.

If the external force be applied to a point in the line GC, lying beyond C, the motion of the centre will be in the oppoſite direction to what it would have taken had the body been free, and ſo will be the preſſures exerted by the points of ſupport on the axis.

A force $m.$GI applied at P produces the initial progreſſive motion $m.$GH; and *any* force applied at O, perpendicularly to CG, produces the ſame motion of the centre as if the body were free. Therefore a force m. GH applied thus at O will produce a motion m. GH in the centre, and therefore the ſame motion which m. GI applied at P would produce; and it will produce the momentum m. GI at P. Therefore if a force equal to the progreſſive motion of the body be applied at O, perpendicularly to CO, in the oppoſite direction, it will ſtop all this motion without exciting any ſtrain on the axis or points of ſupport. Therefore the equivalent of all the motions of each particle round C is conceived as paſſing through O in a direction perpendicular to CO; and the blow given by that point to any body oppoſed to its motion is conſidered as equal to the compounded effect of the rotatory motion, or to the progreſſive motion of the body combined with its rotation

For ſuch reaſons O has been called the Centre of Percussion of the body turning round C. But the name of *centre of momentum*, or *rotatory effort*, would have been more proper.

We can feel this property of the point O when we give a ſmart blow with a ſtick. If we give it a motion round the joint of the wriſt only, and ſtrike ſmartly with a point conſiderably nearer or more remote than $\frac{2}{3}$ of its length, we feel a painful ſhock or wrench in the hand; but if we ſtrike with that point which is preciſely at $\frac{2}{3}$ of its length, we feel no ſuch diſagreeable ſtrain.

Mechanical writers frequently ſay, that O, conſidered as the centre of percuſſion, is that with which the moſt violent blow is ſtruck. But this is by no means true; O is that point of a body turning round C which gives a blow preciſely equal to the progreſſive motion of the body, and in the ſame direction. As we have already ſaid, it is the point where we may ſuppoſe the whole rotatory momentum of the body accumulated. Every particle of the body is moving in a particular direction, with a velocity proportional to its diſtance from the axis of rotation; and if the body were ſtopped in any point, each particle tending to continue its motion endeavours to drag the reſt along with it. Whatever point we call the centre of percuſſion ſhould have this property, that when it is ſtopped by a ſufficient force, the whole motion and tendency to motion of every kind ſhould be ſtopped; ſo that if at that inſtant the ſupports of the axis were annihilated, the body would remain in abſolute reſt.

The conſideration of a very ſimple caſe will ſhow that this point of ſtoppage cannot be taken indifferently. Suppoſe a ſquare or rectangular board CDD'C', fig. 4. advancing in the direction GH, perpendicular to its plane, without any rotation. Let G be the centre of gravity, and the middle of the board. It is evident, that if a force be applied at G, in the direction HG, and equal to the quantity of motion of the board, all motion will be ſtopped: for when the point G is ſtopped, no reaſon can be aſſigned why one part of the board ſhall advance more than another. The ſame thing muſt happen if the board be ſtopped by a ſtraight edge put in its way, and paſſing through G: for example, in the line LGM, or g G b. But if this edge be ſo placed that the board ſhall meet it with the line IPK, then, becauſe this line does not divide it equally, and becauſe there is a greater quantity of motion in the part CIKC than in the part IDDK, though the progreſſive motion may be ſtopped, the upper part will advance, and a motion of rotation will commence, of which IK will be the axis. Now ſuppoſe that the board, inſtead of having been moving along in the direction GH, every part with the ſame velocity had been ſwinging round the axis CC like a pendulum, from the poſition C d d' C', and that it is ſtopped by a ſtraight edge meeting it in the line LGM parallel to CC', in the moment that it has attained the vertical poſition CDD C'; all its motion will not be ſtopped: for, although LGM divides the board equally, there is more motion in the lower part LDD'M than in the upper part CLMC', becauſe every particle of the lower part is deſcribing larger circles and moving ſwifter. Therefore when the line LGM is ſtopped, there will be a *tendency* of the lower part to advance, and the pivots C and C' of the axis will be preſſed backwards on their holes; and if the holes were at that inſtant removed, a rotation would commence, of which LM is the axis. The board muſt therefore be ſtopped in ſome line IPK below LGM, and ſo ſituated, that the ſum of all the momenta on each ſide of it ſhall be equal. This alone can hinder a rotation round the axis IPK. From what has been already demonſtrated, it appears, that this will be prevented if the edge meets the board in a line IPK paſſing through O the centre of oſcillation, which is ſituated in the line g G b paſſing through the centre of gravity perpendicular to the axis CC'. This line IOK may therefore be called the *line* or *axis* of percuſſion.

But any point of this line will not do. It is evident that if the board ſhould meet the fixed edge in the line g GO b, all motion will be ſtopped, for the motions on each ſide are equal, and neither can prevail. But if it be ſtopped in the line p P q, there is more motion in the part $p\,q$ D'C' than in the part $p\,q$ DC: and if the ſupports at C and C' were that inſtant taken away, there would commence a rotation round the axis $p\,q$. Conſequently, if the body were not ſtopped by an edge, but by a ſimple point at P, this rotation would take place. The motions above and below P. would indeed balance each other, but the motions on the right and left ſides of it would not. Therefore it is not enough for determining the centre of percuſſion that we have aſcertained its diſtance g O from the axis of rotation by the equation $g\,O = \frac{\int p\, r^2}{m\, g\, G}$. This equation only gives us the line IOK parallel to CC', but not the point of percuſſion. This point (ſuppoſe it P) muſt be ſuch that if any line p P q be drawn through it, and conſidered as an axis round which a rotation *may* commence, it *ſhall not* commence, becauſe the ſum of all the momenta round this axis on the right ſide is equal to the ſum of the momenta on the left. Let us inveſtigate in what manner this condition may be ſecured.

Let there be a body in a ſtate of rotation round the axis D d (fig. 5.), and let G be its centre of gravity, and CGO a line through the centre of gravity perpendicular to the axis DC d. At the moment under conſideration, the centre of gravity is moving in the direction GH, perpendicular to the radius vector GC, as alſo perpendicular to a plane paſſing through the lines D d and CG. Let O be the centre of oſcillation. Draw the line n O parallel to D d. The centre of percuſſion muſt be ſomewhere in this line. For the point of percuſſion, wherever it is, muſt be moving in the ſame direction with the progreſſive motion of the body, that is, in a direction parallel to GH, that is, perpendicular to the plane DCG. And its diſtance from the axis D d muſt be the ſame

with that of the centre of oſcillation. Theſe conditions require it therefore to be in ſome point of *n* O. Suppoſe it at P. Draw P *p* perpendicular to D *d*. P muſt be ſo ſituated, that all the momenta tending to produce a rotation round the line *p* P may balance each other, or their ſum total be nothing.

Now let A be any particle of the body which is out of the plane DCG, in which lie all the lines CGO, *p* P *n* OP, &c. Draw its radius vector A *a* perpendicular to D *a*, and draw *a n* parallel to CG, and therefore perpendicular to D *a*. The plane A *a n* is perpendicular to the plane D *a n* (Euclid, XI. 4). Draw AL, perpendicular to A *a*, and A *l* perpendicular to *a n*. Then, while the body is beginning to turn round D *d*, the incipient motion of the particle A is in the direction AL, perpendicular to its radius vector A *a*. This motion AL may be conſidered as compounded of the motion A *l*, perpendicular to the plane DCG, and the motion *l* L in this plane. It is evident that it is A *l* only which is oppoſed by the external force ſtopping the body at P, becauſe A *l* alone makes any part of the progreſſive motion of the centre of gravity in the direction GH.

We have hitherto taken the *radii vectores* for the meaſures of the velocities or motions of the particles. Therefore the quanty of motion or the moving force of A is A.A*a*, and this is exerted in the direction AL, and may be conceived as exerted on any point in this line, and therefore on the point L. That is, the point L might be conſidered as urged in this direction with the force A.A *a*, or with the two forces of which the force A.A *a* is compounded. The force in the direction AL is to the force in the direction A *l* as AL to A *l*, or as *a* A to *a l*, becauſe the triangles A *l* L and *a l* A are ſimilar. Therefore, inſtead of ſuppoſing the point L urged by the force A.A *a*, acting in the direction AL, we may ſuppoſe it impelled by the force A.*a l*, acting perpendicularly to the line A *l*, or to the plane DCG, and by the force A.A *l* acting in this plane, viz. in the direction L *n*. This laſt force has nothing to do with the percuſſion at P. Therefore we need conſider the point L as only impelled by the force A.A *l*. The momentum of this force, or its power to urge the plane DCG forward in the direction GH, by turning it round D *d*, muſt be A.*a l*.*a* L. (*N. B.* This is equal to $A.Aa^2$, becauſe *a l* : *a* A = *a* A : *a* L, and $A.Aa^2$, has been ſhown long ago to be the general expreſſion of the rotatory momentum of a particle).

Draw L *m* perpendicular to P *p*. If we conſider P *p* as an axis about which a motion of rotation may be produced, it is plain that the momentum of the point L to produce ſuch a rotation will be A.*a l*. L *m*. In like manner, its momentum for producing a rotation round *n* P would be A.*a l*. L.*n*. In general, its momentum for producing rotation round any axis is equal to the product of the perpendicular force at L (that is, A.*a l*) and the diſtance of L from this axis.

In order therefore that P may be the centre of percuſſion, the ſum of all the forces A.*a l*.L *m* muſt be equal to nothing; that is, the ſum of the forces A.*a l*. L *m* on one ſide of this axis P *p* muſt be balanced by the ſum of forces A′. *á l*′. L′ *m*′ on the other ſide. To expreſs this in the uſual manner, we muſt have $\int A.al.nP=0$. But $nP=nO-OP$. Therefore $\int A.al.nO-\int A.al.OP=0$, and $\int A.al.nO=\int A.al.OP$. But OP is the ſame wherever the particle A is ſituated; and becauſe G is the centre of gravity, the ſum of all the quantities A.*a l* is *m*.GC, *m* being the quantity of matter of the body; that is, $\int A.al=m.GC$, and $\int A.al.OP=m.GC.OP,=\int A.al.nO$. Hence we derive the final equation $OP=\frac{\int A.al.nO}{m.GC}$.

Therefore the centre of percuſſion P of a body turning round the axis D *d* is determined by theſe conditions: 1ſt, It is in the plane DCG paſſing through the axis and the centre of gravity; 2d, It is in a line *n* O paſſing through the centre of oſcillation, and parallel to the axis, and therefore its diſtance P *p* from the axis of rotation is $\frac{\int A.Aa^2}{m.CG}$; and, 3d, Its diſtance OP from the centre of oſcillation is $\frac{\int A.al.nO}{m.CG}$.

In order therefore that the centres of oſcillation and percuſſion may coincide, or be one and the ſame, OP muſt vaniſh, or SA *a l*. *n* O muſt be equal to nothing, that is, the ſum of all the quantities A. *a l*. *n* O on one ſide of the line CO muſt be equal to the ſum of all the quantities A′. *á l*′. *n*′ O on the other ſide.

Let D *d* δ Δ be a plane paſſing through the axis D *d* perpendicular to that other plane DCG through it, in which the centre of gravity is ſituated, and let C *g* γ κ be a third plane paſſing through the centre of gravity perpendicular to both the planes D *d* δ Δ and DCG. Draw *l r* and *a* α perpendicular to *a* L, and *r* α′ perpendicular to *c r*, and then draw A α, A α′ perpendicular to *a* α and *r* α′. It is evident that A α and A α′ are reſpectively equal to *a l* and *l r*, or to *a l* and *n o*; ſo that the two factors or conſtituents of the momentum of a particle A round the centre of percuſſion are the diſtances of the particle from the planes D *d* δ Δ and κ *c g* γ, both of which are perpendicular to that plane through the axis in which the centre of gravity is placed.

We may ſee, from theſe obſervations, that the centres of oſcillation and percuſſion do not neceſſarily coincide, and the circumſtance which is neceſſary for their coincidence, viz. that ∫A. A α. A α′ is equal to O. It is of importance to keep this in mind.

There occurs here another obſervation of great importance. Since every force is balanced by an equal force acting in the oppoſite direction, and ſince all motion progreſſive and rotatory is ſtopped by an external force applied at P in the direction *q* P, it follows that, if the body were at reſt, and the ſame force be applied there, it will ſet the body in rotation round the axis D *d*, in the oppoſite direction, with the ſame angular velocity, and without any preſſure on the pivots D and *d*. For whatever motion of the particle A, in the direction AL, was ſtopped by a part of the external force applied at P, the ſame motion will be produced by it in the quieſcent particle A in the oppoſite direction LA. And as the pivots D and *d* had no motion in the caſe of the body turning round them, they will acquire no motion, or will have no tendency to motion, or no preſſure will be exerted on them, in the laſt caſe. Therefore when an external force is applied at P in a direction perpendicular to the line P *p*, the line D *d* will become a momentary ſpontaneous axis of converſion, and the incipient motion of the body will perfectly reſemble the rotation of the ſame body round a fixed axis D *d*.

There is another ſet of forces of which we have as yet taken no notice, viz. that part of each force AL which is directed along the plane DCG, and is repreſented by *l* L when the whole force is repreſented by AL, or by A *l* when the whole force is repreſented by A *a*. Theſe forces being all in the plane DCG, and in the direction CG or GC, can have no effect on the rotation round any axis in that plane. But they tend, ſeparately, to produce rotation round any axis paſſing through this plane perpendicularly. And the momentum of A to produce a rotation round an axis perpendicular to this plane, in O for inſtance, muſt evidently be A.A *l*.*n* O, and round P it muſt be A.A *l*. *n*.P, &c. We ſhall have occaſion to conſider theſe afterwards.

It is uſual in courſes of experimental philoſophy to illuſtrate the motions of bodies on inclined planes and curved ſurface by experiments with balls rolling down theſe ſurfaces. But he

motions of ſuch rolling balls are by no means juſt repreſentations of the motions they repreſent. The ball not only goes down the inclined plane by the action of gravity, but it alſo turns round an axis. Force is neceſſary for producing this rotation; and as there is no other ſource but the weight of the ball, part of this weight is expended on the rotation, and the remainder only accelerates it down the plane. The point of the ball which reſts on the plane is hindered from ſliding down by friction; and therefore the ball tumbles, as it were, over this point of contact, and is inſtantly catched by another point of contact, over which it tumbles in the ſame manner. A cylinder rolls down in the very ſame way; and its motion is nearly the ſame as if a fine thread had been lapped round it, and one end of it made faſt at the head of the inclined plane. The cylinder rolls down by unwinding this thread.

The mechaniſm of all ſuch motions (and ſome of them are important) may be underſtood by conſidering them as follows: Let a body of any ſhape be connected with a cylinder FCB (fig. 6.) whoſe axis paſſes through G the centre of gravity of the body. Suppoſe that body ſuſpended from a fixed point A by a thread wound round the cylinder. This body will deſcend by the action of gravity, and it will alſo turn round, unwinding the thread. Draw the horizontal line OGC. It will paſs through the point of contact C of the thread and cylinder, and C is the point round which it *begins* to turn in deſcending. Let O be its centre of oſcillation correſponding to the momentary centre of rotation C. It will begin to deſcend in the ſame manner as if all its matter were collected in O: for it may be conſidered, in this inſtant, as a pendulum ſuſpended at C. But in this caſe O will deſcend in the ſame manner as if the body were falling freely. Therefore the velocity of G (that is, the velocity of deſcent) will be to the velocity with which a heavy body would fall as CG to CO. Now ſince the points C, G, O, are always in a horizontal line, and the radius CG is given; as alſo CO (p. 116.) the velocity of a body falling freely, and of the body unwinding from this thread, will always be in the ſame proportion of CO to CG, and ſo will the ſpaces deſcribed in any given time. And thus we can compare their motions in every caſe when we know the place of the centre of oſcillation.

Cor. 1. The weight of the deſcending body will be to the tenſion of the thread as CO to GO: for the tenſion of the thread is the difference between the momentum of the rolling body and that of the body falling freely.

Obſerve, that this proportion between the weight of the body and the tenſion of the thread will be always the ſame; for it has been demonſtrated already, page 115, that if C be in the circumference of a circle whoſe centre is G, O will be in the circumference of another circle round the ſame centre, and therefore the ratio of CG to CO is conſtant.

Cor. 2. If a circular body FCB roll down an inclined plane by unfolding a thread, or by friction which prevents all ſliding, the ſpace deſcribed will be to that which the body would deſcribe freely as CG to CO: for the tendency down the inclined plane is a determined proportion of the weight of the body. The motion of rotation in theſe caſes, both progreſſive and whirling, is uniformly accelerated.

Some thing of the ſame kind obtains in common pendulous bodies. A ball hung by a thread not only oſcillates, but alſo makes part of a rotation; and for this reaſon its oſcillations differ from thoſe of a heavy point hanging by the ſame thread, and the centre of oſcillation is a little below the centre of the ball. A ball hung by a thread, and oſcillating between cycloidal cheeks, does not oſcillate like a body in a cycloid, becauſe its centre of oſcillation is continually ſhifting its place. Huygens avoided this by ſuſpending his pendulous body from two points, ſo that it did not change its attitude during its oſcillation. If our ſpring carriages were hung in this manner, having the four lower ſtaples to which the ſtraps are fixed as far aſunder as the four upper ſtaples at the ends of the ſprings, the body of the carriage would perform its oſcillations without kicking up and down in the diſagreeable manner they now do, by which we are frequently in danger of ſtriking the glaſſes with our heads. The ſwings would indeed be greater, but incomparably eaſier; and we could hold things almoſt as ſteadily in our hand as if the carriage were not ſwinging at all.

This will ſuffice for an account of the rotation round fixed axes, as the foundation for a theory of machines actually performing work. The limits of our undertaking will not allow us to do any more than juſt point out the method of applying it.

Let there be any machine of the rotatory kind, *i. e.* compoſed of levers or wheels, and let its conſtruction be ſuch, that the velocity of the point to which the power is applied (which we ſhall call the *impelled point*) is to the velocity of the working point in the ratio of m to n. It is well known that the energy of this machine will be the ſame with that of an axis in peritrochio, of which the radii are m and n.

Let p expreſs the actual preſſure exerted on the impelled point by the moving power, and let r be the actual preſſure or reſiſtance exerted on the working point by the work to be performed. Let x be the inertia of the power, or the quantity of dead matter which muſt move with the velocity of the impelled point in order that the moving power may act. Thus the moving power may be *the weight* of a bucket of water in a water-wheel; then x is the quantity of matter in this bucket of water. Let y in like manner be the inertia of the work, or matter which muſt be moved with the velocity of the working-point, in order that the work may be performed. Thus y may be a quantity of water which muſt be continually puſhed along a pipe. This is quite different from the weight of the water, though it is proportional to it, and may be meaſured by it.

Let f be a preſſure giving the ſame reſiſtance when applied at the working point with the friction of the machine, and let an^2 be the momentum of the machine's inertia, viz. the ſame as if a proper quantity of matter a were attached to the working-point, or to any point at the ſame diſtance from the axis.

This ſtate of things may be repreſented by the wheel and axle PQS (fig. 7.) where x and y and a are repreſented by weights acting by lines. P is the impelled point, and R the working-point; CP is m and CR is n. The moving force is repreſented by PA, the reſiſtance by RB, and the friction by BF.

It is evident that the momentum of the inertia of x, y, and a are the ſame as if they were for a moment attached to the points P and R.

Hence we derive the following expreſſions.

1. The angular velocity $= \dfrac{pm - \overline{r+f}\,n}{\overline{xn^2+y+an^2}}$.

2. Velocity of the working-point $= \dfrac{pmn - \overline{r+f}\,n^2}{\overline{xm^2+y+an^2}}$

3. Work performed $= \dfrac{pmnr - \overline{r+f}\,n^2r}{\overline{xm^2+y+an^2}}$. For the work is proportional to the product of the reſiſtance and the velocity with which it is overcome.

We ſhall give a very ſimple example of the utility of theſe formulæ. Let us ſuppoſe that water is to be raiſed in a bucket by the deſcent of a weight, and that the machine is a ſimple pulley. Such a machine is deſcribed by Deſaguliers, who ſays he found it preferable to all other machines. The bucket dipped itſelf in the ciſtern. A chain from it went over a pulley, and at its extremity was a ſtage on which a man could ſtep from the head of a ſtair. His preponderance brought down the ſtage and raiſed the bucket, which diſcharged its water into

another ciſtern The man quitted the ſtage and walked up ſtairs, and there he found it ready to receive him, becauſe the empty bucket is made heavier than the empty ſtage.

Now, if there be no water in the bucket, it is evident that although the motion of the machine will be the quickeſt poſſible, there will be no work performed. On the other hand, if the loaded ſtage and the full bucket are of equal weight, which is the uſual ſtatement of ſuch a machine in elementary treatiſes of mechanics, the machine will ſtand ſtill, and no work will be performed. In every intermediate ſtate of things the machine will move, and work will be performed. Therefore the different values of the work performed muſt be a ſeries of quantities which increaſe from nothing to a certain magnitude, and then diminiſh to nothing again. The maxim which is uſually received as a fundamental propoſition in mechanics, viz, that what is gained in force by the intervention of a machine is loſt in time, is therefore falſe. There muſt be a particular proportion of the velocities of the impelled and working-points, which will give the greateſt performance when the power and reſiſtance are given; and there is a certain proportion of the power and reſiſtance which will have the ſame effect when the ſtructure of the machine has previouſly fixed the velocities of the impelled and working points.

This proportion will be found by treating the formula which expreſſes the work as a fluxionary quantity, and finding its maximum. Thus, when the ratio of the power and reſiſtance is given, and we wiſh to know what muſt be the proportion of the velocities m and n, that we may conſtruct the machine accordingly, we have only to conſider n as the variable quantity in the third formula. This gives us

$$n = m \times \frac{\sqrt{a^2 \times \overline{r+f}^2 + p^2 x\,\overline{a+y}} - \overline{xr+f}}{\overline{pa+y}}$$

This is a fundamental propoſition in the theory of working machines: but the application requires much attention. Some natural powers are not accompanied by any inertia worth minding: in which caſe x may be omitted. Some works, in like manner, are not accompanied by any inertia; and this is a very general caſe. In many caſes the work exerts no contrary ſtrain on the machine at reſt, and r is nothing. In moſt inſtances the intenſity of the power varies with the velocity of the impelled point, and is diminiſhed when this increaſes; the reſiſtance or actual preſſure at the working-point frequently increaſes with the velocity of the working-point. All theſe circumſtances muſt be attended to; but ſtill they only modify the general propoſition. Theſe are matters which do not come within the limits of the preſent article. We only took this opportunity of ſhowing how imperfect is the theory of machines in equilibrio for giving us any knowledge of their performance or juſt principles of their conſtruction.

One thing, however, muſt be particularly attended to in this theory. The forces which are applied to the body moveable round an axis are conſidered in the theory as preſſures actually exerted on the impelled points of the body or machine, as when a weight is appended to a lever or wheel and axle, and, by deſcending uniformly, acts with its whole weight. In this caſe the weight multiplied by its diſtance from the axis will always expreſs its momentum, and the rotation will (*cæteris paribus*) be proportional to this product. But in many important caſes our machines are actuated by external impulſions. A body in motion ſtrikes on the impelled point of the machine and cauſes it to turn round its axis. It is natural for us to conſider the quantity of motion of this impelling body as the meaſure of our moving force. Suppoſing n to be its quantity of matter, and V its velocity, n V appears a very proper meaſure of its intenſity. And if it be applied at the diſtance CP from the axis of rotation, $n\text{V}\cdot\text{CP}$ ſhould expreſs its energy, momentum, or power to turn the machine round C; and we ſhould expreſs the angular velocity by $\frac{n\text{V}\cdot\text{CP}}{\int p\, r^2}$. Accordingly, this is the manner in which calculations are uſually made for the conſtruction and performance of the machine, as may be ſeen in almoſt every treatiſe of mechanics.

But nothing can be more erroneous, as we ſhall ſhow by a very ſimple inſtance. It ſhould reſult from theſe principles that the angular velocity will be proportional to CP. Let us ſuppoſe our moving power to be a ſtream of water moving at the rate of ten feet per ſecond, and that every ſecond there paſſes 100 pounds of water. We ſhould then call our moving force 1000. It is evident, that if we ſuppoſe the arm of the float-board on which it ſtrikes to be infinitely long, the impelled point can never move faſter than 10 feet in a ſecond, and this will make the angular velocity infinitely ſmall, inſtead of being the greateſt of all. The rotation will therefore certainly be greater if CP be ſhorter. We need not examine the caſe more minutely.

We muſt therefore carefully diſtinguiſh between the quantity of motion of the impelling body and its moving power, as it is modified by its manner of acting. The moving power is the *preſſure actually exerted* on the impelled point of the machine. Now the univerſal fact of the equality of action and reaction in the colliſion of bodies aſſures us that their mutual preſſure in their colliſion is meaſured by the *change* of motion which each ſuſtains: for this change of motion is the only indication and meaſure of the preſſure which we ſuppoſe to be its cauſe. A way therefore of aſcertaining what is the real moving force on a machine actuated by the impulſion of a moving body, is to diſcover what quantity of motion is loſt by the body or gained by the machine; for theſe are equal. Having diſcovered this, we may proceed according to the propoſitions of rotatory motion.

Therefore let AEF (fig. 8.) repreſent a body moveable round an axis paſſing through C, perpendicular to the plane of the figure. Let this body be ſtruck in the point A by a body moving in the direction FA, and let BAD be a tangent to the two bodies in the point of colliſion. It is well known that the mutual actions of two ſolid bodies are always exerted in a direction perpendicular to the touching ſurfaces. Therefore the mutual preſſure of the two bodies is in the direction AP perpendicular to AD. Therefore let the motion of the impelling body be reſolved into the directions AP and AD. The force AD has no ſhare in the preſſure. Therefore let V be the velocity of the impelling body eſtimated in the direction AP, and let n be its quantity of matter. Its quantity of motion in the direction AP will be n V.

Did AP paſs through C, it is evident that the only effect would be to preſs the axis on its ſupports. But AP, the direction of the preſſure, being inclined to AC, the point A is forced aſide, and in ſome ſmall moment of time deſcribes the little arch A a round the centre C. The point P will therefore deſcribe a ſmall arch P p, ſubtending an angle PC p = AC a. Draw $a\,o$ perpendicular to AP, and $a\,d$ perpendicular to AD. The triangles dAo, ACP are ſimilar, and A a : A o = AC : CP. But the angles AC a, PC p being equal, the arches are as their radii and A a : P p = AC : CP, = A a : A o; therefore P p = A o.

Now ſince, in conſequence of the impulſe, A deſcribes A a in the moment of time, it is plain that A o is the ſpace through which the impelling body continues to advance in the direction of the preſſure; and if V be taken equal to the ſpace which it deſcribed in an equal moment before the ſtroke, v will expreſs the remaining velocity, and V − v is the velocity loſt, and n (V − v) is the quantity of motion loſt by the impelling body, and is the true meaſure of the preſſure exerted. This gives

us the whole circumftances of the rotatory motion. The angular velocity will be $\frac{n(\mathrm{V} - v)\cdot\mathrm{CP}}{\int p\, r^2}$, and the velocity of the point A will be $\frac{n(\mathrm{V} - v)\cdot\mathrm{CP}\cdot\mathrm{CA}}{\int p\, r^2}$. Call this velocity u. The fimilarity of triangles gives us $\mathrm{CA} : \mathrm{CP} = \mathrm{A}\,a$ (or u) : $\mathrm{A}\,o$ (or v) and $u = \frac{v.\mathrm{CA}}{\mathrm{CP}}$. Therefore $\frac{\mathrm{V}\cdot\mathrm{CA}}{\mathrm{CP}} = \frac{n(\mathrm{V}-v)\mathrm{CP.CA}}{\int p\, r^2}$ From this we deduce $v = \frac{n.\mathrm{V.CP}^2}{\int pr^2 + n.\mathrm{CP}^2}$, and thus we have obtained the value of v in known quantities; for n was given, or fuppofed known; fo alfo was V: and fince the direction FA was given, its diftance CP from the axis is given; and the form of the body being known, we can find the value of $\int p\, r^2$. Now we have feen that v is alfo the velocity of the point P; therefore we know the abfolute velocity of a given point of the body or machine, and confequently the whole rotatory motion.

We have the angular velocity $= \frac{n\mathrm{V}\cdot\mathrm{CP}}{\int p\, r^2 + n.\mathrm{CP}^2}$: we fhall find this a maximum when $\int p\, r^2 = n.\mathrm{CP}^2$; and in this cafe $\mathrm{CP} = \sqrt{\frac{\int p\, r^2}{n}}$, and $v = \frac{1}{2}\mathrm{V}$. So that the greateft velocity of rotation will be produced when the ftriking body lofes $\frac{1}{2}$ of its velocity.

What we have now delivered is fufficient for explaining all the motions of bodies turning round fixed axes; and we prefume it to be agreeable to our readers, that we have given the inveftigation of the centres of gyration, ofcillation, and percuffion. The curious reader will find the application of thefe theorems to the theory of machines in two very valuable differtations by Mr. Euler in the Memoirs of the Academy of Berlin, vol. viii. and x. and occafionally by other authors who have treated mechanics in a fcientific and ufeful manner, going beyond the fchool-boy elements of equilibrium.

There remains a very important cafe of the rotation of bodies, without which the knowledge of the motion of folid bodies is incomplete; namely, the rotation of free bodies, that is, of bodies unconnected with any fixed points. We hardly fee an inftance of motion of a free body without fome rotation. A ftone thrown from the hand, a ball from a cannon, the planets themfelves, are obferved not only to advance, but alfo to whirl round. The famous problem of the preceffion of the equinoxes depends for its folution on this doctrine; and the theory of the working of fhips has the fame foundation. We can only touch on the leading propofitions.

We need not begin by demonftrating, that when the direction of the external force paffes through the centre of the body, the body will advance without any rotation. This we confider as familiarly known to every perfon verfant in mechanics; nor is it neceffary to demonftrate, that when the direction of the moving force does not pafs through the centre of gravity, this centre will ftill advance in a direction parallel to that of the moving force. and with the fame velocity as if the direction of the moving force had paffed through it. This is the immediate confequence of the equality of action and reaction obferved in all the mechanical phenomena of the univerfe.

But it is incumbent on us to demonftrate, that when the direction of the moving force does not pafs through the centre of gravity, the body will not only advance in the direction of the moving force but will alfo turn round an axis, and we muft determine the pofition of this axis, and the relation fubfifting between the progreffive and rotatory motions.

The celebrated John Bernouilli was the firft who confidered this fubject; and, in his *Difquifitiones Mechanicodynamicæ*, he has demonftrated feveral propofitions concerning the fpontaneous axis of converfion, and the motions arifing from eccentric external forces: and although he affumed for the leading principle a propofition which is true only in a great number of cafes, he has determined the rotation of fpherical bodies with great accuracy.

This combination of motions will be palpable in fome fimple cafes, fuch as the following: Let two equal bodies A and B (fig. 9) be connected by an inflexible rod (of which we may neglect the inertia for the prefent). Let G be the middle point, and therefore the centre of gravity. Let an external force act on the point P in the direction FP perpendicular to AB, and let AP be double of PB. Alfo let the force be fuch, that it would have caufed the fyftem to have moved from the fituation AB to the fituation $a\, b$, in an indefinitely fmall moment of time, had it acted immediately on the centre G. G would in this cafe have defcribed G g, A would have defcribed A a, and B would have defcribed B b, and $a\, b$ would have been parallel to AB; for the force impreffed on A would have been equal to the force impreffed on B: but becaufe the force acts on P, the force impreffed on A is but one half of that impreffed on B by the property of the lever: therefore the initial motion or acceleration of A will be only half of the initial motion of B; yet the centre G muft ftill be at g. We fhall therefore afcertain the initial motion of the fyftem, by drawing through g a line $\alpha\, g\, \beta$, fo that A α fhall be $\frac{1}{2}$ of B β. This we fhall do by making AC = AB, and drawing C $\alpha\, g\, \beta$. Then $\alpha\ \beta$ will be the pofition of the fyftem at the end of the moment of time. Thus we fee that the body muft have a motion of rotation combined with its progreffive motion.

And we deduce immediately from the premifes that this rotation is performed round an axis paffing through the centre of gravity G: for fince the centre defcribes a ftraight line, it is never either above or below the axis of rotation, and is therefore always in it. This is a fundamental theorem, and our fubfequent inveftigation is by this means greatly fimplified, being thus reduced to two problems: 1. To determine in what direction the axis paffes through the centre of gravity. 2. To determine the angular velocity of the rotation, or how far the centre muft advance while the body makes one turn round the axis. This eftablifhes the relation between the progreffive and rotatory motions. It will contribute to our better conception of both thefe problems to fee the refult in the prefent fimple cafe.

It is evident, in the firft place, that the impreffions made on A and B are in lines A a, B b parallel to FP and G g; and therefore the motions of the points A, G, and B, are made in one plane, viz. the plane FPG. The axis of rotation therefore muft be a line drawn through G, perpendicular to this plane. If we give it any other pofition, one of the points A, B, or both of them, muft quit this plane.

In the next place, in $b\, a$ produced take $b\, c$ = BC. Then fuppofing AC to be a rigid line connected with the fyftem, it is evident that if there had been no rotation, the line BC would have kept parallel to its firft pofition, and that at the end of the moment of time C would have been at c. The point C therefore has had, by the rotation, a backward motion c C, relative to the centre G or g, and this motion is equal to the progreffive motion G g of the centre; therefore if we make G γ equal to the circumference of a circle whofe radius is CG, the body will make one rotation round the centre of gravity, while this centre moves along G γ; and thus the relation is eftablifhed between the two motions.

But, further, the point C has, in fact, not moved out of its place. The incipient motion has therefore been fuch that C has become a fpontaneous centre of converfion. It is eafy to fee that this muft always be the cafe, whatever may be the form of the rigid body or fyftem of particles connected by inflexible and inextenfible lines. Since the fyftem both advances and turns round an axis paffing through its centre of gravity, there muft

be ſome point in the ſyſtem, or which may be conceived as connected with it by an inflexible line, which moves backward, by the rotation, as faſt as the centre advances forward. A line drawn through this point parallel to the axis muſt in this inſtant be at reſt, and therefore muſt be a ſpontaneous axis of converſion. And, in this inſtant, the combined motions of rotation round an axis paſſing through the centre of gravity and the motion of progreſſion, are equivalent to, and actually conſtitute an incipient ſimple motion of rotation round another axis parallel to the former, whoſe poſition may be aſcertained. But it is neceſſary to eſtabliſh this propoſition and its converſe on clearer evidence.

Therefore let G (fig. 10.) be the centre of gravity of a rigid ſyſtem of particles of matter, ſuch as we ſuppoſe a ſolid body to be. Let this ſyſtem be ſuppoſed to turn round the axis G g, while the axis itſelf is moving forward in the direction and with the velocity GI. Let the rotation be ſuch, that a particle A has the direction and velocity A b. Let us firſt ſuppoſe the progreſſive motion GI to be perpendicular to the axis G g. It will therefore be parallel to the planes of the circles deſcribed round the axis by the different particles. Let C G g be a plane perpendicular to G I. It will cut the plane of the circle deſcribed by A in a ſtraight line c g, and g will be the centre round which A is turning. Therefore A g will be the radius vector of A, and A b is perpendicular to A g. Let A d be perpendicular to c g, and in A d take A e equal to G I or g i. It is evident, that the abſolute motion of A is compounded of the motions A e and A b, and is the diagonal A f of the parallelogram A e f b. In the line g c, which is perpendicular to G g, take g c to g A, as A e to A b, and draw c C parallel to g G, and produce b A till it cut c g in n. We ſay that C c is in this moment a ſpontaneous axis of converſion; for, becauſe A n is perpendicular to A g and A d to C g, the angle c g A is equal to d A n, or f b A. Therefore, ſince $c\,g : g\,A = f\,b : b\,A$, the triangles c g A and f b A are ſimilar, and the angle g A c is equal to b A f. Take away the common angle g A f, and the remaining angle c A f is equal to the remaining angle b A g, and A f is perpendicular to A c, and the incipient motion of A is the ſame in reſpect of direction as if it were turning round the axis c C. Moreover A f is to f b or g i as A c to c g. Therefore both the direction and velocity of the abſolute motion of A is the ſame as if the body were turning round the fixed axis c C; and the combined motion A e of progreſſion, and the motion A b of rotation round Gg, are equivalent to, and really conſtitute, a momentary ſimple motion of rotation round the axis C c given in poſition, that is, determinable by the ratio of A e to A b.

On the other hand, the converſe propoſition is, that a ſimple motion of rotation round a fixed axis C c, ſuch that the centre G has the velocity and direction GI perpendicular to CG, is equivalent to, and produces a motion of rotation round an axis G g, along with the progreſſive motion GI of this axis. This propoſition is demonſtrated in the very ſame way, from the conſideration that, by the rotation round C c, we have $c\,A : c\,g = A\,f : g\,i$. From this we deduce, that A b is perpendicular to A g, and that $f\,b : A\,b = c\,g : g\,A$; and thus we reſolve the motion A f into a motion A b of rotation round G g, and a motion A e of progreſſion common to the whole body.

But let us not confine the progreſſive motion to the direction perpendicular to the axis G g. Let us ſuppoſe that the whole body, while turning round G g, is carried forward in the direction and with the velocity GK. We can always conceive a plane LGC, which is perpendicular to the plane in which the axis G g and the direction GK of the progreſſive motion are ſituated. And the motion GK may be conceived as compounded of a motion GI perpendicular to this plane and to the axis; and a motion of tranſlation GL, by which the axis ſlides along in its own direction. It is evident that, in conſequence of the firſt motion G I, there ariſes a motion of rotation round C c. It is alſo evident that, if, while the body is turning for a moment round C c, this line be ſlid along itſelf in the direction c C, a motion equal to GL will be induced on every particle A, and compounded with its motion of rotation AF, and that if f r be drawn equal and parallel to GL, φ will be the ſituation of the particle A when G is in K.

And thus it appears, that when the progreſſive motion is perpendicular to the axis of rotation paſſing through the centre of gravity, the two motions progreſſive and rotatory are equivalent to a momentary ſimple motion of rotation round a ſpontaneous axis of converſion, which is at reſt: but when the progreſſive motion is inclined to the axis paſſing through the centre, the ſpontaneous axis of converſion is ſliding in its own direction.

We may conceive the whole of this very diſtinctly and accurately by attending to the motion of a garden roller. We may ſuppoſe it ſix feet in circumference, and that it is dragged along at the rate of three feet in a ſecond from eaſt to weſt, the axis of the roller lying north and ſouth. Suppoſe a chalk line drawn on the ſurface of the roller parallel to its axis. The roller will turn once round in two ſeconds, and this line will be in contact with the ground at the intervals of every ſix feet. In that inſtant the line on the roller now ſpoken of is at reſt, and the motion is the ſame as if it were fixed, and the roller really turning round it. In ſhort, it is then a ſpontaneous axis of converſion.

Now, ſuppoſe the roller dragged in the ſame manner and in the ſame direction along a ſheet of ice, while the ice is floating to the ſouth at the rate of four feet in a ſecond. It is now plain that the roller is turning round an axis through its centre of gravity, while the centre is carried in the direction f 36° 52′ W. at the rate of five feet *per* ſecond. It is alſo plain, that when the line drawn on the ſurface of the ſtone is applied to the ice, its only motion is that which the ice itſelf has to the ſouthward. The motion is now a motion of rotation round this ſpontaneous axis of converſion, compounded with the motion of four feet *per* ſecond in the direction of this axis. And thus we ſee that any complication of motion of rotation round an axis paſſing through the centre of gravity, and a motion of progreſſion of that centre, may always be reduced to a momentary or incipient motion of rotation round another axis parallel to the former, compounded with a motion of that axis in its own direction.

The demonſtration which we have given of theſe two propoſitions points out the method of finding the axis C c, the incipient rotation round which is equivalent to the combined progreſſive motion of the body, and the rotation round the axis G g. We have only to note the rotatory velocity Ab of ſome particle A, and its diſtance A g from the axis, and the progreſſive velocity GI of the whole body, and then to make GC a fourth proportional to A b, GI, and g A, and to place GC in a plane perpendicular to GI, which is perpendicular to G g, and to place C on that ſide of G g which is moving in the oppoſite direction to the axis.

In the ſimple caſe of this problem, which we exhibited in order to give us eaſy and familiar notions of the ſubject, it appeared that the retrograde velocity of rotation of the point C was equal to the progreſſive velocity of the centre. This muſt be the caſe in every point of the circumference of the circle of which CG, fig. 9, is the radius. Therefore, as the body advances, and turns round G, this circle will apply itſelf in ſucceſſion to the line CK parallel to G γ; and any individual point of it, ſuch as C, will deſcribe a cycloid of which this circle is the generating circle, CK the baſe, and CG half the

altitude. The other points of the body will deſcribe trochoids, elongated or contracted according as the deſcribing points are nearer to or more remote from G than the point C is.

It is now evident that all this muſt obtain in every caſe, as well as in this ſimple one. And when we have aſcertained the diſtance GC between the axis of rotation paſſing through the centre, and the momentary ſpontaneous axis of converſion paſſing through C, we can then aſcertain the relation between the motions of rotation and progreſſion. We then know that the body will make one rotation round its central axis, while its centre moves over a ſpace equal to the circumference of a circle of a known diameter.

We muſt therefore proceed to the methods for determining the poſition of the point C. This muſt depend on the proportion between the velocity of the general progreſſive motion, that is, the velocity of the centre, and the velocity of ſome point of the body. This muſt be aſcertained by obſervation. In moſt caſes which are intereſting, we learn the poſition of the axis, the place of its poles, the comparative progreſſive velocity of the centre, and the velocity of rotation of the different points, in a variety of ways; and it would not much increaſe our knowledge to detail the rules which may be followed for this purpoſe. The circumſtance which chiefly intereſts us at preſent is to know how theſe motions may be produced; what force is neceſſary, and how it muſt be applied, in order to produce a given motion of rotation and progreſſion; or what will be the motion which a given force, applied in a given manner, will produce.

We have already given the principles on which we may proceed in this inveſtigation. We have ſhown the circumſtances which determine the place of the centre of percuſſion of a body turning round a given fixed axis. This centre of percuſſion is the point of the body where all the inherent forces of the whirling body preciſely balance each other, or rather where they unite and compoſe one accumulated progreſſive force, which may then be oppoſed by an equal and oppoſite external force. If, therefore, the body is not whirling, but at reſt on this fixed axis, and if this external force be applied at the centre of percuſſion, now become a *point of impulſion*, a rotation will commence round the fixed axis preciſely equal to what had been ſtopped by this external force, but in the oppoſite direction; or, if the external force be applied in the direction in which the centre of percuſſion of the whirling body was moving at the inſtant of ſtoppage, the rotation produced by this impulſe will be the ſame in every reſpect. And we found that in the inſtant of application of this external force, either to ſtop or to begin the motion, no preſſure whatever was excited on the ſupports of the axis, and that the axis was, in this inſtant, a ſpontaneous axis of converſion.

Moreover, we have ſhown, p. 121 that a rotation round any axis, whether fixed or ſpontaneous, is equivalent to, or compounded of, a rotation round another axis *parallel to it*, and paſſing through the centre of gravity, and a progreſſive motion in the direction of the centre's motion at the inſtant of impulſe.

Now, as the poſition of the fixed axis, and the known diſpoſition of all the particles of the body with reſpect to this axis, determines the place of the centre of percuſſion, and furniſhes all the mathematical conditions which muſt be implemented in its determination, and the direction and magnitude of the force which is produced and exerted at the centre of percuſſion; ſo, on the other hand, the knowledge of the magnitude and direction of an external force which is exerted on the point of impulſion of a body not connected with any fixed axis, and of the diſpoſition of all the parts of this body with reſpect to this point of impulſion, will furniſh us with the mathematical circumſtances which determine the poſition of the ſpontaneous axis of converſion, and therefore determine the poſition of the axis through the centre (parallel to the ſpontaneous axis of converſion), round which the body will whirl, while its centre proceeds in the direction of the external force.

The proceſs, therefore, for determining the axis of progreſſive rotation is juſt the converſe of the proceſs for determining the centre of percuſſion.

John Bernoulli was the firſt who conſidered the motion of free bodies impelled by forces whoſe line of direction did not paſs through their centre of gravity; and he takes it for granted that ſince the body both advances and turns round an axis, paſſing through the centre of gravity, this axis is perpendicular to the plane paſſing through the direction of the force, and through the point of impulſion and the centre of gravity. Other authors of the firſt name, ſuch as Huygens, Leibnitz, Roberval, &c. have thought themſelves obliged to demonſtrate this. Their demonſtration is as follows:

Let a body whoſe centre of gravity is G (fig. 11.) be impelled at the point P by a force acting in the direction PQ not paſſing through the centre. The inertia of the whole body will reſiſt in the ſame manner as if the whole matter were collected in G, and therefore the reſiſtance will be propagated to the point P in the direction GP. The particle P, therefore, is impelled in the direction PQ, and reſiſted in the direction PA, and muſt therefore begin to move in ſome direction PB, which makes the diagonal of a parallelogram of which the ſides have the directions PQ and PA. The diagonal and ſides of a parallelogram are in one plane. P is therefore moving in the plane APQB or GPQ, and it is turning round an axis which paſſes through G.—Therefore this axis *muſt* be perpendicular to the plane GPQ.

It would require a ſeries of difficult propoſitions to ſhow the fallacy of this reaſoning in general terms, and to determine the poſition of the axis through G. We ſhall content ourſelves with a very ſimple caſe, where there can be no heſitation. Let A and B (fig. 12.) be two equal balls connected with the axis $a\,b$ by inflexible lines A a, B b, perpendicular to $a\,b$. Let A a be 1, and B b 2. The centre of gravity G will evidently be in the line c G parallel to A a and B b, and in the middle of $a\,b$, and c G is $1\frac{1}{2}$. Let O be the centre of oſcillation. c O is $= \dfrac{\mathrm{A.A}a^2 + \mathrm{B.B}b^2}{\mathrm{A+B}.c\mathrm{G}}$, $= \frac{5}{3}$.—Draw A m, B n perpendicular to c G. and ſuppoſe the balls transferred to m and n. Their centre of oſcillation will be ſtill at O; and we ſee that if the ſyſtem in this form were ſtopped at O, all would be in equilibrio. For the force with which the ball A arrives (by ſwinging round the axis) at m, is as its quantity of matter and velocity jointly, that is, A . A a, or 1. That of B arriving at n is B . B b, or 2. The arm m O of the lever turning round O is $\frac{2}{3}$, and the arm n O is $\frac{1}{3}$. The forces, therefore, are reciprocally as the arms of the lever on which they act, and their momenta, or powers to turn the line $m\,n$ round O, are equal and oppoſite, and therefore balance each other: and therefore, at the inſtant of ſtopping, no preſſure is exerted at c. Therefore, if any impulſe is made at O, the balls at m and n will be put in motion with velocities 1 and 2, and c will be a ſpontaneous centre of converſion. Let us ſee whether this will be the caſe when the balls are in their natural places A and B, or whether there will be any tendency to a rotation round the axis cO. The momentum of A, by which it tends to produce a rotation round c O is A . A a . Am, $= 1 \times$ A m. That of B is B . B b. B n, $= 2 \times$ B n. A m and B n are equal, and therefore the momentum of B is double that of A, and there is a tendency of the ſyſtem to turn round c O; and if, at the inſtant of ſtoppage, the ſupports of the axis $a\,b$ were removed, this rotation round c O would take place, and the point b would advance, and a would recede, c only remaining at reſt. Therefore, if an impulſe were made at O, $a\,b$ would not become a ſpontaneous momen-

tary axis of converſion, and O is not the centre of percuſſion. This centre muſt be ſomewhere in the line OP parallel to $a\,b$, as at P, and ſo ſituated that the momenta A . A a . A α and B . Bβ. B β may be equal, or that A α may be double of B β, or $a\,p$ double of $b\,p$. If an impulſe be now made at P, the balls AB will be urged by forces as 1 and 2, and therefore will move as if round the axis $a\,b$, and there will be no preſſures produced at a and b, and $a\,b$ will really become a momentary ſpontaneous axis of converſion.

Now join G and P. Here then it is evident, that a body or ſyſtem A, B, receiving an impulſe at P perpendicular to the plane $a\,c$ G, acquires to itſelf a ſpontaneous axis of converſion which is not perpendicular to the line joining the point of impulſion and the centre of gravity. And we have ſhown, in page 121, that this motion round $a\,b$ is compounded of a progreſſive motion of the whole body in the direction of the centre, and a rotation round an axis paſſing through the centre *parallel to* $a\,b$. Therefore, in this ſyſtem of free bodies, the axis of rotation is not perpendicular to the plane paſſing through the centre of gravity in the direction of the impelling force.

As we have already obſerved, it would be a laborious taſk to aſcertain in general terms the poſition of the progreſſive axis of rotation. Although the proceſs is the inverſe of that for determining the centre of percuſſion when the axis of rotation is given, it is a moſt intricate buſineſs to convert the ſteps of this proceſs. The general method is this: The momentum of a particle A (fig. 5.) by which it tends to change the poſition of the axis D d, has for its factors A α A l, and A δ, which are its diſtances from three planes D $l\,\delta\,\Delta$, DCO n, and C $g\,\gamma\,\alpha$, given in poſition. The ſum of all theſe muſt be equal to nothing, by the compenſation of poſitive and negative quantities. We muſt find three other planes (of which only one is in ſome meaſure determined in poſition, being perpendicular to DCO n), ſo ſituated that the ſums of ſimilar products of the diſtances of the particles from them may in like manner be equal to nothing. This is a very intricate problem; ſo intricate, that mathematicians have long doubted and diſputed about the certainty of the ſolutions. Euler, d'Alembert, Friſi, Landen, and others, have at laſt proved that every body, however irregular its ſhape, has at leaſt three axes paſſing through its centre of gravity, round which it will continue to revolve while proceeding forward, and that theſe are at right angles to each other; and they have given the conditions which muſt be implemented in the determination of theſe axes. But they ſtill leave us exceedingly at a loſs for means to diſcover the poſitions of the axes of a given body which have theſe conditions.

To ſolve this problem therefore in general terms, would lead to a diſquiſition altogether diſproportioned to our work. We muſt reſtrict ourſelves to thoſe forms of body and ſituations of the point of impulſion which admit of the coincidence of the centres of oſcillation and percuſſion; and we muſt leave out the caſes where the axis has a motion in the direction of its length; that is, we ſhall always ſuppoſe the ſpontaneous axis of converſion to have no motion. Thus we ſhall comprehend the phenomena of the planetary motions, ſimilar to the preceſſion of our equinoctial points, and all the intereſting caſes of practical mechanics. The ſpeculative mathematical reader will fill up the blanks of this inveſtigation by conſulting the writings of Euler and d'Alembert in the Berlin Memoirs, Friſi's Coſmographia, and the papers of Mr. Landen, Mr. Milner, and Mr. Vince, in the Philoſophical Tranſactions. But we hope, by means of a beautiful propoſition on the compoſition of rotatory motions, to enable every reader to diſcover the poſition of the axis of progreſſive rotation in every caſe which may intereſt him, without the previous ſolution of the intricate problem mentioned above.

Let ABPC $p\,b$ A (fig. 13.) be a ſection of a body through its centre of gravity G, ſo formed, that the part ABPC is ſimilar, and ſimilarly placed with the part A $b\,p$ C, ſo that the plane AC would divide it equally. Let this body be impelled at P in the direction HP, perpendicular to the plane AC. The axis round which it will turn will be perpendicular to G π. Suppoſe it at A. Then drawing AB and A b to ſimilar points, it is plain that B β, $b\,\beta$ are equal and oppoſite; theſe repreſent the forces which would raiſe or lower one end of the axis, as has been already obſerved. The axis therefore will remain perpendicular to G π.

Let the body be ſo ſhaped, that if the parts to the right and left of the point of impulſe π (the impulſe is here ſuppoſed not *perpendicular* to the plane AC, but *in* this plane) are equal and ſimilarly placed; then the momenta round AC muſt balance each other, and the axis EF will have no tendency to go out of the plane ABC b A perpendicular to the impulſe.

Any body whoſe ſhape has theſe two properties will turn round an axis perpendicular to the plane which paſſes through the centre of gravity in the direction of the impelling force. This condition is always found in the planets when diſturbed by the gravitation to a diſtant planet: for they are all figures of revolution. The direction of the diſturbing or impelling force is always in a plane paſſing through the axis and the diſturbing body.

With ſuch limitations therefore we propoſe the following problem:

Let G (fig. 14.) be the centre of gravity of a body in free ſpace, which is impelled by an external force f acting in the line FP, which does not paſs through the centre. Let m be the number of equal particles in the body, or its quantity of matter. Let the force f be ſuch, that it would communicate to the body the velocity v; that is, would cauſe the centre to move with the velocity v. It may be expreſſed by the quantity of motion which it produces, that is, by $m\,v$, and it would produce the velocity $m\,v$ on one particle. It is required to determine the whole motion, progreſſive and rotatory, which it will produce, and the ſpace which it will deſcribe during one turn round its axis.

Draw GI parallel and PGC perpendicular to FP, and let GI be taken for the meaſure of the progreſſive velocity v.

It has been demonſtrated that the centre G will proceed in the direction GI with the velocity v, and that the body will at the ſame time turn round an axis paſſing through G, perpendicular to the plane of the figure, every particle deſcribing circles in parallel planes round this axis, and with velocities of rotation proportional to their diſtances from it. There is therefore a certain diſtance GB, ſuch that the velocity with which a particle deſcribes its circumference is equal to the progreſſive velocity v. Let BCD be this circumference. When the particle deſcribing this circumference is in the line GP, and in that part of it which lies beyond P from G, its abſolute velocity muſt be double that of the centre G; but when it is in the oppoſite point C, its retrograde velocity being equal to the progreſſive velocity of the centre, it muſt be at reſt. In every poſition of the body therefore, that point of the accompanying circumference which is at this extremity of the perpendicular drawn through the centre on the line of direction of the impelling force is at reſt. It is at that inſtant a ſpontaneous centre of converſion, and the ſtraight line drawn through it perpendicular to the plane of the figure is then a ſpontaneous axis of converſion, and every particle is in a momentary ſtate of rotation round this axis, in directions perpendicular to the lines drawn to the axis at right angles, and with velocities proportional to theſe diſtances; and laſtly, the body advances in the direction GI through a ſpace equal to the circumference BCD, while it makes one turn round G.

Let A be one of the particles in the plane of the figure. Join AC, AG, AP. Draw A b, A c, A d perpendicular to CP, CA, GA. The abſolute motion A c of A is compounded of the progreſſive motion A b common to the whole body and

equal to GI, and the motion A d of rotation round the centre of gravity G. Therefore ſince A b is equal to v, and A c is the diagonal of a parallelogram given both in ſpecies and magnitude, it is alſo given, and (as appears alſo from the reaſoning in p. 121.) it is to GI as CA to CG.

By the application of the force $m\,v$ in the direction FP, every particle of the body is dragged out of its place, and exerts a reſiſtance equal to the motion which it acquires. A part of this force, which we may call $m\,v$, is employed in communicating the motion A c to A. And, from what has been lately ſhown, CG : CA = GI : A c, $=v$: A c, and therefore A $c=\frac{v\cdot CA}{CG}$. But further (agreeably to what was demonſtrated in p. 112.) we have $CP : CA = A\,c : m\,\dot{v}, = \frac{v\,.CA}{CG} : m\,\dot{v}$, and therefore $m\,\dot{v} = \frac{v.\,CA^2}{CG\cdot CP}$. Therefore the whole force employed in communicating to each particle the motion it really acquires, or $m\,v$, is equal to the fluent of the quantity $\frac{v.\,CA^2}{CP.CG}$ or $m\,v = \frac{v.\int CA^2}{CP\cdot CG}$, and $m.CP.\,CG=\int CA^2$, which, as was ſhown p. 113, is equal to $\int GA^2 + m\,.\,CG^2$. Therefore we have $m\cdot CP.\,CG - m.CG.\,CG = \int GA^2$, or $m.\,GP.\,CG = \int GA^2$, and finally, $CG = \frac{\int GA^2}{m.GP}$.

Now the form of the body gives us $\int GA^2$, and the poſition of the impelling force gives us $m.$ GP. Therefore we can compute the value of CG; and if π be the periphery of a circle whoſe radius is unity, we have π.CG equal to the ſpace which the body muſt deſcribe in the direction GI, while it makes one rotation round its axis.

Cor. 1. The angular velocity, that is, the number of turns or the number of degrees which one of the radii will make in a given time, is proportional to the impelling force: for the length of CG depends only on the form of the body and the ſituation of the point of impulſion; while the time of deſcribing π times this length is inverſely as the force.

2. The angular velocity with any given force is as GP: for CG, and conſequently the circumference π.CG, deſcribed during one turn, is inverſely as GP.

3. PC is equal to $\frac{\int PA^2}{m.GP}$: for we have $\int PA^2 = \int GA^2 + m.\,GP^2$. Therefore $\frac{\int PA^2}{m.\,GP} = \frac{\int GA^2}{m.\,GP} + \frac{m.\,GP^2}{m.\,GP}, = CG + GP, = CP$.

4. If the point C is the centre of impulſion of the ſame body, P will be a ſpontaneous centre of converſion (ſee p. 115).

5. A force equal and oppoſite to $m\,v$, or to f, applied at G, will ſtop the progreſſive motion, but will make no change in the rotation; but if it be applied at P, it will ſtop all motion both progreſſive and rotatory. If applied between P and G, it will ſtop the progreſſive motion, but will leave ſome motion of rotation. If applied beyond P it will leave a rotation in the oppoſite direction. If applied beyond G, or between G and C, it will increaſe the rotation. All this will be eaſily conceived by reflecting on its effect on the body at reſt.

6. A whirling body which has no progreſſive motion cannot have been brought into this ſtate by the action of a ſingle force. It may have been put into this condition by the ſimultaneous operation of two equal and oppoſite forces. The equality and oppoſition of the forces is neceſſary for ſtopping all progreſſive motion. If one of them has acted at the centre, the rotatory motion has been the effect of the other only. If they have acted on oppoſite ſides, they conſpired with each other in producing the rotation; but have oppoſed each other if they acted on oppoſite ſides.

In like manner, it is plain that a motion of rotation together with a progreſſive motion of the centre in the direction of the axis, could not have been produced by the action of a ſingle force.

7. When the ſpace S which a body deſcribes during one rotation has been obſerved, we can diſcover the point of impulſe by which a ſingle force may have acted in producing both the motions of progreſſion and rotation: for $CG = \frac{S}{\pi}$, and $GP = \frac{\int GA^2}{m.CG}, = \frac{\pi \int GA^2}{m.S}$.

In this manner we can tell the diſtances from the centre at which the ſun and planets may have received the ſingle impulſes which gave them both their motions of revolution in their orbits and rotation round their axes.

It was found (p. 115 f) that the diſtance OG of the centre of oſcillation or percuſſion of a ſphere ſwinging round the fixed point C from its centre G, is $\frac{2}{5}$ of the third proportional to CG, and the radius of the ſphere, or that $OG = \frac{2}{5}\,\frac{RG^2}{CG}$. Suppoſing the planets to be homogeneous and ſpherical, and calling the radius of the planet r, and the radius of its orbit R, the time of a rotation round its axis t, and the time of a revolution in its orbit T, and making $1:\pi$ the ratio of radius to the periphery of a circle, we ſhall have π R for the circumference of the orbit, and $\pi\,R\frac{t}{T}$ for the arch of this circumference deſcribed during one rotation round the axis. This is S in the above-mentioned formula. Then diminiſhing this in the ratio of the circumference to radius, we obtain $CG = R\,\frac{t}{T}$, and $OG = \frac{2}{5}\,\frac{r^2}{CG}, = \frac{2}{5}\,\frac{Tr^2}{t\,R}$. This is equivalent to $\frac{\pi \int GA^2}{m.\,S}$, and eaſier obtained.

This gives us G v

$$\left.\begin{array}{ll} \text{For the Earth} = & \frac{r}{157} \\ \text{Moon} & \frac{r}{555} \\ \text{Mars} & \frac{r}{195} \\ \text{Jupiter} & \frac{r}{2{,}8125} \\ \text{Saturn} & \frac{r}{2{,}588} \end{array}\right\} \text{nearly.}$$

We have not data for determining this for the ſun. But the very circumſtance of his having a rotation in $27^d\ 7^h\ 47'$ makes it very probable that he, with all his attending planets, is alſo moving forward in the celeſtial ſpaces, perhaps round ſome centre of ſtill more general and extenſive gravitation: for the perfect oppoſition and equality of two forces, neceſſary for giving a rotation without a progreſſive motion, has the odds againſt it of infinity to unity. This corroborates the conjectures of philoſophers, and the obſervations of Herſchel and other aſtronomers, who think that the ſolar ſyſtem is approaching to that quarter of the heavens in which the conſtellation Aquila is ſituated.

8. As in the communication of progreſſive motion among bodies, the ſame quantity of motion is preſerved before and after colliſion, ſo in the communication of rotation among whirling bodies the quantity of rotatory momentum is preſerved. This appears from the general tenor of our formulæ: for, if we ſuppoſe a body turning round an axis paſſing through its centre, without any progreſſive motion, we muſt ſuppoſe that the force $m\,v$, which put it in motion, has been oppoſed by an equal and oppoſite force. Let this be ſuppoſed to have acted on the centre. Then the whole rotation has been the effect of the other acting at ſome diſtance GP from the centre. Its momentum is $m\,v.\,\mathrm{GP}$. Had it acted alone, it would have produced a rotation compounded with a progreſſive motion of the centre with the velocity v; and the body acquires a momentary ſpontaneous axis of converſion at the diſtance GC from the centre of gravity. The abſolute velocity AC of any particle is $\frac{v.\mathrm{AC}}{\mathrm{CG}}$; its momentum is $\frac{v.\mathrm{AC}^2}{\mathrm{GC}}$, and the ſum of all the momenta is $\frac{\int v.\mathrm{AC}^2}{\mathrm{CG}}$, or $\frac{v\int \mathrm{AC}^2}{\mathrm{CG}}$, and this equal to $m\,v.\,\mathrm{GP}$. But when the progreſſive motion is ſtopped, A b, which was a conſtituent of the abſolute motion of A, is annihilated, and nothing remains but the motion A d of rotation round G. But the triangles dAc and GAC were demonſtrated (p. 121.) to be ſimilar; and therefore AC : Ad=CA : GA. Therefore the abſolute velocity of the particle, while turning round the quieſcent centre of gravity G, is $\frac{v.\,\mathrm{GA}}{\mathrm{GC}}$; its momentum is $\frac{v.\,\mathrm{GA}^2}{\mathrm{GC}}$; the ſum of all the momenta is $\frac{v\int \mathrm{GA}}{\mathrm{GC}}$; and this is ſtill equal to $m\,v$. Obſerve, that now GC is not the diſtance of the centre of converſion from the centre of gravity, becauſe there is now no ſuch thing as the ſpontaneous axis of converſion, or rather it coincides with the axis of rotation. GC is the diſtance from the centre of a particle whoſe velocity of rotation is equal to v.

Now let the body be changed, either by a new diſtribution of its parts, or by an addition or abſtraction of matter, or by both; and let the ſame force $m\,v$ act at the ſame diſtance GP from the centre. We ſhall ſtill have $m\,v.\,\mathrm{GP}=\frac{v\int \mathrm{GA}^2}{\mathrm{GC}}$; and therefore the ſum of the momenta of the particles of the whirling body is ſtill the ſame, viz. equal to the momentum of the force $m\,v$ acting by the lever GP. If therefore a free body has been turning round its centre of gravity, and has the diſtribution of its parts ſuddenly changed (the centre however remaining in the ſame place), or has a quantity of matter ſuddenly added or taken away, it will turn with ſuch an angular velocity that the ſum of the momenta is the ſame as before.

We have been ſo particular on this ſubject, becauſe it affects the celebrated problem of the preceſſion of the equinoxes; and ſir Iſaac Newton's ſolution of it is erroneous on account of his miſtake in this particular. He computes the velocity with which a quantity of matter equal to the exceſs of the terreſtrial ſpheroid over the inſcribed ſphere would perform its librations, if detached from the ſpherical nucleus. He then ſuppoſes it ſuddenly to adhere to the ſphere, and to drag it into the ſame libratory motion; and he computes the libration of the whole maſs, upon the ſuppoſition that the quantity of motion in the libratory ſpheroid is the ſame with the previous quantity of motion of the librating redundant ring or ſhell; and whereas he ſhould have computed it on the ſuppoſition that it was the quantity of momenta that remained unchanged.

The ſame thing obtains in rotations round fixed axes, as appears by the perfect ſameneſs of the formulæ for both claſſes of motions.

This law, which, in imitation of the Leibnitzians, we might call the *conſervatio momentorum*, makes it of importance to have expreſſions of the value of the accumulated momenta in ſuch caſes as moſt frequently occur. The moſt frequent is that of a ſphere or ſpheroid in rotation round an axis or an equatorial diameter; and a knowledge of it is neceſſary for the ſolution of the problem of the preceſſion of the equinoxes. See PRECESSION.

Let AP $a\,p$ (fig. 15.) be a ſphere turning round the diameter Pp, and let DD′, dd' be two circles parallel to the equator A a, very near each other, comprehending between them an elementary ſlice of the ſphere. Let CA be $=a$, CB $=x$, and BD$=y$, and let π be the circumference of a circle whoſe radius is 1. Laſtly, let the velocity of the point A be v. Then

$v\frac{y}{a}$ is the velocity at the diſtance y from the axis, πy is the quantity of matter in the circumference whoſe radius is y; for it is the length of that circumference when expanded.

$\frac{v\pi y^2}{a}$, or $\frac{v\,y}{a}+\pi y$, is the quantity of motion in this circumference turning round the axis Pp.

$\frac{v\pi y^3}{a}$, is the momentum of the ſame circumference.

$\frac{v\pi y^3 y}{a}$ is the fluxion of the momentum of the circle whoſe radius is y, turning in its own plane round the axis.

$\frac{v\pi y^4}{4\cdot a}$ is the fluent, or the momentum of the whole circle; and therefore it is the momentum circle DD′.

$\frac{v\pi y^4\dot{x}}{4a}$ is the fluxion of the momentum of the hemiſphere; for B$b=\dot{x}$, and this fraction is the momentum of the ſlice dDD′d.

$y^2=a^2-x^2$, and $y^4=a^4-2\,a^2\,x^2+x^4$. Therefore $\frac{v\pi}{2\,a}\times(a^4\,\dot{x}-2\,a^2\,x^2\,\dot{x}+x^4\,\dot{x})$ is the fluxion of the momentum of the whole ſphere. Of this the fluent for the ſegments whoſe heights are CB, or x, is $\frac{v\pi}{2\,a}\ (a^4\ x-\frac{2\,a^2\,x^3}{3}+\frac{x^5}{5})$.

Let x become a, and we have for the momentum of the whole ſphere $\frac{v\pi}{2\,a}\,(a^5-\frac{2}{3}\,a^5+\frac{1}{5}\,a^5)$, $=v\pi\left(\frac{a^4}{2}\frac{a^4}{3}+\frac{a^4}{10}\right)$ $=v\pi\,\frac{4}{15}\,a^4$

Let us ſuppoſe that this rotation has been produced by the action of a force $m\,u$; that is, a force which would communicate the velocity u to the whole matter of the ſphere, had it acted in a direction paſſing through its centre; and let us ſuppoſe that this force acted on the equatorial point A at right angles to AC: Its momentum is $m\,u\,a$, and this is equal to $v\pi\,\frac{4}{15}\,a^4$. Alſo, we know that $m=\frac{2}{3}\pi\,a^3$. Therefore we have $u.\,\frac{2}{3}\pi\,a^4=v\,\frac{4}{15}\pi\,a^4$, $\frac{2}{3}u=\frac{4}{15}\,v$, and $v=\frac{5}{2}\,u$.

Let EPQ p be an oblate ſpheroid whoſe ſemi-axis PC is a, and equatorial radius EC is b, and let v be the velocity on the equator of the inſcribed ſphere. Then ſince the momentum of the whirling circle DD is $\frac{v\pi y^4}{4\,a}$, the momenta of the ſphere and

ſpheroid are in the quadruplicate ratio of their equatorial radii; and therefore that of the whole ſpheroid is $\frac{4}{15}\pi b^4 v$. And if w be the velocity at E correſponding to the velocity v at A, ſo that $w = \frac{b}{a}v$, we have the momentum of the ſpheroid, expreſſed in terms of the equatorial velocity at the ſurface, $\frac{4}{15} b^3 a w$.

If the ſame force mu be made to act in the ſame manner at E, its momentum mub is $= \frac{4}{15} b^3 a w$, and $w = \frac{15\,mu}{4\pi b^2 a}$. Therefore the angular velocities $\frac{v}{a}$, $\frac{w}{b}$, which the ſame force mu acting at A or E will produce in the ſphere and the ſpheroid, are as $\frac{15\,mu}{4\pi a^4}$ and $\frac{15\,mu}{4\pi b^3 a}$, that is, in the triplicate ratio of the equatorial diameter b to the polar axis a.

Laſtly, if the oblate ſpheroid is made to turn round an equatorial diameter paſſing through C perpendicular to the plane of the figure, it is plain that every ſection parallel to the meridian EPQ p is an ellipſe ſimilar to this meridian. If this ellipſe differs very little from the inſcribed circle, as is the caſe of the earth in the problem of the preceſſion of the equinoxes, the momentum of each ellipſe may be conſidered as equal to that of a circle of the ſame area, or whoſe diameter is a mean proportional between the equatorial and polar diameters of the ſpheroid. This radius is to the radius of the circumſcribed circle as $\sqrt{ba}$ to b. Therefore the momenta of the ſection of the ſpheroid and of the circumſcribed ſphere are in the conſtant ratio of $b^2 a^2$ to b^4, or of a^2 to b^2. And if the velocity in the equator of this circumſcribed ſphere be called w, the momentum of the ſphere is $\frac{4}{15}\pi b^4 w$; and therefore that of the ſpheroid is $\frac{4}{15}\pi b^2 a^2 w$, agreeably to what was aſſumed in the article PRECESSION.

This value of the momentum of a ſpheroid round an equatorial diameter is only a very eaſy approximation; an exact value may be obtained by an infinite ſeries. The whole matter of the ſpheroid may be conſidered as uniformly diſtributed on the ſurface of a ſimilar ſpheroid whoſe diameter is $= \sqrt{\frac{1}{2}}$ of the diameter of the ſpheroid. It will have the ſame momentum, becauſe a triangle in one of the ellipſes, having an elementary arch of the circumference for its baſe, and the centre of the ellipſe for its vertex, has its centre of gyration diſtant from the vertex $\sqrt{\frac{1}{2}}$ the length of the radius of the ellipſe, and the problem is reduced to the finding the ſum of theſe lines. But even when the ſeries for this ſum involves the 3d power of the eccentricity, it is not more exact than the above approximation.

A ſimilar propoſition may be obtained for a prolate ſpheroid vibrating round an equatorial diameter, and applied to the conjectural ſhape of the moon, for explaining her oſcillations.

The reader muſt have obſerved that the preceding diſquiſitions refer to thoſe motions only which reſult from the action of external forces and to the ſtate of incipient motion. All circular motions, ſuch as thoſe of rotation, are accompanied by centrifugal forces. A central force is neceſſary for retaining every particle in its circular path; ſuch forces muſt therefore be excited in the body, and can ariſe only from the forces of coheſion by which its particles are held together. Theſe forces are mutual, equal, and oppoſite; and as much as a particle A (fig. 5.) is retained by a force in the direction Aa of the line which connects it with the fixed axis Dd, or in the direction AG (fig. 10.), which connects it with the progreſſive axis; ſo much muſt the point a of the axis D d be urged in the oppoſite direction aA, or ſo much muſt the whole body be urged in the direction GA. Every point therefore of the axis D d, or of the axis through G in fig. 10. is carried in a variety of directions perpendicular to itſelf. Theſe forces may or may not balance each other. If this balance obtains with reſpect to the fixed axis, its ſupports will ſuſtain no preſſure but what ariſes from the external force; if not, one ſupport will be more preſſed than the other; and if both were removed, the axis would change its poſition. The ſame muſt be affirmed of the axis through G in fig. 10. This, having no ſupport, muſt change its poſition.

And thus it may happen, that the axis of rotation paſſing through G which has been determined by the preceding diſquiſitions, is not permanent either in reſpect of the body, or in reſpect of abſolute ſpace. Theſe two rotations are eſſentially different. The way to conceive both is this. Suppoſe a ſpherical ſurface deſcribed round the body, having its centre in the centre of gravity; and ſuppoſe this ſurface to revolve and to proceed forward along with the body: in ſhort, let it be conceived as an immaterial ſurface attached to the body. The axis of rotation will paſs through this ſurface in two points, which we ſhall call its poles. Now, we ſay that the axis is permanent with reſpect to the body when it has always the ſame poles in this ſpherical ſurface. Suppoſe another ſpherical ſurface deſcribed round the ſame centre, and that this ſurface alſo accompanies the body in all its progreſſive motion, but does not turn with it. The axis is permanent with reſpect to abſolute ſpace when it has always the ſame poles in this ſurface: it is evident that theſe two facts are not inſeparable. A boy's top ſpins on the ſame point and the ſame corporeal axis, while, towards the end of its motion, we obſerve it directing this round and round to different quarters of the room. And when we make an egg or a lemon ſpin with great rapidity on its ſide on a level table, we ſee it gradually riſe up, till it ſtand quite on end, ſpinning all the while round an axis pointing to the zenith.

This change in the poſition of the axis is produced by the unbalanced actions of the centrifugal forces exerted by the particles. Suppoſe two equal balls A and B (fig. 16.) connected by an inflexible rod whoſe middle point is G, the centre of gravity of the balls. This ſyſtem may be made to turn round the material axis D d, A deſcribing the circle AEFA, and B deſcribing the circle BHKB. The rod AB may alſo be conceived as moveable round the point G by means of a pin at right angles to the axis. Suppoſe the balls paſſing through the ſituations A and B; their centrifugal forces urge them at the ſame time in the directions CA and OB, which impulſions conſpire to make the connecting rod recede from both ends of the axis D d. And thus the balls, inſtead of deſcribing parallel circles round this axis, will deſcribe parallel ſpirals, gradually opening the angles DGA, d GB more and more, till the balls acquire the poſition $\alpha\,\beta$ at right angles to the axis. They will not ſtop there, for each came into that poſition with an oblique motion. They will paſs it; and were it not for the reſiſtance of the air and the friction of the joint at G, they would go on till the ball A came to deſcribe the circle BHK, and the ball B to deſcribe the circle AEF. The centrifugal forces will now have exhauſted by oppoſition all the motions which they had acquired during their paſſage from the poſition AB to the poſition $\alpha\,\beta$; and now they will again deſcribe ſpirals gradually opening, and then contracting, till the balls arrive at their original poſition AB, when the proceſs will begin again. Thus they will continue a kind of oſcillating rotation.

Thus the axis is continually changing with reſpect to the ſyſtem of balls; but it is fixed in reſpect to abſolute ſpace, becauſe the axis D d is ſupported. It does not yet appear that it has any tendency to change its poſition, becauſe the centrifugal tendency of the balls is completely yielded to by the joint at G. The material axis has indeed ſuſtained no change; but the real axis, or mathematical line round which the rotation was going

on every moment, has been continually ſhifting its place. This is not ſo obvious, and requires a more attentive conſideration. To ſhow accurately the gradual change of poſition of the real axis of rotation would require a long diſcuſſion. We ſhall content ourſelves with exhibiting a caſe where the poſition of the momentary axis is unqueſtionably different from D *d*, which we may ſuppoſe horizontal.

Take the balls in the poſition $\alpha\beta$. They came into this poſition with a ſpiral motion, and therefore each of them was moving obliquely to the tangents $\alpha\phi$, $\beta\gamma$ to the circle $\alpha\delta\beta\varepsilon$, ſuppoſe in the directions $\alpha\theta$, $\beta\lambda$. They are therefore moving round the centre G in a plane $\theta\alpha\beta\lambda$, inclined to the plane $\phi\alpha\beta\gamma$ of the circle $\alpha\delta\beta\varepsilon$. The momentary axis of rotation is therefore perpendicular to this oblique plane, and therefore does not coincide with D *d*.

We cannot enter upon the inveſtigation of this evagation of the axis, although the ſubject is both curious and important to the ſpeculative mathematicians. A knowledge of it is abſolutely neceſſary to a *complete* ſolution of the great problem of the preceſſion. But when treating that article, we contented ourſelves with ſhowing that the evagation which obtains in this natural phenomenon is ſo exceedingly minute, that although multiplied many thouſands of times, it would eſcape the niceſt obſervations of modern aſtronomers; and that it is a thing which does not accumulate beyond a certain limit, much too ſmall for obſervation, and then diminiſhes again, and is periodical. Euler, d'Alembert, Friſi, and de la Grange, have ſhown the momentary poſition of the real variable axis correſponding to any given time; and Landen has with great ingenuity and elegance connected theſe momentary poſitions, and given the whole paths of evagation. Mr. Segnor was, we believe, the firſt who ſhowed (in a Diſſertation *De Motu Turbinum*, Halle, 1755), that in every body there were at leaſt three lines paſſing through the centre of gravity at right angles to each other, forming the ſolid angle of a cube, round which the centrifugal forces were accurately balanced, and therefore a rotation begun round either of theſe three lines would be continued, and they are permanent axes of rotation. Albert Euler gave the firſt demonſtration in 1760, and ſince that time the inveſtigation of theſe axes has been extended and improved by the different authors already named. It is an exceedingly difficult ſubject; and we recommend the ſynthetical inveſtigation by Friſi in his *Coſmographia* as the fitteſt for inſtructing a curious reader to whom the ſubject is new. We ſhall conclude this diſſertation with a beautiful theorem, the enunciation of which we owe to P. Friſi, which has amazingly improved the whole theory, and gives eaſy and elegant ſolutions of the moſt difficult problems, It is analogous to the great theorem of the compoſition of motions and forces.

If a body turns round an axis AG*a* (fig. 17.) paſſing through its centre of gravity G with the angular velocity *a*, while this axis is carried round another axis BG*b* with the angular velocity *b*, and if GD be taken to GK as *a* to *b* (the points B and E being taken on that ſide of the centre where they are moving towards the ſame ſide of the plane of the figure), and the line DE be drawn, though the whole and every particle of the body will be in a ſtate of rotation round a third axis CG*c*, lying in the plane of the other two, and parallel to DE, and the angular velocity *c* round this axis will be to *a* and to *b* as DE is to GD and to GE.

For, let P be any particle of the body, and ſuppoſe a ſpherical ſurface to be deſcribed round G paſſing through P. Draw PR perpendicular to the plane of the figure. It is evident that PR is the common ſection of the circle of rotation IP*i* round the axis A*a*, and the circle KP*k* of rotation round the axis B*b*. Let I*i*, K*k* be the diameters of theſe circles of rotation, F and G their centres. Draw the radii PF and PO, and the tangents PM and PN. Theſe tangents are in a plane MPN which touches the ſphere in P, and cuts the plane of the axis in a line MN, to which a line drawn from the centre G of the ſphere through the point R is perpendicular. Let PN repreſent the velocity of rotation of the point P round the axis B*b*, and P*f* its velocity of rotation round A*a*. Complete the parallelogram PN*tf*. Then P*t* is the direction and velocity of motion reſulting from the compoſition of PN and P*f*. P*t* is in the plane MPN, becauſe the diagonal of a parallelogram is in the plane of its ſides PN and P*f*.

Let perpendiculars *f*F, *t*T, be drawn to the plane of the axes, and the parallelogram PN*tf* will be orthographically projected on that plane, its projection being a parallelogram RNTF. (F here falls on the centre by accident.) Draw the diagonal RT. It is evident that the plane PR*t*T is perpendicular to the plane of the two axes, becauſe PR is ſo. Therefore the compound motion P*t* is in the plane of a circle of revolution round ſome axis ſituated in the plane of the other two. Therefore produce TR, and draw GC cutting it at right angles in H, and let LP*l* be the circle, and PH a radius. P*t* is therefore a tangent, and perpendicular to PH, and will meet RT in ſome point Q of the line MN. The particle P is in a ſtate of rotation round the axis CG*c*, and its velocity is to the velocities round A*a* or B*b* as P*t* to P*f* or PN. The triangles PRN and OPN are ſimilar. For PN the tangent is perpendicular to the radius OP, and PR is perpendicular to ON. Therefore OP : PN = PR : RN, and $\text{RN} = \frac{\text{PR.PN}}{\text{OP}}$. But the velocity of P round the axis B*b* is OP.*b*. Therefore $\text{RN} = \frac{\text{PR OP}.b}{\text{OP}}, = \text{PR}.b$. In like manner RF = PR*a*. Therefore RF : RN = *a* : *b* = GD : GE. But NT : RN = ſine NRT : ſine NTR, and GD : GE = ſine GED : ſine GDE. Therefore ſine NRT : ſine NTR = ſine GED : ſine GDE. But RNT = EGD, for NR is perpendicular to EG, and NT (being parallel to IF) is perpendicular to DG. Therefore TR is perpendicular to VD, and C*c* is parallel to ED, and the rotation of the particle P is round an axis parallel to ED.

And ſince RN, RF, RT, are as the velocities *b*, *a*, *c*, round theſe different axes, and are proportional to EG, DG, DE, we have *c* to *a* or to *b* as ED to GD or GE, and the propoſition is demonſtrated.

This theorem may be thus expreſſed in general terms.

If a body revolves round an axis paſſing through its centre of gravity with the angular velocity *a*, while this axis is carried round another axis, alſo paſſing through its centre of gravity, with the angular velocity *b*, theſe two motions compoſe a motion of every particle of the body round a third axis, lying in the plane of the other two, and inclined to each of the former axes in angles whoſe ſines are inverſely as the angular velocities round them; and the angular velocity round this new axis is to that round one of the primitive axes as the ſine of inclination of the two primitive axes is to the ſine of the inclination of the new axis to the other primitive axis.

When we ſay that we owe the enunciation of this theorem to P. Friſi, we grant at the ſame time that ſomething like it has been ſuppoſed or aſſumed by other authors. Newton ſeems to have conſidered it as true, and even evident, in homogeneous ſpheres; and this has been tacitly acquieſced in by the authors who followed him in the problem of the preceſſion. Inferior writers have careleſsly aſſumed it as a truth. Thus Nollet, Graveſande, and others, in their contrivances for exhibiting experiments for illuſtrating the compoſition of vortices, proceeded on this aſſumption. Even authors of more ſcrupulous reſearch have ſatisfied themſelves with a very imperfect proof. Thus Mr. Landen, in his excellent diſſertation on rotatory motion, Philoſophical Tranſactions, Vol. LXVII. contents himſelf with ſhowing, that, by the equality and oppoſite directions of the motions round the axes A *a* and B *b*, the point C will be at reſt,

and from thence concludes that CG c will be the new axis of rotation. But this is exceedingly hafty (note alfo that this differtation was many years pofterior to that of P. Frifi): For although the feparate motions of the point C may be equal and oppofite, it is by no means either a mathematical or a mechanical confequence that the body will turn round the axis C c. In order that the point C may remain at reft, it is neceffary that all tendencies to motion be annihilated: this is not even thought of in making the affumption. Frifi has fhown, that in the motion of every particle round the axis C c, there is involved a motion round the two axes A a and B b, with the velocities a and b; and it is a confequence of this, and of this only, that the impulfes which would feparately produce the rotations of every particle round A a and B b will, either in fucceffion or in conjunction, produce a rotation round C c. Moreover, Mr. Landen's not having attended to this, has led him, as we imagine, into a miftake refpecting the velocity with which the axis changes its pofition; and though his procefs exhibits the path of evagation with accuracy, we apprehend that it does not affign the true times of the axes arriving at particular points of this path.

It follows from this propofition, that if every particle of a body, whether folid or fluid, receives in one inftant a feparate impulfe, competent to the production of a motion of the particle round an axis with a certain angular velocity, and another impulfe competent to the production of a motion round another axis with a certain velocity, the combined effect of all thefe impulfions will be a motion of the whole fyftem round a third axis given in pofition, with an angular velocity which is alfo given: and this motion will obtain without any feparation or difunion of parts; for we fee that a motion round two axes conftitutes a motion round a third axis in every particle, and no feparation would take place although the fyftem were incoherent like a mafs of fand, except by the action of the centrifugal forces arifing from rotation. Mr. Simpfon therefore erred in his folution of the problem of the preceffion, by fuppofing another force neceffary for enabling the particles of the fluid fpheroid to accompany the equator when difplaced from its former fituation. The very force which makes the difplacement produces the accompaniment, as far as it obtains, which we fhall fee prefently is not to the extent that Mr. Simpfon and other authors who treat this problem have fuppofed.

For the fame reafon, if a body be turning round any axis, and every particle in one inftant get an impulfe precifely fuch as is competent to produce a given angular velocity round another axis, the body will turn round a third axis given in pofition, with a given angular velocity: for it is indifferent (as it is in the ordinary compofition of motion) whether the forces act on a particle at once or in fucceffion. The final motion is the fame both in refpect of direction and velocity.

Laftly, when a rigid body acquires a rotation round an axis by the action of an impulfe on one part of it, and at the fame time, or afterwards, gets an impulfe on any part, which, alone, would have produced a certain rotation round another axis, the effect of the combined actions will be a rotation round a third axis, in terms of this propofition; for when a rigid body acquires a motion round an axis, not by the fimultaneous impulfe of the precifely competent force on each particle, but by an impulfe on one part, *there has been propagated to every particle* (by means of the connecting forces) an impulfe precifely competent to produce the motion which the particle really acquires; and when a rigid body, already turning round an axis A a (fig. 17.), receives an impulfe which makes it actually turn round another axis C c, there *has been propagated to each particle* a force precifely competent to produce, not the motion, but the *change* of motion which takes place in that particle, that is, a force which, when compounded with the inherent force of its primitive motion, produces the new motion; that is (by this theorem), a force which alone would have caufed it to turn round a third axis B b, with a rotation making the other conftituent of the actual rotation round C c.

This muft be confidered as one of the moft important propofitions in dynamics, and gives a great extenfion to the doctrine of the compofition of motion. We fee that rotations are compounded in the fame manner as other motions, and it is extremely eafy to difcover the compofition. We have only to fuppofe a fphere defcribed round the centre of the body; and the equator of this fphere correfponding to any primitive pofition of the axis of rotation gives us the direction and velocity of the particles fituated in it. Let another great circle cut this equator in any point; it will be the equator of another rotation. Set off an arch of each from the point of interfection, proportional to the angular velocity of each rotation, and complete the fpherical parallelogram. The great circle, which is the diagonal of this parallelogram, will be the equator of the rotation, which is actually compounded of the other two.

And thus may any two rotations be compounded. We have given an inftance of this in the folution of the problem of the PRECESSION *of the Equinoxes*, which fee.

It appears plainly in the demonftration of this theorem that the axis of C c is a new line in the body. The change of rotation is not accomplifhed by a transference of the poles and equator of the former rotation to a new fituation, in which they are again the poles and equator of the rotation; for we fee that in the rotation round the axis C c, the particle of the body which was formerly the pole A is defcribing a circle round the axis C c. Not knowing this compofition of rotations, Newton, Walmefly, Simpfon, and other celebrated mathematicians, imagined, that the axis of the earth's rotation remained the fame, but changed its pofition. In this they were confirmed by the conftancy of the obferved latitudes of places on the furface of the earth. But the axis of the earth's rotation really changes its place, and the poles fhift through different points of its furface; but thefe different points are too near each other to make the change fenfible to the niceft obfervation.

It would feem to refult from thefe obfervations, that it is impoffible that the axis of rotation can change its pofition in abfolute fpace without changing its pofition in the body, contrary to what we experience in a thoufand familiar inftances; and indeed this is impoffible by any one change. We cannot by the impulfe of any one force make a body which is turning round the axis A a change its pofition and turn round the fame material axis brought into the pofition C c. In the fame way that a body muft pafs through a feries of intermediate points, in going from one end of a line to the other, fo it muft acquire an infinite feries of intermediate rotations (each of them momentary) before the fame material axis paffes into another pofition, fo as to become an axis of rotation. A momentary impulfe may make a great change of the pofition of the axis of rotation, as it may make in the velocity of a rectilineal motion. Thus, although the rotation round A a be indefinitely fmall, if another equally fmall rotation be impreffed round an axis B b perpendicular to A a, the axis will at once fhift to C c half way between them; but a fucceffion of rotations is neceffary for carrying the primitive material axis into a new pofition, where it is again an axis. This transference, however, is poffible, but gradual, and muft be accomplifhed by a *continuation* of impulfes totally different from what we fhould at firft fuppofe. In order that A may pafs from A to C, it is not enough that it gets an impulfe in the direction AC. Such an impulfe would carry it thither, if the body had not been whirling round A a by the mere perfeverance of matter in its ftate of motion; but when the body is already whirling round A a the particles in the circle IP i are moving in the circumference of that circle; and fince that circle alfo partakes

of the motion given to A, every particle in it muſt be *inceſſantly* deflected from the path in which it is moving. The *continual* agency of a force is therefore neceſſary for this purpoſe; and if this force be diſcontinued, the point A will immediately quit the plane of the arch AC, along which we are endeavouring to move it, and will ſtart up.

This is the theorem which we formerly ſaid would enable us to overcome the difficulties in the inveſtigation of the axis of rotation.

Thus we can diſcover what Mr. Landen calls the evagations of the poles of rotation by the action of centrifugal forces: for in fig. 16. the known velocity of the ball A and the radius AC of its circle of rotation will give us the centrifugal force by which the balls *tend* to turn in the plane DA *d*BD. This gives the axis D *d* a tendency to move in a plane perpendicular to the plane of the figure; and its ſeparation from the poles D and *d* does not depend on the ſeparation of the connecting rod AB from its preſent inclination to D *d*, but on the angle which the ſpiral path of the ball makes with the plane of a circle of rotation round D *d*. The diſtance of the new poles from D and *d* is an arch of a circle which meaſures the angle made by the ſpiral with the circle of rotation round the primitive axis. This will gradually increaſe, and the mathematical axis of rotation will be deſcribing a ſpiral round D and *d*, gradually ſeparating from theſe points, and again approaching them, and coinciding with them again, at the time that the balls themſelves are moſt of all removed from their primitive ſituation, namely, when A is in the place of B.

The ſame theorem alſo enables us to find the incipient axis of rotation in the complicated caſes which are almoſt inacceſſible by means of the elementary principles of rotation.

Thus, when the centres of oſcillation and percuſſion do not coincide, as we ſuppoſed in fig. 5. and 12. Suppoſe, firſt, that they do coincide, and find the poſition of the axis *a b*, and the angular velocity of the rotation. Then find the centre of percuſſion, the axis P *p*, and the momentum round it, and the angular velocity which this momentum would produce. Thus we have obtained two rotations round given axes, and with given angular velocities. Compound theſe rotations by this theorem, and we obtain the required poſition of the true incipient axis of rotation, and the angular velocity, without the intricate proceſs which would otherwiſe have been neceſſary.

If the body is of ſuch a ſhape, that the forces in the plane DCG do not balance each other, we ſhall then diſcover a momentum round an axis perpendicular to this plane. Compound this rotation in the ſame manner with the rotation round D *d*.

And from this ſimple view of the matter we learn (what would be difficult to diſcover in the other way), that when the centre of percuſſion does not coincide with that of rotation, the axis is in the plane DGC, though not perpendicular to PG. But when there is a momentum round an axis perpendicular to this plane, the incipient axis of rotation is neither perpendicular to PC, nor in a plane perpendicular to that paſſing through the centre in the direction of the impelling force.

We muſt content ourſelves with merely pointing out theſe tracks of inveſtigation to the curious reader, and recommending the cultivation of this moſt fruitful theorem of Father Friſi.

Theſe are by no means ſpeculations of mere curioſity, intereſting to none but mathematicians: the nobleſt art which is practiſed by man muſt receive great improvement from a complete knowledge of this ſubject; we mean the art of SEAMANSHIP. A ſhip, the moſt admirable of machines, muſt be conſidered as a body in free ſpace, impelled by the winds and waters, and continually moved round ſpontaneous axes of converſion, and inceſſantly checked in theſe movements. The trimming of the ſails, the action of the rudder, the very diſpoſition of the loading, all affect her verſatility. An experienced ſeaman knows by habit how to produce and facilitate theſe motions, and to check or ſtop ſuch as are inconvenient. Experience, without any reflection or knowledge how and why, informs him what poſition of the rudder produces a deviation from the courſe. A ſort of common ſenſe tells him that, in order to make the ſhip turn her head away from the wind, he muſt increaſe the ſurface or the obliquity of the head ſails, and diminiſh the power of the ſails near the ſtern. A few other operations are dictated to him by this kind of common ſenſe; but few, even of old ſeamen, can tell why a ſhip has ſuch a tendency to bring her head up in the wind, and why it is ſo neceſſary to crowd the fore-part of the ſhip with ſails; fewer ſtill know that a certain ſhifting of the loading will facilitate ſome motions in different caſes; that the crew of a great ſhip running ſuddenly to a particular place ſhall enable the ſhip to accompliſh a movement in a ſtormy ſea which could not be done otherwiſe; and perhaps not one in ten thouſand can tell why this procedure will be ſucceſsful. But the mathematical inquirer will ſee all this; and it would be a moſt valuable acquiſition to the public, to have a manual of ſuch propoſitions, deduced from a careful and judicious conſideration of the circumſtances, and freed from that great complication and intricacy which only the learned can unravel, and expreſſed in a familiar manner, clothed with ſuch reaſoning as will be intelligible to the unlearned; and, though not accurate, yet perſuaſive. Mr. Bouguer, in his *Traité du Navire*, and in his *Manœuvre des Vaiſſeaux*, has delivered a great deal of uſeful information on this ſubject; and Mr. Bezout has made a very uſeful abſtract of theſe works in his *Cours de Mathematique*. But the ſubject is left by them in a form far too abſtruſe to be of any general uſe; and it is unfortunately ſo combined with or founded on a falſe theory of the action and reſiſtance of fluids, that many of the propoſitions are totally inconſiſtent with experience, and many maxims of ſeamanſhip are falſe. This has occaſioned theſe doctrines to be neglected altogether. Few of our profeſſional ſeamen have the preparatory knowledge neceſſary for improving the ſcience; but it would be a work of immenſe utility, and would acquire great reputation to the perſon who ſucceſsfully proſecutes it.

We ſhall mention under the article SEAMANSHIP the chief problems, and point out the mechanical principles by which they may be ſolved.

ROTHERAM, a town in the Weſt Riding of Yorkſhire, ſeated on the river Don, near which there is a handſome ſtone bridge. It is a well built place, and the market is large for proviſions. W. lon. 1. 10. N. lat. 53. 25.

ROTHSAY, a borough of Scotland, the capital of the iſle of Bute. It is ſituated on the eaſt ſide of the iſland, and has an excellent harbour and pier. Here is an ancient caſtle, once a royal palace, which gives the title of duke to the prince of Wales, as it long did, before the Union, to the heir apparent of the crown of Scotland. It is 70 miles weſt of Edinburgh. W. lon. 5. 17. N. lat. 55. 50.

ROTTEŒLLIA, in botany; a genus of the digynia order, belonging to the triandria claſs of plants. The rachis is jointed, roundiſh, and in many caſes filiform; the calyx is ovate, lanceolated, flat, ſimple, or bipartite; the florets are alternate on the winding rachis.

ROTONDO, or ROTUNDO, in architecture, an appellation given to any building that is round both within and without; whether it be a church, a ſaloon, or the like. The moſt celebrated rotundo of the ancients is the Pantheon at Rome. See PANTHEON.

ROTTEN-STONE, a mineral found in Derbyſhire, and uſed by mechanics for all ſorts of finer grinding and poliſhing, and ſometimes for cutting of ſtones. According to Ferber, it is a tripoli mixed with calcareous earth.

ROTTENNESS. See PUTREFACTION.

ROTTERDAM, a city of the United Provinces, in Holland, with one of the fineſt harbours in the Netherlands. It is the moſt conſiderable place in Holland, for ſize, beauty of its buildings, and trade, next to Amſterdam. There are ſo many deep canals, that ſhips may unload at the very doors of the warehouſes. The town-houſe, the bank, and the arſenals are magnificent. It is more frequented by the Britiſh merchants than Amſterdam, becauſe the ice goes away ſooner, and a ſingle tide, in two or three hours, will carry a veſſel into the open ſea. Some of the houſes are built in the old Spaniſh ſtyle with the gable ends embattled in front; but there is a great number of modern brick houſes, which are lofty and ſpacious, particularly on that magnificent quay called the Bomb Tees. On this quay is a handſome Jewiſh ſynagogue. Eraſmus was born in this city, and his ſtatue in bronze ſtands in an open piece, at the head of one of the canals; and in a narrow ſtreet, leading from the ſtatue to the great church, is ſtill ſhown the houſe in which he was born, with an inſcription, in front, to his honour. Rotterdam received the French troops, Jan. 23, 1795. It is ſeated on the Merwe (the moſt northern branch of the Maeſe) 13 miles ſouth-eaſt of Hague, and 30 ſouth ſouth-weſt of Amſterdam. E. lon. 4. 28. N. lat. 51. 56.

ROTULA, in anatomy, the ſmall bone of the knee, called alſo *patella*.

ROTUNDUS, in anatomy, a name given to ſeveral muſcles otherwiſe called *teres*.

ROUAD. See ARADUS.

ROUANNE, a populous and commercial town of France, in the department of Rhone and Loire and late province of Lyonois. It was a village only at the commencement of the preſent century, and is ſeated on the Loire, where it begins to be navigable for barks. Hence the merchandiſe of Lyons, Marſeilles, and the Levant, is conveyed down the Loire, and by the canal of Briare, into the Seine, and thence to Paris. Rouanne is 50 miles north-eaſt of Clermont, and 210 ſouth-eaſt of Paris. E. lon. 4. 12. N. lat. 46. 13.

ROUCOU, in dyeing, the ſame with ANOTTA and BIXA.

ROUEN, a city of France, in the department of Lower Seine and late province of Normandy, with an archbiſhop's ſee. It is the capital of the department, and ſeated on the north ſide of the Seine. The ſtreets are narrow, crooked, dirty, and conſiſt of wooden houſes; notwithſtanding which, it is one of the moſt opulent and important places in France. It is two leagues and a half in circuit, and (its ſix ſuburbs included) is computed to contain 73,000 inhabitants. Among the public buildings, the moſt diſtinguiſhed are, the Great Hall of the Palace, in which the late parliament of Rouen met; the old caſtle; and the principal church, ornamented with three towers, in one of which is the great bell, which bears the name of cardinal George d'Amboiſe, a miniſter, whoſe memory is much reſpected in France. It weighs 40,000 lbs. and is one foot thick; its circumference is 32 feet, and its height and breadth 10 feet: the clapper alone weighs 710 lbs. Near this church, which is not the only remarkable one, is the public library. The ſteeple of the late Benedictines of St. Oven is an elegant Gothic ſtructure. The linens of Rouen, particularly what are called the *Siamoiſe*, are much eſteemed. There are alſo manufactures of cloth, and a manufacture of oil of vitriol, the only one in France. The ſuburb of St. Sever, ſituate on the other ſide of the Seine, communicates with the city by a bridge of boats, which riſes and falls with the tide, and is made to open, ſo as to admit the paſſage of ſhips. It is paved, and is 270 paces long. Rouen is the birthplace of the two Corneilles, and of Fontenelle. It is 50 miles ſouth-weſt of Amiens, and 70 north-weſt of Paris. E. lon. 1. 10. N. lat. 49. 27.

ROVERE, or ROVEREDO, a ſtrong town of the Tyrol, on the confines of the republic of Venice; ſeated on the river Adige, at the foot of a mountain, and on the ſide of a ſtream, over which there is a bridge, defended by two large towers and a ſtrong caſtle, 10 miles ſouth of Trent. The town is tolerably well built, and governed by a chief magiſtrate ſtyled a *Podeſtat*. There are ſeveral churches and convents, that contain nothing worthy of notice. The moſt remarkable thing, and what they call the great *wonder of Roveredo*, is its ſpinning houſe for a manufacture of ſilk, in which they have a great trade here to the fairs of Bolzano. They have alſo a very good trade in wine. Betwixt Trent and Roveredo is the ſtrong fort of Belem, belonging to the houſe of Auſtria. It is ſituated on a rock, and commands the roads at the foot of the mountain. E. lon. 11. 1. N. lat. 46. 12.

ROUERGUE, a late province of France, in the government of Guienne, 75 miles long and 50 broad; bounded on the eaſt by the Cevennes and Gevaudan, on the weſt by Querci, on the north by the ſame and Auvergne, and on the ſouth by Languedoc. It is not very fertile, but feeds a number of cattle, and has mines of copper, iron, alum, vitriol, and ſulphur. It now forms the department of Aveiron.

ROVIGNO, a populous town of Italy, in Iſtria, with two good harbours, and quarries of fine ſtone. It is ſeated in a territory which produces excellent wine, in a peninſula on the weſtern coaſt. E. lon. 13. 53. N. lat. 45. 14.

ROVIGO, is a town of Italy, in the territory of Venice, and capital of the Poleſin di Rovigo, in E. lon. 12. 25. N. lat. 45. 6. It is a ſmall place, poorly inhabited, and encompaſſed with ruinous walls. Formerly it belonged to the duke of Ferrara, but has been ſubject to the Venetians ſince 1500, and is famous for being the birth-place of that learned man Cœlius Rhodoginus. It was built upon the ruins of Adria, anciently a noble harbour one mile from Rovigo, that gave name to the gulph, but now a half drowned village, inhabited by a few fiſhermen.

ROUNDELAY, or ROUNDO, a ſort of ancient poem, derived its name, according to Menage, from its form, and becauſe it ſtill turns back again to the firſt verſe, and thus goes round. The common roundelay conſiſts of 13 verſes, eight of which are in one rhyme and five in another. It is divided into couplets; at the end of the ſecond and third of which the beginning of the roundelay is repeated; and that, if poſſible, in an equivocal or punning ſenſe. The roundelay is a popular poem in France, but is little known among us. Marot and Voiture have ſucceeded the beſt in it. Rapin remarks, that if the roundelay be not very exquiſite, it is intolerably bad. In all the ancient ones, Menage obſerves, that the verſe preceding has a leſs complete ſenſe, and yet joins agreeably with that of the cloſe, without depending neceſſarily thereon. This rule, well obſerved, makes the roundelay more ingenious, and is one of the fineſſes of the poem. Some of the ancient writers ſpeak of the roundelay or roundel as a kind of air appropriated to dancing; and in this ſenſe the term ſeems to indicate little more than dancing in a circle with the hands joined.

ROUND HOUSE, a kind of priſon for the nightly watch in London to ſecure diſorderly perſons till they can be carried before a magiſtrate.

ROUND-*Houſe*, in a ſhip, the uppermoſt room or cabin on the ſtern of a ſhip, where the maſter lies.

ROUNDS, in military matters, a detachment from the main-guard, of an officer or a non-commiſſioned officer and ſix men, who go round the rampart of a garriſon to liſten if any thing be ſtirring without the place, and to ſee that the ſentinels be diligent upon their duty, and all in order. In ſtrict-garriſons the rounds go every half hour. The ſentinels are to challenge at a diſtance, and to reſt their arms as the round paſſes. All guards turn out, challenge, exchange the parole, and reſt their arms, &c.

Rounds are ordinary and extraordinary. The ordinary rounds are three; the town-major's round, the grand round, and the visiting-round.

Manner of going the Rounds. When the town-major goes his round, he comes to the main-guard, and demands a serjeant and four or six men to escort him to the next guard; and when it is dark, one of the men is to carry a light.

As soon as the sentry at the guard perceives the round coming, he shall give notice to the guard, that they may be ready to turn out when ordered; and when the round is advanced within about 20 or 30 paces of the guard, he is to challenge briskly; and when he is answered by the serjeant who attends the round, *Town-major's round*, he is to say, *Stand round!* and rest his arms; after which he is to call out immediately, *Serjeant, turn out the guard, town-major's round.* Upon the sentry calling, the serjeant is to turn out the guard immediately, drawing up the men in good order with shouldered arms, the officer placing himself at the head of it, with his arms in his hand. He then orders the serjeant and four or six men to advance toward the round, and challenge: the serjeant of the round is to answer, *Town-major's round*; upon which the serjeant of the guard replies. *Advance, serjeant, with the parole!* at the same time ordering his men to rest their arms. The serjeant of the round advances alone, and gives the serjeant of the guard the parole in his ear, that none else may hear it; during which period the serjeant of the guard holds the spear of his halbert at the other's breast. The serjeant of the round then returns to his post, whilst the serjeant of the guard, leaving his men to keep the round from advancing, gives the parole to his officer. This being found right, the officer orders his serjeant to return to his men; says, *Advance, town major's round!* and orders the guard to rest their arms; upon which the serjeant of the guard orders his men to wheel back from the centre, and form a lane, through which the town-major is to pass (the escort remaining where they were), and go up to the officer and give him the parole, laying his mouth to his ear. The officer holds the spear of his esponton at the town major's breast while he gives him the parole.

The design of rounds is not only to visit the guards, and keep the sentinels alert; but likewise to discover what passes in the outworks, and beyond them.

ROUSSILLON, a late province of France, 50 miles long and 25 broad; bounded on the east by the Mediterranean, on the west by Cerdagna, on the north by Lower Languedoc, and on the south by Catalonia, from which it is separated by the Pyrenees. See Pyrenees Eastern.

ROUSSEAU (James), an eminent painter, was born at Paris in the year 1630, and studied first under Swanevelt, who had married one of his relations; after which he improved himself by travelling into Italy, practising solely in perspective, architecture, and landscape. On his return home, he was employed at Marly. He distinguished himself very much in painting buildings, and by his knowledge of, and attention to, the principles of perspective. Louis XIV. employed him to decorate his hall of devices at St. Germaine en Laie, where he represented the operas of Lulli. But being a Protestant, he quitted France on the persecution of his brethren, and retired to Swisserland. Louis invited him back; he refused, but sent his designs and recommended a proper person to execute them. After a short stay in Swisserland, he went to Holland; whence he was invited over to England by Ralph duke of Montague, to adorn his new house in Bloomsbury, where he painted much. Some of his pictures, both in landscape and architecture, are over doors at Hampton court; and he etched some of his own designs. His perspectives having been most commonly applied to decorate courts or gardens, have suffered much from the weather. Such of them as remain are monuments of an excellent genius. The colours are durable and bright, and the choice of them most judicious. He died in Soho-square, about the year 1693, aged 63.

Rousseau (John Baptist), a celebrated French poet, was born at Paris in April 1671. His father, who was a shoemaker in good circumstances, made him study in the best colleges of Paris, where he distinguished himself by his abilities. He at length applied himself entirely to poetry, and soon made himself known by several short pieces, that were filled with lively and agreeable images, which made him sought for by persons of the first rank, and men of the brightest genius. He was admitted in quality of *élève*, or pupil, into the academy of Inscriptions and Belles Lettres, in 1701, and almost all the rest of his life attached himself to some of the great lords. He attended marshal Tallard into England, in quality of secretary, and here contracted a friendship with St. Evremond. At his return to Paris, he was admitted into the politest company, lived among the courtiers, and seemed perfectly satisfied with his situation; when, in 1708, he was prosecuted for being the author of some couplets, in which the characters of several persons of wit and merit were blackened by the most atrocious calumnies. This prosecution made much noise; and Rousseau was banished in 1712 out of the kingdom, to which he was never more to return, by a decree of the parliament of Paris. However, he always steadily denied, and even on his death-bed, his being the author of these couplets.—From the date of this sentence he lived in foreign countries, where he found illustrious protectors. The count de Luc, ambassador of France in Swisserland, took him into his family, and studied to render his life agreeable. He took him with him to the treaty of Baden in 1714, where he was one of the plenipotentiaries, and presented him to prince Eugene, who entertaining a particular esteem for him, took him to Vienna, and introduced him to the emperor's court. Rousseau lived about three years with prince Eugene; but having lost his favour by satirising one of his mistresses, he retired to Brussels, where he afterwards usually resided, and where he met with much attention and much generosity, as we shall soon mention.—It was here that his disputes with Voltaire commenced, with whom he had become acquainted at the college of Louis the Great, who then much admired his turn for poetry, At that time Voltaire assiduously cultivated the acquaintance of Rousseau, and made him a present of all his works; and Rousseau, flattered by his respect, announced him as a man who would one day be a glory to the age. The author of the Henriad continued to consult him about his productions, and to lavish on him the highest encomiums, while their friendship daily increased. When they again met at Brussels, however, they harboured the blackest malice against one another. The cause of this enmity, as Rousseau and his friends tell the story, was a lecture which he had composed from his Epistle to Julia, now Urania. This piece frightened Voltaire, as it plainly discovered his rage against him. The young man, vexed at these calumnies, understood the whole as thrown out against him. This is what Rousseau asserts. But his adversaries, and the friends of the poet whom he cried down, suspected him, perhaps rather rashly, of having employed sarcasms, because he thought that his own reputation was in danger of being eclipsed by that of his rival. What is very singular, these two celebrated characters endeavoured each of them to prepossess the public with a bad opinion of the other, which they themselves never entertained in reality, and to smother in their breast that esteem for each other which, in defiance of all their exertions, still held its place. Rousseau, from the period of this dispute, always represented Voltaire as a buffoon, as a writer possessing neither taste nor judgment, who owed all his success to a particular mode which he pursued. As a poet he considered him as inferior to Lucan, and little superior to Pradon.

Voltaire treated him ſtill worſe. Rouſſeau, according to him, was nothing better than a plagiariſt, who could make ſhift to rhyme, but could not make any reflections; that he had nothing but the talent of arranging words, and that he had even loſt that in foreign countries. He thus addreſſes him, in a piece little known:

Auſſitôt le Dieu qui m'inſpire
T'arra'a le luth et la lyre
Qu'avoient deſhonorés tes mains;
Tu n'es plus qu'un reptile immonde,
Rebus du Parnaſſe et du monde,
Enſéveli dans tes venins.

In conſequence of the little eſteem in which Rouſſeau was held at Bruſſels, he could never forget Paris. The grand-prior of Vendôme and the baron de Breteuil ſolicited the regent duke of Orleans to allow him to return; which favour was obtained. But our poet, before he would make uſe of the *lettres de rapel* iſſued in his favour, demanded a review of his proceſs, which he wiſhed to be repealed, not as a matter of favour, but by a ſolemn judgment of court; but his petition was refuſed. He then came over, in 1721, to England, where he printed *A Collection of his Works*, in 2 vols. 12mo, at London. This edition, publiſhed in 1723, brought him near 10,000 crowns, the whole of which he placed in the hands of the Oſtend company. The affairs of this company, howver, ſoon getting into confuſion, all thoſe who had any money in their hands loſt the whole of it; by which unfortunate event Rouſſeau, when arrived at that age when he ſtood moſt in need of the comforts of fortune, had nothing to depend upon but the generoſity of ſome friends. Boutet, public notary in Paris, was peculiarly generous and attentive to him. He found a ſtill greater aſylum in the duke d'Aremberg, whoſe table was open to him at all times; who being obliged in 1733 to go into the army in Germany, ſettled on him a penſion of 1500 livres. But unfortunately he ſoon loſt his good opinion, having been imprudent enough to publiſh in a Journal (of which Voltaire accuſed him), that the duke d'Aremberg was the author of thoſe verſes for which he himſelf had been baniſhed France. He was therefore diſmiſſed from his table, and his pride would not allow him to accept the penſion after this rupture. Bruſſels now became infupportable to him; and the count du Luc, and M. de Senezan, receiver-general of the church revenue, being informed of his diſappointments, invited him to come privately to Paris, in the hopes of procuring a diminution of the period of his baniſhment. Some time previous to this Rouſſeau had publiſhed two new letters; one to P. Brumoi, on tragedy; the other to Rollin, on hiſtory. It is ſaid, he expected from his letter to Brumoi to get the favour of all the Jeſuits; and from the one to Rollin the patronage of the Janſeniſts. He had likewiſe written an Ode, in praiſe of cardinal de Fleury, on Peace, which met with a favourable reception, although it was not equal to ſome of his former pieces. He imagined his return to Paris would be found no difficult matter. He attempted it, and found he could not obtain a paſs for a ſingle year. Some ſay, that Rouſſeau had irritated ſome perſons in power, by an allegory called *The Judgment of Pluto*; in which piece he deſcribes one of the principal judges, whoſe ſkin Pluto had cauſed to be taken off, and ſtretched out on the ſeat in the bench. This ſatire, joined to the ſecret machinations of enemies, rendered all the attempts of his friends to procure his return abortive. After having ſtaid three months at Paris, he returned to Bruſſels in February 1740, at which place he died March 17, 1741, ſtrongly impreſſed with religious ſentiments. Immediately before he received the viaticum, he proteſted he was not the author of thoſe horrid verſes which had ſo much embittered his life; and this declaration, in the opinion of the virtuous part of mankind, will be conſidered as a ſufficient proof of his innocence. Some have ſaid that Rouſſeau was profane, troubleſome, capricious, forward, vindictive, envious, a flatterer, and a ſatiriſt. Others again repreſent him as a man full of candour and openneſs, a faithful and grateful friend, and as a Chriſtian affected with a ſenſe of religion.—Amidſt ſuch widely varied accounts it is difficult to form an opinion of his character. Such of our readers as wiſh to know more of this great poet may conſult the Dictionary of M. Chaupepié, written with as much preciſion as impartiality, who endeavours to give a juſt idea of his character. From what he ſays, it does not appear that Rouſſeau can be cleared from the accuſation brought againſt him of having attacked his benefactors. We believe he may be much more eaſily freed from the imputation brought againſt him by ſome of having diſowned his father: for what occaſion had Rouſſeau to conceal the obſcurity of his birth? It exalted his own merit.

M. Seguy, in concert with M. the prince of la Tour Taſſis, has given a very beautiful edition of his works, agreeable to the poet's laſt corrections. It was publiſhed in 1743, at Paris, in 3 vols. 4to, and in 4 vols. 12mo, containing nothing but what was acknowledged by the author as his own. It contains, 1. Four Books of Odes, of which the firſt are ſacred odes, taken from the Pſalms. "Rouſſeau (ſays Freron) unites in himſelf Pindar, Horace, Anacreon, and Malherbe. What fire, what genius, what flights of imagination, what rapidity of deſcription, what variety of affecting ſtrokes, what a crowd of brilliant compariſons, what richneſs of rhymes, what happy verſification; but eſpecially what inimitable expreſſion! His verſes are finiſhed in the higheſt ſtyle of perfection that French verſe is capable of aſſuming." The lyric compoſitions of Rouſſeau are, in general, above mediocrity. All his odes are not, however, of equal merit. The moſt beautiful are thoſe which he has addreſſed to count du Luc, to Malherbe, to prince Eugene, to Vendôme, to the Chriſtian princes; his Odes on the death of the prince de Conti, on the battle of Peterwaradin; and the Ode to Fortune, although there are certainly ſome few weak ſtanzas to be met with in it. There is conſiderable neatneſs in the compoſition of the Ode to a Widow, in his ſtanzas to the Abbe de Chaulieu, in his addreſſes to Roſſignol, in his Odes to count de Bonneval, to M. Duche, and to count de Sinzindorf; and it is to be lamented that he wrote ſo few pieces of this kind, from which his genius ſeemed to lead him with difficulty. 2. Two books of Epiſtles, in verſe. Although theſe do not want their beauties, yet there prevails too much of a miſanthropic ſpirit in them, which takes away greatly from their excellence. He makes too frequent mention of his enemies and his miſfortunes; he diſplays thoſe principles which are ſupported leſs on the baſis of truth than on thoſe various paſſions which ruled his mind at the time. He puts forth his anger in paradoxes. If he be reckoned equal to Horace in his odes, he is far inferior in his epiſtles. There is much more philoſophy in the Roman poet than in him. 3. *Cantatas.* He is the father of this ſpecies of poetry, in which he ſtands unrivalled. His pieces of this ſort breathe that poetical expreſſion, that pictureſque ſtyle, thoſe happy turns, and thoſe eaſy graces, which conſtitute the true character of this kind of writing. He is as lively and impetuous as he is mild and affecting, adapting himſelf to the paſſions of thoſe perſons whom he makes to ſpeak. "I confeſs (ſays M. de la Harpe) that I find the cantatas of Rouſſeau more purely lyric than his odes, although he riſes to greater heights in theſe. I ſee nothing in his cantatas but bold and agreeable images. He always addreſſes himſelf to the imagination, and he never becomes either too verboſe or too prolix. On the contrary, in ſome of the beſt of his odes, we find ſome languid ſtanzas, ideas too long delayed, and verſes of inexcuſable meanneſs." 4. *Allegories*, the moſt of which are happy, but ſome of them appear forced. 5. *Epigrams*, after the manner of Martial and Marot. He has taken care to leave out of this

edition those pieces which licentiousness and debauchery inspired. They bear, indeed, as well as his other pieces, the marks of genius; but such productions are calculated only to dishonour their authors, and corrupt the heart of those who read them. 6. A book of *Poems on Various Subjects*, which sometimes want both ease and delicacy. The most distinguished are two eclogues, imitated from Virgil. 7. Four comedies in verse; the *Flatterer*, whose character is well supported; the *Imaginary Forefathers*, a piece which had much less success, although it affords sufficiently good sentiment; the *Capricious Man*, and the *Dupe of Herself*, pieces of very inconsiderable merit. 8. Three comedies in prose; the *Coffee-house*, the *Magic Girdle*, and the *Madragore*, which are little better than his other theatrical pieces. The theatre was by no means his forte; he had a genius more suited for satire than comedy, more akin to Boileau's than Moliere's. 9. A *Collection of Letters*, in prose. In this edition he has selected the most interesting.—There is a larger collection in 5 volumes. This last has done at the same time both injury and honour to his memory. Rousseau in it speaks both in favour of and against the very same persons. He appears too hasty in tearing to pieces the characters of those who displeased him. We behold in them a man of a steady character and an elevated mind, who wishes to return to his native country only that he might be enabled completely to justify his reputation. We see him again corresponding with persons of great merit and uncommon integrity, with the abbé d'Olivet, Racine the son, the poets La Fosse and Duche, the celebrated Rollin, M. le Franc de Pompignan, &c. &c. We meet also with some anecdotes and exact judgments of several writers. A bookseller in Holland has published his port-folio, which does him no honour. There are, indeed, some pieces in this wretched collection which did come from the pen of Rousseau; but he is less to be blamed for them than they are who have drawn these works from that oblivion to which our great poet had consigned them. A pretty good edition of his *Select Pieces* appeared at Paris in 1741, in a small 12mo volume. His portrait engraved by the celebrated Aved, his old friend, made its appearance in 1778, with the following motto from Martial: "*Certior in nostro carmine vultus erit.*"

Rousseau (John James) was born at Geneva, June 28, 1712. His father was by profession a clock and watchmaker. At his birth, which, he says, was the first of his misfortunes, he endangered the life of his mother, and he himself was for a long time after in a very weak and languishing state of health; but as his bodily strength increased, his mental powers gradually opened, and afforded the happiest presages of future greatness. His father, who was a citizen of Geneva, was a well informed tradesman; and in the place where he worked he kept a Plutarch and a Tacitus, and these authors of course soon became familiar to his son. A rash juvenile step occasioned his leaving his father's house. "Finding himself a fugitive in a strange country, and without money or friends, he changed (says he himself) his religion, in order to procure a subsistence." Bornex, bishop of Anneci, from whom he solicited an asylum, committed the care of his education to Madame de Warrens, an ingenious and amiable lady, who had in 1726 left part of her wealth, and the Protestant religion, in order to throw herself into the bosom of the church. This generous lady served in the triple capacity of a mother, a friend, and a lover, to the new proselyte, whom she regarded as her son. The necessity of procuring for himself some settlement, however, or perhaps his unsettled disposition, obliged Rousseau often to leave his tender mother.

He possessed more than ordinary talents for music; and the abbé Blanchard flattered his hopes with a place in the royal chapel, which he, however, failed in obtaining for him; he was therefore under the necessity of teaching music at Chamberi. He remained in this place till 1741, in which year he went to Paris, where he was long in very destitute circumstances. Writing to a friend in 1743, he thus expresses himself: "Every thing is dear here, but especially bread." What an expression! and to what may not genius be reduced! Meanwhile he now began to emerge from that obscurity in which he had hitherto been buried. His friends placed him with M. de Montaigu, ambassador from France to Venice. According to his own confession, a proud misanthropy and a peculiar contempt of the riches and pleasures of this world constituted the chief traits in his character, and a misunderstanding soon took place between him and the ambassador. The place of depute, under M. Dupin, farmer general, a man of considerable parts, gave him some temporary relief, and enabled him to be of some benefit to Madame de Warrens, his former benefactress. The year 1750 was the commencement of his literary career. The academy of Dijon had proposed the following question: "Whether the *revival* of the arts and sciences has contributed to the refinement of manners?" Rousseau at first inclined to support the affirmative. "This is the *pons asinorum* (says a philosopher, at that time a friend of his): take the negative side of the question, and I'll promise you the greatest success."

His discourse against the sciences, accordingly, having been found to be the best written, and replete with the deepest reasoning, was publicly crowned with the approbation of that learned body. Never was a paradox supported with more eloquence: it was not however a new one; but he enriched it with all the advantages which either knowledge or genius could confer on it. Immediately after its appearance, he met with several opponents of his tenets, which he defended; and from one dispute to another, he found himself involved in a formidable train of correspondence, without having ever almost dreamed of such opposition. From that period he decreased in happiness as he increased in celebrity. His "Discourse on the causes of inequality among mankind, and on the origin of social compacts," a work full of almost unintelligible maxims and wild ideas, was written with a view to prove that mankind are equal; that they were born to live apart from each other; and that they have perverted the order of nature in forming societies. He bestows the highest praise on the state of nature, and depreciates the idea of every social compact. This discourse, and especially the dedication of it to the republic of Geneva, are the *chef-d'œuvres* of that kind of eloquence of which the antients alone had given us any idea. By presenting this performance to the magistrates, he was received again into his native country, and reinstated in all the privileges and rights of a citizen, after having with much difficulty prevailed on himself to abjure the Catholic religion. He soon, however, returned to France, and lived for some time in Paris. He afterwards gave himself up to retirement, to escape the shafts of criticism, and follow after the regimen which the strangury, with which he was tormented, demanded of him. This is an important epoch in the history of his life, as it is owing to this circumstance, perhaps, that we have the most elegant works that have come from his pen. His "Letter to M. d'Alembert" on the design of erecting a theatre at Geneva, written in his retirement, and published in 1757, contains, along with some paradoxes, some very important and well-handled truths. This letter first drew down upon him the envy of Voltaire, and was the cause of those indignities with which that author never ceased to load him. What is singular in him, is, that, although so great an enemy to theatrical representations himself, he caused a comedy to be printed, and in 1752 gave to the theatre a pastoral (The Village Conjuror), of which he composed both the poetry and music, both of them abounding with sentiment and elegance, and full of innocent and rural simplicity. What renders the Village Conjuror highly delightful to persons of taste, is that perfect harmony of words and music which every where pervades it; that

proper connection among the parties who compose it; and its being perfectly correct from beginning to end. The musician hath spoken, hath thought, and felt like a poet. Every thing in it is agreeable, interesting, and far superior to those common, affected, and insipid productions of our modern petit-dramas. His Dictionary of Music affords several excellent articles; some of them, however, are very inaccurate. "This work (says M. la Borde), in his Essay on Music, has need to be written over again, to save much trouble to those who wish to study it, and prevent them from falling into errors, which it is difficult to avoid, from the engaging manner in which Rousseau drags along his readers." The passages in it which have any reference to literature may be easily distinguished, as they are treated with the agreeableness of a man of wit and the exactness of a man of taste. Rousseau, soon after the rapid success of his Village Conjuror, published a Letter *on* French Music, or rather *against* French music, written with as much freedom as liveliness. The exasperated partisans of French comedy treated him with as much fury as if he had conspired against the state. A crowd of insignificant enthusiasts spent their strength in outcries against him. He was insulted, menaced, and lampooned. Harmonic fanaticism went even to hang him up in effigy.

That interesting and tender style, which is so conspicuous throughout the Village Conjuror, animates several letters in the New Heloisa, in six parts, published in 1761, in 12mo. This epistolary romance, of which the plot is ill-managed, and the arrangement bad, like all other works of genius, has its beauties as well as its faults. More truth in his characters and more precision in his details were to have been wished. The characters, as well as their style, have too much sameness, and their language is too affected and exaggerated. Some of the letters are indeed admirable, from the force and warmth of expression, from an effervescence of sentiments, from the irregularity of ideas which always characterise a passion carried to its height. But why is so affecting a letter so often accompanied with an unimportant digression, an insipid criticism, or a self-contradicting paradox? Why, after having shone in all the energy of sentiment, does he on a sudden turn unaffecting? It is because none of the personages are truly interesting. That of St. Preux is weak, and often forced. Julia is an assemblage of tenderness and pity, of elevation of soul and of coquetry, of natural parts and pedantry. Wolmar is a violent man, and almost beyond the limits of nature. In fine, when he wishes to change his style, and adopt that of the speaker, it may easily be observed that he does not long support it, and every attempt embarrasses the author and cools the reader. In the Heloisa, Rousseau's unlucky talent of rendering every thing problematical, appears very conspicuous; as in his arguments in favour of and against duelling, which afford an apology for suicide, and a just condemnation of it: in his facility in palliating the crime of adultery, and his very strong reasons to make it abhorred: on the one hand, in declamations against social happiness; on the other, in transports in favour of humanity; here, in violent rhapsodies against philosophers; there, by a rage for adopting their opinions: the existence of God attacked by sophistry, and Atheists confuted by the most irrefragable arguments; the Christian religion combated by the most specious objections, and celebrated with the most sublime eulogies.

His Emilia afterwards made more noise than the New Heloisa. This moral romance, which was published in 1762, in four vols. 12mo, treats chiefly of education. Rousseau wished to follow nature in every thing; and though his system in several places differs from received ideas, it deserves in many respects to be put in practice, and with some necessary modifications it has been so. See our article EDUCATION. His precepts are expressed with the force and dignity of a mind full of the leading truths of morality. If he has not always been virtuous, nobody at least has felt it more, or made it appear to more advantage. Every thing which he says against luxury shows the vices and conceited opinions of his age, and is worthy at once of Plato or of Tacitus. His style is peculiar to himself. He sometimes, however, appears, by a kind of affected rudeness and asperity, to aim at the mode of Montaigne, of whom he is a great admirer, and whose sentiments and expressions he often clothes in a new dress. What is most to be lamented is, that in wishing to educate a young man as a Christian he has filled his third volume with objections against Christianity. He has, it must be confessed, given a very sublime eulogium on the gospel, and an affecting portrait of its divine Author: but the miracles, and the prophecies which serve to establish his mission, he attacks without the least reserve. Admitting only natural religion, he weighs every thing in the balance of reason; and this reason, being false, leads him into dilemmas very unfavourable to his own repose and happiness.

He dwelt from 1754 in a small house in the country near Montmorenci; a retreat which he owed to the generosity of a farmer-general. The cause of his love for this retirement was, according to himself, "that invincible spirit of liberty which nothing could conquer, and in competition with which honours, fortune, and reputation, could not stand. It is true, this desire of liberty has occasioned less pride than laziness; but this indolence is inconceivable. Every thing startles it; the most inconsiderable reciprocalities of social life are to it insupportable. A word to speak, a letter to write, a visit to pay, things necessary to be done, are to me punishments. Hear my reasons. Although the ordinary intercourse between mankind be odious to me, intimate friendship appears to me very dear; because there are no mere ceremonies due to it; it agrees with the heart, and all is accomplished. Hear, again, why I have always shunned kindnesses so much; because every act of kindness requires a grateful mind, and I find my heart ungrateful, from this alone, that gratitude is a duty. Lastly, that kind of felicity which is necessary for me, is not so much to do that which I wish, as not to do what I wish not to do." Rousseau enjoyed this felicity, which he so much wished, in his retirement. Without entirely adopting that too rigorous mode of life pursued by the ancient Cynics, he deprived himself of every thing that could in any measure add fuel to this wished-for luxury, which is ever the companion of riches, and which inverts even custom itself. He might have been happy in this retreat, if he could have forgot this public which he affected to despise; but his desire after a great name got the better of his self-love, and it was this thirst after reputation which made him introduce so many dangerous paragraphs in his Emilia.

The French parliament condemned this book in 1762, and entered a criminal prosecution against the author, which forced him to make a precipitate retreat. He directed his steps towards his native country, which shut its gates upon him. Proscribed in the place where he first drew breath, he sought an asylum in Switzerland, and found one in the principality of Neufchatel. His first care was to defend his Emilia against the mandate of the archbishop of Paris, by whom it had been anathematised. In 1763 he published a letter, in which he re-exhibits all his errors, set off with the most animated display of eloquence, and in the most insidious manner. In this letter he describes himself as "more vehement than celebrated in his researches, but sincere, on the whole, even against himself; simple and good, but sensible and weak; often doing evil, and always loving good; united by friendship, never by circumstances, and keeping more to his opinions than to his interests; requiring nothing of men, and not wishing to be under any obligation to them; yielding no more to their prejudices than

to their will, and preſerving his own as free as his reaſon; diſputing about religion without licentiouſneſs; loving neither impiety nor fanaticiſm, but diſliking preciſe people more than bold ſpirits," &c. &c. From this ſpecimen the limitation he would appoint to this portrait may eaſily be diſcovered.

The letters of La Montaigne appeared ſoon after; but this work, far leſs eloquent, and full of envious diſcuſſions on the magiſtrates and clergy of Geneva, irritated the Proteſtant miniſters without effecting a reconciliation with the clergy of the Romiſh church. Rouſſeau had ſolemnly abjured the latter religion in 1753, and, what is ſomewhat ſtrange, had then reſolved to live in France, a Catholic country. The Proteſtant clergy were not fully reconciled by this change; and the protection of the king of Pruſſia, to whom the principality of Neufchatel belonged, was not ſufficient to reſcue him from that obloquy which the miniſter of Moutiers-Travers, the village to which he had retired, had excited againſt him. He preached againſt Rouſſeau, and his ſermons produced an uproar among the people. On the night between the 6th and 7th of September 1765, ſome fanatics, driven on by wine and the declamations of their miniſter, threw ſome ſtones at the windows of the Genevan philoſopher, who, fearing new inſults, in vain ſought an aſylum in the canton of Berne. As this canton was connected with the republic of Geneva, they did not think proper to allow him to remain in their city, being proſcribed by that republic. Neither his broken ſtate of health, nor the approach of winter, could ſoften the hearts of theſe obdurate Spartans. In vain, to prevent them from the fear they had of the ſpreading of his opinions, did he beſeech them to ſhut him up in priſon till the ſpring; for even this favour was denied him. Obliged to ſet out on a journey, in the beginning of a very inclement ſeaſon, he reached Straſbourg in a very deſtitute ſituation. He received from marſhal de Contades, who then commanded in that place, every accommodation which could be expected from generoſity, humanity, and compaſſion. He waited there till the weather was milder, when he went to Paris, where Mr. Hume then was, who determined on taking him with him to England. After having made ſome ſtay in Paris, Rouſſeau actually ſet out for London in 1766. Hume, much affected with his ſituation and his misfortunes, procured for him a very agreeable ſettlement in the country. Our Genevan philoſopher was not, however, long ſatisfied with this new place. He did not make ſuch an impreſſion on the minds of the Engliſh as he had done on the French. His free diſpoſition, his obdurate and melancholy temper, was deemed no ſingularity in England. He was there looked upon as an ordinary man, and the periodical prints were filled with ſatires againſt him. In particular, they publiſhed a forged letter from the king of Pruſſia, holding up to ridicule the principles and conduct of this new Diogenes. Rouſſeau imagined there was a plot between Hume and ſome philoſophers in France to deſtroy his glory and repoſe. He ſent a letter to him filled with the moſt abuſive expreſſions, and reproaching him for his conduct towards him. From this time he looked upon Hume as a wicked and perfidious perſon, who had brought him to England with no other view than to expoſe him to public ridicule; which fooliſh and chimerical idea was nouriſhed by ſelf-love and a reſtleſs diſpoſition. He imagined that the Engliſh philoſopher, amidſt all his kindneſſes, had ſomething diſagreeable in the manner of expreſſing them. The bad health of Rouſſeau, a ſtrong and melancholy imagination, a too nice ſenſibility, a jealous diſpoſition, joined with philoſophic vanity, cheriſhed by the falſe informations of his governeſs, who poſſeſſed an uncommon power over him; all theſe taken together might tend to prepoſſeſs him with unfavourable ſentiments of ſome innocent freedoms his benefactor might have taken with him, and might render him ungrateful, which he thought himſelf incapable of becoming. Meanwhile, theſe falſe conjectures and probabilities ought never to have had the weight with an honeſt mind to withdraw itſelf from its friend and benefactor. Proofs are always neceſſary in caſes of this kind; and that which Rouſſeau had was by no means a certain demonſtration. The Genevan philoſopher, however, certainly returned to France. In paſſing through Amiens, he met with M. Greſſet, who interrogated him about his misfortunes, and the controverſies he had been engaged in. He only anſwered, "You have got the art of making a parrot ſpeak; but you are not yet poſſeſſed of the ſecret of making a bear ſpeak." In the mean time, the magiſtrates of this city wiſhed to confer on him ſome mark of their eſteem; which he abſolutely refuſed. His diſordered imagination viewed theſe flattering civilities as nothing elſe than inſults, ſuch as were laviſhed on Sancho in the iſland of Barataria. He thought one part of the people looked upon him as like Lazarillo de Tormes, who, being fixed to the bottom of a tub, with only his head out of the water, was carried from one town to another to amuſe the vulgar. But theſe wrong and whimſical ideas did not prevent him from aſpiring after a reſidence in Paris, where, without doubt, he was more looked on as a ſpectacle than in any other place whatever. On the 1ſt of July 1770, Rouſſeau appeared, for the firſt time, at the Regency coffeehouſe, dreſſed in ordinary clothing, having for ſome time previous to this worn an Armenian habit. He was loaded with praiſes by the ſurrounding multitude. "It is ſomewhat ſingular (ſays M. Sennebier) to ſee a man ſo haughty as he returning to the very place from whence he had been baniſhed ſo often. Nor is it one of the ſmalleſt inconſiſtencies of this extraordinary character, that he preferred a retreat in that place of which he had ſpoken ſo much ill." It is as ſingular, that a perſon under ſentence of impriſonment ſhould wiſh to live in ſo public a manner in the very place where his ſentence was in force againſt him. His friends procured for him, however, liberty of ſtaying, on condition that he ſhould neither write on religion nor politics: he kept his word; for he wrote none at all. He was contented with living in a calm philoſophical manner, giving himſelf to the ſociety of a few tried friends, ſhunning the company of the great, appearing to have given up all his whimſies, and affecting neither the character of a philoſopher nor a *bel eſprit*. He died of an apoplexy at Ermenon-ville, belonging to the marquis de Girardin, about ten leagues from Paris, July 2, 1778, aged 66 years. This nobleman has erected to his memory a very plain monument, in a grove of poplars, which conſtitutes part of his beautiful gardens. On the tomb are inſcribed the following epitaphs:

Ici repoſe
L'Homme de la Nature
Et de la Vérité!

*Vitam impendere Vero**. (*His motto.)

Hic jacent Oſſa J. J. Rouſſeau.

The curious who go to ſee this tomb likewiſe ſee the cloak which the Genevan philoſopher wore. Above the door is inſcribed the following ſentence, which might afford matter for a whole book: "He is truly free, who, to accompliſh his pleaſure, has no need of *the aſſiſtance of a ſecond perſon*." Rouſſeau, during his ſtay in the environs of Lyons, married Mademoiſelle le Vaſſeur, his governeſs, a woman who, without either beauty or talents, had gained over him a great aſcendancy. She waited on him in health and in ſickneſs: But, as if ſhe had been jealous of poſſeſſing him alone, ſhe drove from his mind, by the moſt perfidious inſinuations, all thoſe who came to entertain him; and when Rouſſeau did not diſmiſs them, ſhe prevented their return by invariably refuſing them admittance. By theſe means ſhe the more eaſily led her huſband into inconſiſtencies of conduct, which the originality of

his character as well as of his opinions so much contributed to assist. Nature had perhaps but given him the embryo of his character, and art had probably united to make it more singular. He did not incline to associate with any person; and as this method of thinking and living was uncommon, it procured him a name, and he displayed a kind of fantasticalness in his behaviour and his writings. Like Diogenes of old, he united simplicity of manners with all the pride of genius; and a large stock of indolence, with an extreme sensibility, served to render his character still more uncommon. "An indolent mind (says he), terrified at every application, a warm, bilious, and irritable temperament, sensible also in a high degree to every thing that can affect it, appear not possible to be united in the same peson: and yet these two contrarieties compose the chief of mine. An active life has no charms for me. I would a hundred times rather consent to be idle than to do any thing against my will; and I have a hundred times thought that I should live not amiss in the Bastille, provided I had nothing to do but just continue there. In my younger days I made several attempts to get in there; but as they were only with the view of procuring refuge and rest in my old age, and, like the exertions of an indolent person, only by fits and starts, they were never attended with the smallest success. When misfortunes came, they afforded me a pretext of giving myself up to my ruling passion." He often exaggerated his misfortunes to himself as well as to others. He endeavoured particularly to render interesting by his description his misfortunes and his poverty, although the former were far less than he imagined, and notwithstanding he had certain resources against the latter. In other respects he was charitable, generous, sober, just, contenting himself with what was purely necessary, and refusing the means which might have procured him wealth and offices. He cannot, like many other sophists, be accused of having often repeated with a studied emphasis the word *Virtue*, without inspiring the sentiment. When he is speaking of the duties of mankind, of the principles necessary to our happiness, of the duty we owe to ourselves and to our equals, it is with a copiousness, a charm, and an impetuosity, that could only proceed from the heart. He said one day to M. de Buffon, "You have asserted and proved before J. J. Rousseau that mothers ought to suckle their children." "Yes (says this great naturalist), we have all said so; but M. Rousseau alone forbids it, and causes himself to be obeyed." Another academician said, "that the virtues of Voltaire were without heart, and those of Rousseau without head." He was acquainted at an early age with the works of the Greek and Roman authors; and the republican virtues there held forth to view, the rigorous austerity of Cato, Brutus, &c. carried him beyond the limits of a simple estimation of them. Influenced by his imagination, he admired every thing in the ancients, and saw nothing in his contemporaries but enervated minds and degenerated bodies.

His ideas about politics were almost as eccentric as his paradoxes about religion. Some reckon his *Social Compact*, which Voltaire calls the *Unsocial Compact*, the greatest effort his genius produced. Others find it full of contradictions, errors, and cynical passages, obscure, ill arranged, and by no means worthy of his shining pen. There are several other small pieces written by him, to be found in a collection of his works published in 25 vols. 8vo and 12mo, to which there is appended a very insignificant supplement in 6 vols.

The most useful and most important truths in this collection are picked out in his Thoughts; in which the confident sophist and the impious author disappear, and nothing is offered to the reader but the eloquent writer and the contemplative moralist. There were found in his port-folio his Confessions, in twelve books; the first six of which were published. "In the preface to these memoirs, which abound with characters well drawn, and written with warmth, with energy, and sometimes with elegance, he declaims (says M. Palissot) like a peevish misanthrope; who boldly introduces himself on the ruins of the world, to declare to mankind, whom he supposes assembled upon these ruins, that, in that innumerable multitude, none could dare to say *I am better than that man*. This affectation of seeing himself alone in the universe, and of continually directing every thing to himself, may appear to some morose minds a fanaticism of pride, of which we have no examples, at least since the time of Cardan." But this is not the only blame which may be attached to the author of the Confessions. With uneasiness we see him, under the pretext of sincerity, dishonouring the character of his benefactress Lady Warren. There are innuendos no less offensive against obscure and celebrated characters, which ought entirely or partly to have been suppressed. A lady of wit said, that Rousseau would have been held in higher estimation for virtue, "had he died without his confession." The same opinion is entertained by M. Sennebier, author of the Literary History of Geneva: "His Confessions (says he) appear to me to be a very dangerous book, and paint Rousseau in such colours as we would never have ventured to apply to him. The excellent analyses which we meet with of some sentiments, and the delicate anatomy which he makes of some actions, are not sufficient to counterbalance the detestable matter which is found in them, and the unceasing obloquies everywhere to be met with." It is certain, that if Rousseau has given a faithful delineation of some persons, he has viewed others through a cloud, which formed in his mind perpetual suspicions. He imagined he thought justly and spoke truly; but the simplest thing in nature, says M. Servant, if distilled through his violent and suspicious head, might become poison. Rousseau, in what he says of himself, makes such acknowledgments as certainly prove that there were better men than he, at least if we may judge him from the first six books of his memoirs, where nothing appears but his vices. They ought not perhaps to be separated from the six last books, where he speaks of the virtues which make reparation for them; or, rather, the work ought not to have been published at all, if it be true (which there can be little doubt of) that in his Confessions he injured the public manners, both by the baseness of the vices he disclosed, and by the manner in which he united them with the virtues. The other pieces which we find in this new edition of his works are, 1. *The Reveries of a Solitary Wanderer*, being a journal of the latter part of his life. In this he confesses, that he liked better to send his children into hospitals destined for orphans, than to take upon himself the charge of their maintenance and education; and endeavours to palliate this error, which nothing can exculpate. 2. *Considerations upon the Government of Poland*. 3. *The Adventures of Lord Edward*, a novel, being a kind of supplement to the New Heloisa. 4. *Various Memoirs and Fugitive Pieces*, with a great number of lete rs, some of which are very long, and written with too much study, but containing some eloquent passages and some deep thought. 5. *Emilia and Sophia*. 6. *The Levite of Ephraim*, a poem in prose, in 4 cantos; written in a truly ancient style of simplicity. 7. *Letters to Sara*. 8. *An Opera and a Comedy*. 9. *Translations of the first book of Tacitus's History, of the Episode of Olinda and Sophronia, taken from Tasso*, &c. &c. Like all the other writings of Rousseau, we find in these posthumous pieces many admirable and some useful things; but they also abound with contradictions, paradoxes, and ideas very unfavourable to religion. In his letters especially we see a man chagrined at misfortunes, which he never attributes to himself, suspicious of every body about him, calling and believing himself a lamb in the midst of wolves; in one word, as like Pascal in the strength of his genius, as in his fancy of always seeing a precipice about him. This is the reflection of M. Servant, who knew him, assisted him, and caressed him during his retreat at Grenoble in 1768. This magistrate, having been very attentive in observing his character, ought the rather to be believed, as he inspected it

without either malice, envy, or resentment, and only from the concern he had for this philosopher, whom he loved and admired.

ROUT, in law, is applied to an assembly of persons going forcibly to commit some unlawful act, whether they execute it or not. See RIOT.

ROUTE, a public road, highway, or course, especially that which military forces take. This word is also used for the defeat and flight of an army.

ROWE (NICHOLAS), descended of an ancient family in Devonshire, was born in 1673. He acquired a complete taste of the classic authors under the famous Dr. Busby in Westminster school; but poetry was his early and darling study. His father, who was a lawyer, and designed him for his own profession, entered him a student in the Middle Temple. He made remarkable advances in the study of the law; but the love of the belles-lettres, and of poetry in particular, stopt him in his career. His first tragedy, the Ambitious Stepmother, meeting with universal applause, he laid aside all thoughts of rising by the law. He afterwards composed several tragedies; but that which he valued himself most upon, was his Tamerlane. The others are, the *Fair Penitent*, *Ulysses*, the *Royal Convert*, *Jane Shore*, and *Lady Jane Gray*. He also wrote a poem called the *Biter*, and several poems upon different subjects, which have been published under the title of Miscellaneous Works, in one volume, as his dramatic works have been in two. Rowe is chiefly to be considered (Dr. Johnson observes) in the light of a tragic writer and a translator. In his attempt at comedy, he failed so ignominiously, that his Biter is not inserted in his works; and his occasional poems and short compositions are rarely worthy of either praise or censure, for they seem the casual sports of a mind seeking rather to amuse its leisure than to exercise its powers. In the construction of his dramas there is not much art; he is not a nice observer of the unities. He extends time, and varies place, as his convenience requires. To vary the place is not (in the opinion of the learned critic from whom these observations are borrowed) any violation of nature, if the change be made between the act; for it is no less easy for the spectator to suppose himself at Athens in the second act, than at Thebes in the first; but to change the scene, as is done by Rowe in the middle of an act, is to add more acts to the play, since an act is so much of the business as is transacted without interruption. Rowe, by this licence, easily extricates himself from difficulties; as in Lady Jane Gray, when we have been terrified with all the dreadful pomp of public execution, and are wondering how the heroine or the poet will proceed, no sooner has Jane pronounced some prophetic rhimes, than—pass and be gone—the scene closes, and Pembroke and Gardiner are turned out upon the stage. I know not (says Dr Johnson) that there can be found in his plays any deep search into nature, any accurate discriminations of kindred qualities, or nice display of passion in its progress; all is general and undefined. Nor does he much interest or affect the auditor, except in Jane Shore, who is always seen and heard with pity. Alicia is a character of empty noise, with no resemblance to real sorrow or to natural madness. Whence then has Rowe his reputation? From the reasonableness and propriety of some of his scenes, from the elegance of his diction, and the suavity of his verse. He seldom moves either pity or terror, but he often elevates the sentiment; he seldom pierces the breast, but he always delights the ear, and often improves the understanding. Being a great admirer of Shakespeare, he gave the public an edition of his plays; to which he prefixed an account of that great man's life. But the most considerable of Mr. Rowe's performances was a translation of Lucan's *Pharsalia*, which he just lived to finish, but not to publish; for it did not appear in print till 1728, ten years after his death.

Meanwhile, the love of poetry and books did not make him unfit for business; for nobody applied closer to it when occasion required. The Duke of Queensberry, when secretary of state, made him secretary for public affairs. After the Duke's death all avenues were stopped to his preferment; and during the rest of queen Ann's reign he passed his time with the Muses and his books. A story, indeed, is told of him, which shows that he had some acquaintance with her ministers. It is said, that he went one day to pay his court to the lord treasurer Oxford, who asked him, "If he understood Spanish well?" He answered "No:" but thinking that his Lordship might intend to send him into Spain on some honourable commission, he presently added, "that he did not doubt but he could shortly be able both to understand and to speak it." The earl approving what he said, Rowe took his leave; and, retiring a few weeks to learn the language, waited again on the earl to acquaint him with it. His lordship asking him, "If he was sure he understood it thoroughly?" and Rowe affirming that he did, "How happy are you, Mr. Rowe," said the Earl, "that you can have the pleasure of reading and understanding the History of Don Quixote in the original!" On the accession of George I. he was made poet laureat, and one of the land surveyors of the customs in the port of London. The prince of Wales conferred on him the clerkship of his council; and the lord chancellor Parker made him his secretary for the presentations. He did not enjoy those promotions long; for he died Dec. 6, 1718, in his 45th year.

Mr. Rowe was twice married, had a son by his first wife, and a daughter by his second. He was a handsome, genteel man; and his mind was as amiable as his person. He lived beloved; and at his death had the honour to be lamented by Mr. Pope, in an epitaph which is printed in Pope's works, although it was not affixed on Mr. Rowe's monument in Westminster-abbey, where he was interred in the Poet's Corner, opposite to Chaucer.

ROWE (Elizabeth), an English lady, eminent for her excellent writings both in prose and verse, born at Ilchester in Somersetshire in 1647, was the daughter of worthy parents, Mr. Walter Singer and Mrs. Elizabeth Portnel. She received the first serious impressions of religion as soon as she was capable of it. There being a great affinity between painting and poetry, this lady, who had a vein for the one, naturally had a taste for the other. She was also very fond of music; chiefly of the grave and solemn kind, as best suited to the grandeur of her sentiments and the sublimity of her devotion. But poetry was her favourite employment, her distinguishing excellence. So prevalent was her genius this way, that her prose is all poetical. In 1696, a collection of her poems was published at the desire of two friends. Her paraphrase on the xxxviiith chapter of Job was written at the request of bishop Ken. She had no other tutor for the French and Italian languages than the honourable Mr. Thynne, who willingly took the task upon himself. Her shining merit, with the charms of her person and conversation, had procured her a great many admirers. Among others, it is said, the famous Mr. Prior made his addresses to her. But Mr. Thomas Rowe was to be the happy man. This gentleman was honourably descended: and his superior genius, and insatiable thirst after knowledge, were conspicuous in his earliest years. He had formed a design to compile the lives of all the illustrious persons in antiquity omitted by Plutarch; which, indeed, he partly executed. Eight lives were published since his decease. They were translated into French by the abbé Bellenger in 1734. He spoke with ease and fluency; had a frank and benevolent temper, an inexhaustible fund of wit, and a communicative disposition. Such was the man who, charmed with the person, character, and writings, of our authoress, married her in 1710, and made it his study to repay the felicity with which she crowned his life. Too intense an application to study, beyond what the delicacy of his frame would bear, broke his health, and threw him into a consumption, which put a period to his valuable life in May

1715, when he was but juſt paſt the 28th year of his age. Mrs. Rowe wrote a beautiful elegy on his death; and continued to the laſt moments of her life to expreſs the higheſt veneration and affection for his memory. As ſoon after his deceaſe as her affairs would permit, ſhe indulged her inclination for ſolitude, by retiring to Frome, in Somerſetſhire, in the neighbourhood of which place the greateſt part of her eſtate lay. In this receſs it was that ſhe compoſed the moſt celebrated of her works, Friendſhip in Death, and the Letters Moral and Entertaining. In 1736, ſhe publiſhed, the Hiſtory of Joſeph; a poem which ſhe had written in her younger years. She did not long ſurvive this publication; for ſhe died of an apoplexy, as was ſuppoſed, Feb 20, 1736-7. In her cabinet were found letters to ſeveral of her friends, which ſhe had ordered to be delivered immediately after her deceaſe. The Rev. Dr. Iſaac Watts, agreeably to her requeſt, reviſed and publiſhed her devotions in 1737, under the title of Devout Exerciſes of the Heart in Meditation and Soliloquy, Praiſe and Prayer; and, in 1739, her Miſcellaneous Works, in proſe and verſe, were publiſhed in 2 vols. 8vo, with an account of her life and writings prefixed.

As to her perſon, ſhe was not a regular beauty, yet poſſeſſed a large ſhare of the charms of her ſex. She was of a moderate ſtature, her hair of a fine colour, her eyes of a darkiſh gray inclining to blue, and full of fire. Her complexion was very fair, and a natural bluſh glowed in her cheeks. She ſpoke gracefully; her voice was exceedingly ſweet and harmonious; and ſhe had a ſoftneſs in her aſpect which inſpired love, yet not without ſome mixture of that awe and veneration which diſtinguiſhed ſenſe and virtue, apparent in the countenance, are wont to create.

ROWEL, among farriers, a kind of iſſue anſwering to what in ſurgery is called a *ſeaton*. See FARRIERY.

ROWLEY, a monk who is ſaid to have flouriſhed at Briſtol in the 15th century, and to have been an author voluminous and elegant. Of the poems attributed to him, and publiſhed ſome time ago, various opinions have been entertained, which we have noticed elſewhere. They ſeem now to be almoſt forgotten. See CHATTERTON.

ROWLEY (William), who ſtands in the third claſs of dramatic writers, lived in the reign of king Charles I. and received his education at the univerſity of Cambridge; but whether he took any degree there, is not evident; there being but few particulars preſerved in regard to him more than his cloſe intimacy and connection with all the principal wits and poetical geniuſes of that age, by whom he was well beloved, and with ſome of whom he joined in their writings. Wood ſtyles him "the ornament, for wit and ingenuity, of Pembroke-hall in Cambridge." In a word, he was a very great benefactor to the Engliſh ſtage, having, excluſive of his aid lent to Middleton, Day, Heywood, Webſter, &c. left us five plays of his own compoſing, and one in which even the immortal Shakeſpeare afforded him ſome aſſiſtance.

ROXBURGH-SHIRE, a county of Scotland, ſometimes called Teviotdale; bounded on the N. by Berwickſhire, on the E. and S. by Northumberland and Cumberland, and on the W. by the ſhires of Dumfries and Selkirk. From N. to S. it extends 30 miles, and nearly the ſame from E. to W. The principal rivers are the Tweed, Teviot, and Liddel. The face of the country exhibits a rough, irregular appearance of moſſes, hills, and mountains, interſperſed with narrow vallies, well watered, and fertile in corn. The hills feed great numbers of ſheep and cattle.

ROXENT-CAPE, or ROCK *of Liſbon*, a mountain and remarkable promontory in Portugal, ſituated in the Atlantic ocean, at the north entrance of the Tagus, 22 miles north of Liſbon.

ROYAL, ſomething belonging to a king: thus we ſay, royal family, royal aſſent, royal exchange, &c.

ROYAL *Family*. The firſt and moſt conſiderable of the king's royal family, regarded by the laws of England, is the queen.

1. The queen of England is either queen *regent*, queen *conſort*, or queen *dowager*. The queen *regent*, *regnant*, or *ſovereign*, is ſhe who holds the crown in her own right; as the firſt (and perhaps the ſecond) queen Mary, queen Elizabeth, and queen Anne; and ſuch a one has the ſame powers, prerogatives, rights, dignities, and duties, as if ſhe had been a king. This is expreſsly declared by ſtatute 1 Mar. I. ſt. 3. c. 1. But the queen *conſort* is the wife of the reigning king; and ſhe by virtue of her marriage is participant of divers prerogatives above other women.

And, firſt, ſhe is a public perſon, exempt and diſtinct from the king; and not, like other married women, ſo cloſely connected as to have loſt all legal or ſeparate exiſtence ſo long as the marriage continues. For the queen is of ability to purchaſe lands and to convey them, to make leaſes, to grant copyholds, and do other acts of ownerſhip, without the concurrence of her lord; which no other married woman can do: a privilege as old as the Saxon æra. She is alſo capable of taking a grant from the king, which no other wife is from her huſband; and in this particular ſhe agrees with the *auguſta* or *piiſſima regina conjux divi imperatoris* of the Roman laws; who, according to Juſtinian, was equally capable of making a grant to, and receiving one from, the emperor. The queen of England has ſeparate courts and officers diſtinct from the king's, not only in matters of ceremony, but even of law; and her attorney and ſolicitor general are entitled to a place within the bar of his majeſty's courts, together with the king's counſel. She may likewiſe ſue and be ſued alone, without joining her huſband. She may alſo have a ſeparate property in goods as well as lands, and has a right to diſpoſe of them by will. In ſhort, ſhe is in all legal proceedings looked upon as a feme ſole, and not as a feme covert; as a ſingle not as a married woman. For which the reaſon given by ſir Edward Coke is this: becauſe the wiſdom of the common law would not have the king (whoſe continual care and ſtudy is for the public, and *circa ardua regni*) to be troubled and diſquieted on account of his wife's domeſtic affairs; and therefore it veſts in the queen a power of tranſacting her own concerns, without the intervention of the king, as if ſhe was an unmarried woman.

The queen has alſo many exemptions, and minute prerogatives. For inſtance: ſhe pays no toll; nor is ſhe liable to any amercement in any court. But, in general, unleſs where the law has expreſsly declared her exempted, ſhe is upon the ſame footing with other ſubjects; being to all intents and purpoſes the king's ſubject, and not his equal: in like manner as in the imperial law, *Auguſtus legibus ſolutus non eſt.*

The queen has alſo ſome pecuniary advantages, which form her a diſtinct revenue: as, in the firſt place, ſhe is intitled to an ancient perquiſite called *queen gold*, or *aurum reginæ*; which is a royal revenue belonging to every queen-conſort during her marriage with the king, and due from every perſon who hath made a voluntary offering or fine to the king, amounting to 10 merks or upwards, for and in conſideration of any privileges, grants, licenſes, pardons, or other matter of royal favour conferred upon him by the king: and it is due in the proportion to one-tenth part more, over and above the entire offering or fine made to the king, and becomes an actual debt of record to the queen's majeſty by the mere recording of the fine. As, if 100 merks of ſilver be given to the king for liberty to take in mortmain, or to have a fair, market, park, chaſe, or free warren; there the queen is intitled to 10 merks in ſilver, or (what was formerly an equivalent denomination) to one merk in gold, by the name of *queen gold*, or *aurum reginæ*. But no ſuch payment is due for any aids or ſubſidies granted to the king in parliament or convocation; or for fines impoſed by courts on offenders againſt their will; nor for voluntary preſents to the king, without any conſideration moving from him to the ſubject; nor for any ſale or contract whereby the preſent revenues or poſſeſſions of the crown are granted away or diminiſhed.

The original revenue of our ancient queens, before and soon after the Conquest, seems to have consisted in certain reservations or rents out of the demesne lands of the crown, which were expressly appropriated to her majesty, distinct from the king. It is frequent in domesday-book, after specifying the rent due to the crown, to add likewise the quantity of gold or other renders reserved to the queen. These were frequently appropriated to particular purposes; to buy wood for her majesty's use, to purchase oil for lamps, or to furnish her attire from head to foot, which was frequently very costly, as one single robe in the fifth year of Henry II. stood the city of London in upwards of 80 pounds: A practice somewhat similar to that of the eastern countries, where whole cities and provinces were specifically assigned to purchase particular parts of the queen's apparel. And for a further addition to her income, this duty of queen-gold is supposed to have been originally granted; those matters of grace and favour, out of which it arose, being frequently obtained from the crown by the powerful intercession of the queen. There are traces of its payment, though obscure ones, in the book of domesday, and in the great pipe-roll of Henry I. In the reign of Henry II. the manner of collecting it appears to have been well understood; and it forms a distinct head in the ancient dialogue of the exchequer written in the time of that prince, and usually attributed to Gervase of Tilbury. From that time downwards, it was regularly claimed and enjoyed by all the queen-consorts of England till the death of Henry VIII; though, after the accession of the Tudor family, the collecting of it seems to have been much neglected: and, there being no queen-consort afterwards till the accession of James I., a period of near 60 years, its very nature and quantity then became a matter of doubt; and being referred by the king to the chief justices and chief baron, their report of it was so very unfavourable, that his consort queen Anne, though she claimed it, yet never thought proper to exact it. In 1635, 11 Car. I. a time fertile of expedients for raising money upon dormant precedents in our old records (of which ship-money was a fatal instance), the king, at the petition of his queen Henrietta Maria, issued out his writ for levying it; but afterwards purchased it of his consort at the price of 10,000 pounds; finding it, perhaps, too trifling and troublesome to levy. And when afterwards, at the Restoration, by the abolition of military tenures, and the fines that were consequent upon them, the little that legally remained of this revenue was reduced to almost nothing at all; in vain did Mr. Prynne, by a treatise that does honour to his abilities as a painful and judicious antiquarian, endeavour to excite queen Catherine to revive this antiquated claim.

Another ancient perquisite belonging to the queen-consort, mentioned by all our old writers, and therefore only worthy notice, is this: that on the taking a whale on the coasts, which is a royal fish, it shall be divided between the king and queen; the head only being the king's property, and the tail of it the queen's. *De sturgione observetur, quod rex illum habebit integrum: de balena vero sufficit, si rex habeat caput, et regina caudam.* The reason of this whimsical division, as assigned by our ancient records, was, to furnish the queen's wardrobe with whale-bone.

But further: though the queen is in all respects a subject, yet, in point of the security of her life and person, she is put upon the same footing with the king. It is equally treason (by the statute 25 Edward III.) to imagine or compass the death of our lady the king's companion, as of the king himself; and to violate or defile the queen-consort, amounts to the same high crime; as well in the person committing the fact, as in the queen herself if consenting. A law of Henry VIII. made it treason also for any woman who was not a virgin, to marry the king without informing him thereof: but this law was soon after repealed; it trespassing too strongly, as well on natural justice as female modesty. If however the queen be accused of any species of treason, she shall (whether consort or dowager) be tried by the peers of parliament, as queen Ann Boleyn was in 28 Hen. VIII.

The husband of a queen regnant, as prince George of Denmark was to queen Anne, is her subject; and may be guilty of high treason against her: but, in the instance of conjugal fidelity, he is not subjected to the same penal restrictions. For which the reason seems to be, that if a queen consort is unfaithful to the royal bed, this may debase or bastardize the heirs to the crown; but no such danger can be consequent on the infidelity of the husband to a queen regnant.

2. A queen *dowager* is the widow of the king, and as such enjoys most of the privileges belonging to her as queen consort. But it is not high treason to conspire her death, or to violate her chastity; for the same reason as was before alleged, because the succession to the crown is not thereby endangered. Yet still, *pro dignitate regali*, no man can marry a queen dowager without special license from the king, on pain of forfeiting his lands and goods. This, sir Edward Coke tells us, was enacted in parliament in 6 Henry VI. though the statute be not in print. But she, though an alien born, shall still be entitled to dower after the king's demise, which no other alien is. A queen dowager when married again to a subject, doth not lose her regal dignity, as peeresses-dowager do when they marry commoners. For Katharine, queen dowager of Henry V. though she married a private gentleman, Owen ap Meredith ap Theodore, commonly called *Owen Tudor*; yet, by the name of *Katharine queen of England*, maintained an action against the bishop of Carlisle. And so the dowager of Navarre marrying with Edmond the brother of king Edward I. maintained an action of dower by the name of *queen of Navarre*.

3. The prince of Wales, or heir apparent to the crown, and also his royal consort, and the princess royal, or eldest daughter of the king, are likewise peculiarly regarded by the laws. For, by statute 25 Edw. III. to compass or conspire the death of the former, or to violate the chastity of either of the latter, are as much high treason as to conspire the death of the king, or violate the chastity of the queen. And this upon the same reason as was before given; because the prince of Wales is next in succession to the crown, and to violate his wife might taint the blood-royal with bastardy; and the eldest daughter of the king is also alone inheritable to the crown on failure of issue male, and therefore more respected by the laws than any of her younger sisters; insomuch that upon this, united with other (feodal) principles, while our military tenures were in force, the king might levy an aid for marrying his eldest daughter, and her only. The heir apparent to the crown is usually made prince of Wales and earl of Chester, by special creation and investiture; but being the king's eldest son, he is by inheritance duke of Cornwall, without any new creation.

4. The rest of the royal family may be considered in two different lights, according to the different senses in which the term *royal family* is used. The larger sense includes all those who are by any possibility inheritable to the crown. Such, before the revolution, were all the descendants of William the Conqueror; who had branched into an amazing extent by intermarriages with the ancient nobility. Since the revolution and act of settlement, it means the Protestant issue of the princess Sophia; now comparatively few in number, but which in process of time may possibly be as largely diffused. The more confined sense includes only those who are in a certain degree of propinquity to the reigning prince, and to whom therefore the law pays an extraordinary regard and respect; but after that degree is past, they fall into the rank of ordinary subjects, and are seldom considered any further, unless called to the succession upon failure of the nearer lines. For though collateral consanguinity is regarded indefinitely with respect to inheritance or succession, yet it is and

can only be regarded within ſome certain limits in any other reſpect, by the natural conſtitution of things and the dictates of poſitive law.

The younger ſons and daughters of the king, and other branches of the royal family, who are not in the immediate line of ſucceſſion, were therefore little further regarded by the ancient law, than to give them a certain degree of precedence before all peers and public officers as well eccleſiaſtical as temporal. This is done by the ſtatute 31 Henry VIII. c. 10. which enacts, that no perſon except the king's children ſhall preſume to ſit or have place at the ſide of the cloth of eſtate in the parliament chamber; and that certain great officers therein named ſhall have precedence above all dukes, except only ſuch as ſhall happen to be the king's ſon, brother, uncle, nephew (which ſir Edward Coke explains to ſignify grandſon or *nepos*), or brother's or ſiſter's ſon. But under the deſcription of the king's *children*, his *grandſons* are held to be included, without having recourſe to ſir Edward Coke's interpretation of *nephew*; and therefore when his late majeſty king George II. created his grandſon Edward, the ſecond ſon of Frederick prince of Wales deceaſed, duke of York, and referred it to the houſe of lords to ſettle his place and precedence, they certified that he ought to have precedence next to the late duke of Cumberland, the then king's youngeſt ſon; and that he might have a ſeat on the left hand of the cloth of eſtate. But when, on the acceſſion of his preſent majeſty, theſe royal perſonages ceaſed to take place as the *children*, and ranked only as the *brother* and *uncle* of the king, they alſo left their ſeats on the ſide of the cloth of eſtate; ſo that when the duke of Glouceſter, his majeſty's ſecond brother, took his ſeat in the houſe of peers, he was placed on the upper end of the earl's bench (on which the dukes uſually ſit) next to his royal highneſs the duke of York. And in 1717, upon a queſtion referred to all the judges by king George I. it was reſolved, by the opinion of ten againſt the other two, that the education and care of all the king's grandchildren, while minors, did belong of right to his majeſty as king of this realm, even during their father's life. But they all agreed, that the care and approbation of their marriages, when grown up, belonged to the king their grandfather. And the judges have more recently concurred in opinion, that this care and approbation extend alſo to the preſumptive heir of the crown; though to what other branches of the royal family the ſame did extend, they did not find preciſely determined. The moſt frequent inſtances of the crown's interpoſition go no further than nephews and nieces: but examples are not wanting of its reaching to more diſtant collaterals. And the ſtatute 6 Henry VI. before mentioned, which prohibits the marriage of a queen dowager without the conſent of the king, aſſigns this reaſon for it: "becauſe the diſparagement of the queen ſhall give greater comfort and example to other ladies of eſtate, who are of the blood-royal, more lightly to diſparage themſelves." Therefore by the ſtatute 28 Hen. VIII. c. 18. (repealed, among other ſtatutes of treaſons, by 1 Edw. VI. c. 12.) it was made high treaſon for any man to contract marriage with the king's children or reputed children, his ſiſters or aunts *ex parte paterna*, or the children of his brethren or ſiſters; being exactly the ſame degrees to which precedence is allowed by the ſtatute 31 Henry VIII. before-mentioned. And now, by ſtatute 12 Geo. III. c. 11, no deſcendant of the body of king George II. (other than the iſſue of princeſſes married into foreign families) is capable of contracting matrimony, without the previous conſent of the king ſignified under the great ſeal; and any marriage contracted without ſuch a conſent is void. Provided, that ſuch of the ſaid deſcendants as are not above 25, may after a twelvemonth's notice given to the king's privy council, contract and ſolemnize marriage without the conſent of the crown; unleſs both houſes of parliament ſhall, before the expiration of the ſaid year, expreſsly declare their diſapprobation of ſuch intended marriage. And all perſons ſolemnizing, aſſiſting, or being preſent at any ſuch prohibited marriage, ſhall incur the penalties of the ſtatute of *præmunire*.

ROYAL *Oak*, a fair ſpreading tree at Boſcobel, in the pariſh of Donnington in Staffordſhire, the boughs whereof were once covered with ivy; in the thick of which king Charles II. ſat in the day-time with colonel Careleſs, and in the night lodged in Boſcobel houſe: ſo that they are miſtaken who ſpeak of it as an old hollow oak; it being then a gay flouriſhing tree, ſurrounded with many more. The poor remains thereof are now fenced in with a handſome wall, with this inſcription in gold letters: *Feliciſſimam arborem quam in aſylum potentiſſimi regis Caroli II. Deus op. max. per quam reges regnant, hic creſcere voluit*, &c.

ROYAL *Society*. See SOCIETY.

ROYALTIES, the rights of the king, otherwiſe called the *king's prerogative*, and the *regalia*. See PREROGATIVE and REGALIA.

ROYENIA, in botany: a genus of the digynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 18th order, *Bicornes*. The calyx is urceolated; the corolla monopetalous, with the limb revoluted; the capſule is unilocular and quadrivalved.

ROYSTON, a town of Hertfordſhire, ſeated in E. lon. 0. 1. N. lat 52. 3. It is a large place, ſeated in a fertile vale full of inns, and the market is very conſiderable for corn. There was lately diſcovered, almoſt under the market-place, a ſubterraneous chapel of one Roſia, a Saxon lady: it has ſeveral altars and images cut out of the chalky ſides, and is in form of a ſugar-loaf, having no entrance but at the top.

RUBBER (*India*). See CAOUTCHOUC.

RUBENS (SIR PETER PAUL), the moſt eminent of the Flemiſh painters, was born in 1577; but whether at Antwerp or Cologne it is not eaſy to determine. His father, who was a counſellor in the ſenate of Antwerp, had been forced by the civil wars to ſeek refuge in Cologne, and during his reſidence there Rubens is commonly ſaid to have been born.

The genius of Rubens, which began to unfold itſelf in his earlieſt years, was cultivated with peculiar care, and embelliſhed with every branch of claſſical and polite literature. He ſoon diſcovered a ſtrong inclination for deſigning; and uſed to amuſe himſelf with that employment in his leiſure hours, while the reſt of his time was devoted to other ſtudies. His mother, perceiving the bias of her ſon, permitted him to attend the inſtructions of Tobias Verhaecht a painter of architecture and landſcape. He next became the pupil of Adam Van Oort, but he ſoon found that the abilities of this maſter were inſufficient to anſwer his elevated ideas. His ſurly temper too was diſguſtful to Rubens, whoſe natural diſpoſition was modeſt and amiable. Anxious to find an artiſt whoſe genius and diſpoſitions were congenial with his own, he became the diſciple of Octavio Van Vien, generally known by the name of Otho Venius, a painter of ſingular merit, and who was not only ſkilled in the principles of his art, but alſo diſtinguiſhed for learning and other accompliſhments. Between the maſter and ſcholar a remarkable ſimilarity appeared in temper and inclination; indeed, in the whole turn of their minds. It was this congeniality of ſentiments which animated Rubens with that ardent paſſion for the art of painting which at length determined him to purſue it as a profeſſion. From this time he gave up his whole mind to it; and ſo ſucceſsful were his exertions, that he ſoon equalled his maſter.

In order to arrive at that perfection which he already beheld in idea, it became requiſite to ſtudy the productions of the moſt eminent artiſts. For this purpoſe he travelled through Italy, viſiting the moſt valuable collections of paintings and antique ſtatues with which that country abounds.

Sandrart, who was intimately acquainted with Rubens, informs us that he was recommended in the moſt honourable

manner to the duke of Mantua by the archduke Albert, who had witneſſed his talents in the finiſhing of ſome fine paintings deſigned for his own palace. At Mantua he was received by the duke with the moſt flattering marks of diſtinction, and had opportunities of improving himſelf which he did not neglect. Here he carefully ſtudied the works of Julio Romano. He next viſited Rome, where he had an opportunity of examining the productions of Raphael. The paintings of Titian and Paolo Veroneſe called him to Venice, where he accompliſhed himſelf in the art of colouring.

He continued in Italy ſeven years. At length receiving intelligence that his mother was taken ill, he haſtened to Antwerp: but his filial affection was not gratified with a ſight of her; ſhe died before his arrival. He married ſoon after; but his wife dying at the end of four years, he retired from Antwerp for ſome time, and endeavoured to ſoothe his melancholy by a journey to Holland. At Utrecht he viſited Hurtort, for whom he had a great value.

The fame of Rubens was now ſpread over Europe. He was invited by Mary of Medicis queen of Henry IV. of France to Paris, where he painted the galleries in the palace of Luxemburg. Theſe form a ſeries of paintings which delineate the hiſtory of Mary; and afford a convincing proof how well qualified he was to excel in allegorical and emblematical compoſitions. While at Paris he became acquainted with the duke of Buckingham, who was ſo taken with his great talents and accompliſhments, that he judged him well qualified to explain to Iſabella, the wife of Albert the archduke, the cauſe of the miſunderſtanding which had taken place between the courts of England and Spain. In this employment Rubens acquitted himſelf with ſuch propriety, that Iſabella appointed him envoy to the king of Spain, with a commiſſion to propoſe terms of peace, and to bring back the inſtructions of that monarch. Philip was no leſs captivated with Rubens: he conferred on him the honour of knighthood, and made him ſecretary to his privy council. Rubens returned to Bruſſels, and thence paſſed over into England in 1630 with a commiſſion from the Catholic king to negotiate a peace between the two crowns. He was ſucceſsful in this negotiation, and a treaty was concluded. Charles I. who then filled the Britiſh throne, could not receive Rubens in a public character on account of his profeſſion; nevertheleſs, he treated him with every mark of reſpect. Having engaged him to paint ſome of the apartments of Whitehall, he not only gave him a handſome ſum of money, but, as an acknowledgment of his merit, created him a knight; and the duke of Buckingham, his friend and patron, purchaſed of him a collection of pictures, ſtatues, medals, and antiques, with the ſum of 10,000l. He returned to Spain, where he was magnificently honoured and rewarded for his ſervices. He was created a gentleman of the king's bedchamber, and named ſecretary to the council of ſtate in the Netherlands. Rubens, however, did not lay aſide his profeſſion. He returned to Antwerp, where he married a ſecond wife called *Helena Forment*, who, being an eminent beauty, helped him much in the figures of his women. He died on the 30th of May 1640, in the 63d year of his age; leaving vaſt riches to his children. Albert his eldeſt ſon ſucceeded him in the office of ſecretary of ſtate in Flanders.

As Rubens was poſſeſſed of all the ornaments and advantages that render a man worthy to be eſteemed or courted, he was always treated as a perſon of conſequence. His figure was noble, his manners engaging, and his converſation lively; his learning was univerſal. Though his favourite ſtudy muſt have occupied him much, yet he found time to read the works of the moſt celebrated authors, and eſpecially the poets. He ſpoke ſeveral languages perfectly, and was an excellent ſtateſman.

His houſe at Antwerp was enriched with every thing in the arts that was rare and valuable. It contained one ſpacious apartment, in imitation of the Rotunda at Rome, adorned with a choice collection of pictures which he had purchaſed in Italy; part of which he ſold to the duke of Buckingham.

His genius qualified him to excel equally in every thing that can enter into the compoſition of a picture. His invention was ſo fertile, that, if he had occaſion to paint the ſame ſubject ſeveral times, his imagination always ſupplied him with ſomething ſtriking and new. The attitudes of his figures are natural and varied, the carriage of the head is peculiarly graceful, and his expreſſion noble and animated. He is by all allowed to have carried the art of colouring to its higheſt pitch; he underſtood ſo thoroughly the true principles of the chiaro-ſcuro, that he gave to his figures the utmoſt harmony, and a prominence reſembling real life. His pencil is mellowed, his ſtrokes bold and eaſy, his carnation glows with life, and his drapery is ſimple, but grand, broad, and hung with much ſkill. The great excellence of Rubens appears in his grand compoſitions; for, as they are to be viewed at a diſtance, he laid on a proper body of colours with uncommon boldneſs, and fixed all his tints in their proper places; ſo that he never impaired their luſtre by breaking or torturing them; but touched them in ſuch a manner as to give them a laſting force, beauty, and harmony.

It is generally allowed that Rubens wanted correctneſs in drawing and deſigning; ſome of his figures being heavy and too ſhort, and the limbs in ſome parts not being juſtly ſketched in the outline. Though he had ſpent ſeven years in Italy in ſtudying thoſe antiques by which other celebrated artiſts had modelled their taſte; though he had examined them with ſuch minute attention as not only to perceive their beauties, but to be qualified to deſcribe them in a diſſertation which he wrote on that ſubject; yet he ſeems never to have diveſted himſelf of that heavy ſtyle of painting, which, being peculiar to his native country, he had inſenſibly acquired. The aſtoniſhing rapidity too with which he painted, made him fall into inaccuracies, from which thoſe works that he finiſhed with care are entirely exempted.

Among his finiſhed pieces may be mentioned the Crucifixion of Jeſus Chriſt between the two Thieves, which was very lately to be ſeen at Antwerp; but of all his works the paintings in the palace of Luxemburg beſt diſplay his genius and his ſtyle.

It is the obſervation of Algarotti, that he was more moderate in his movements than Tintoretto, and more ſoft in his chiaroſcuro than Carravaggio; but not ſo rich in his compoſitions, nor ſo light in his touches, as Paolo Veroneſe; in his carnations leſs true than Titian, and leſs delicate than Vandyck. Yet he contrived to give his colours the utmoſt tranſparency and harmony, notwithſtanding the extraordinary deepneſs of them; and he had a ſtrength and grandeur of ſtyle entirely his own.

RUBIA, MADDER: a genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 47th order, *Stellatæ*. The corolla is monopetalous and campanulated; and there are two monoſpermous berries. There are three ſpecies, of which the moſt remarkable is the tinctorum, or dyer's madder, ſo much uſed by the dyers and callico-printers. This hath a perennial root and annual ſtalk: the root is compoſed of many long, thick, ſucculent fibres, almoſt as large as a man's little finger; theſe are joined at the top in a head like aſparagus, and run very deep into the ground. From the upper part or head of the root come out many ſide-roots, which extend juſt under the ſurface of the ground to a great diſtance, whereby it propagates very faſt; for theſe ſend up a great number of ſhoots, which, if carefully taken off in the ſpring ſoon after they are above ground, become ſo many plants. Theſe roots are of a reddiſh colour, ſomewhat tranſparent; and have a yellowiſh pith in the middle, which is

tough and of a bitterish taste. From this root arise many large four-cornered jointed stalks, which in good land will grow five or six feet long, and, if supported, sometimes seven or eight: they are armed with short herbaceous prickles; and at each joint are placed five or six spear-shaped leaves: their upper surfaces are smooth: but their mid-rib on the under side is armed with rough herbaceous spines, and the leaves sit close to the branches in whorls. From the joints of the stalk come cut the branches, which sustain the flowers: they are placed by pairs opposite; each pair crossing the other: these have a few small leaves toward the bottom, which are by threes, and upwards by pairs opposite: the branches are terminated by loose branching spikes of yellow flowers, which are cut into four parts resembling stars. These appear in June, and are sometimes succeeded by seeds, which seldom ripen in England. For the manner of its cultivation and preparation for the use of dyers, see the article MADDER.

Madder-root is used in medicine. The virtues attributed to it are those of a detergent and aperient; whence it has been usually ranked among the opening roots, and recommended in obstructions of the viscera, particularly of the kidneys, in coagulations of the blood from falls or bruises, in the jaundice, and beginning dropsies. It is an ingredient in the icteric decoction of the Edinburgh pharmacopœia.

It is observable, that this root, taken internally, tinges the urine of a deep red colour; and in the Philosophical Transactions we have an account of its producing a like effect upon the bones of animals who had it mixed with their food: all the bones, particularly the more solid ones, were said to be changed, both externally and internally, to a deep red; but neither the fleshy nor cartilaginous parts suffered any alterations: some of these bones macerated in water for many weeks together, and afterwards steeped and boiled in spirit of wine, lost none of their colour, nor communicated any tinge to the liquors. This root, therefore, was concluded to be possessed of great subtilty of parts, and its medical virtues hence to deserve inquiry. The same trials, however, made by others, have not been found to produce the same effects as those above mentioned. Of late the root has come into great reputation as an emmenagogue.

RUBININSKA, one of the northern provinces of Russia, bounded by the province of Dwina on the north, by Syrianes on the east, by Belozera on the south, and by the lake Onega on the west.

RUBRIC, in the canon law, signifies a title or article in certain antient law-books; thus called because written, as the titles of the chapters in our ancient bibles are, in red letters.

RUBUS, the BRAMBLE, or *Raspberry-bush*: a genus of the polygamia order, belonging to the icosandria class of plants; and in the natural order ranking under the 35th order, *Senticosæ*. The calyx is quinquefid, the petals five; the berry consisting of monospermous acini or pulpy grains. The principal species is the common raspberry, which, with its varieties, demands culture in every garden for their fruit; particularly the common red kind, white sort, and twice-bearing raspberry; all of which are great bearers: but, for the general plantations, we choose principally the common red and the white kind, as being generally the greatest bearers of all; planting also a share of the twice-bearing sort, both as a curiosity and for the sake of its autumnal crops of fruit, which in favourable seasons ripen in tolerable perfection; observing to allow all the sorts some open exposure in the kitchen garden, though they will prosper in almost any situation.

The other species are considered as plants of variety, for hardy plantations in the shrubbery. Some of them are also very ornamental flowering plants; particularly the Virginian flowering raspberry, and the double blossomed bramble, which have great merit as furniture for ornamental compartments; and the white-berried bramble, which is a great curiosity. All the other species and varieties serve to diversify large collections.

RUBY, a genus of precious stones of various colours; as, 1. Of a deep red colour inclining a little to purple; the *carbuncle* of Pliny. 2. The spinell, of the colour of a bright corn poppy flower. 3. The balass, or pale red inclining to violet; supposed to be the mother of rubies. 4. The rubicell, of a reddish yellow. According to Cronstedt, the ruby crystallises into an octoedral form, as well as the diamond, from which it differs very little in hardness and weight; whence he concludes that they are both of the same nature: but some late experiments have shown that the diamond differs excessively from all other gems, in being dissipable by a strong fire, which the others resist. Tavernier and Dutens inform us, that in the East Indies all coloured gems are named *rubies*, without regard to what their colours may be; and that the particular colour is added to the name of each in order to distinguish them from one another. There are, however, some soft stones of this kind which they call *lacan*: and it is certain, that the hard and brilliant rubies named *oriental*, as well as the sapphires and topazes, are all the same, excepting only the circumstance of colour. Some are partly red and partly blue, yellow, and some quite colourless. The spinell rubies are about half the value of diamonds of the same weight; the balass is valued at 30 shillings per carat. Tavernier mentions 108 rubies in the throne of the Great Mogul, from 100 to 200 carats, and of a round one almost $2\frac{1}{2}$ ounces: there is also mention made by other travellers of rubies exceeding 200 carats in weight. According to Dutens, a perfect ruby, if it weighs more than $3\frac{1}{2}$ carats, is of greater value than a diamond of the same weight. If it weighs one carat, it is worth 10 guineas; if two carats, 40 guineas; three carats, 150 guineas; if six carats, upwards of 1000 guineas.

According to the experiments of Bergman and Achard, the texture of the ruby is foliated like that of diamonds: it is fusible with borax in a strong and long-continued heat, running into a transparent glass of a pale green colour: the same effect is produced by microcosmic salt; but with sedative salt, or mineral or vegetable alkali, the glass is opaque and differently coloured. From the experiments of M. d'Arcet, it appears that the ruby does not lose its colour in the greatest fire; but Henckel says, that, by means of a burning glass, he softened it in such a manner as to receive the impression of a seal of jasper. It becomes electric by being rubbed. Its specific gravity, according to Bergman, is from 3,180 to 4,240: but Brisson tells us that it is 4,283. The specific gravity of the spinell is 3,760, of the Brasilian ruby 3,531.

Rubies are met with in the Capelan mountains of Pegu in the East Indies; and at Caos, Ava, Bisnagar, Calicut, Cananor, Ceilan, and Brasil. They are found in the sands of rivers of a red colour, in an argillaceous earth of a hard texture and greenish colour; sometimes they adhere to red rocks. The spinell rubies are met with in Hungary, Silesia, Bohemia, and Brasil. The balass comes principally from Brasil, though some are also brought from the East Indies. The rubicell comes also from Brasil, but they are said to lose their colour in the fire. A variety of this gem, but of a soft quality, is found in great plenty on the sea-shore near Ely in Fifeshire, Scotland. There is also a stone which comes near to the ruby found near Portsoy, Banffshire, and at Inverary, Argyleshire, Scotland. The *rubino di rocca* of the Italians is a true garnet of a deep red and violet, or of the amethyst colour. What is called ruby of arsenic or of sulphur is the realgar: the ruby of zinc is the red blend; and the ruby of silver is the red silver ore. Rubies may be artificially made from Brasilian topazes of a smoky appearance, by giving them a gradual heat in a crucible filled with ashes, until it be red-hot.

Rock RUBY, the *amethystizontas* of the antients, is found in

Syria, Calcutta, Cananor, Cambaya, and Ethiopia. It is the moſt valued of all the ſpecies of garnets, and is frequently ſold as a ruby under the name of *rubinus Ruſſicus*. See GARNET and RUBY.

RUCTATION, or ERUCTATION, a ventoſity ariſing from indigeſtion, and diſcharging itſelf at the mouth with a very diſagreeable noiſe.

RUDBECK (OLAUS), a learned Swediſh phyſician, born of an antient and noble family in 1630. He became profeſſor of medicine at Upſal, where he acquired great applauſe by his extenſive knowledge; and died in 1702. His principal works are, 1. *Exercitatio anatomica, exhibens ductus novos hepaticos aquoſos, & vaſa glandularum ſeroſa*, in 4to. He there aſſers his claim to the diſcovery of the lymphatic veſſels, againſt the pretenſions of Thomas Bartholin. 2. *Atlantica, ſive Manheim, vera Japheti poſterorum ſedes ac patria*, 4 vols. folio, is full of ſtrange paradoxes ſupported with profound learning: he there endeavours to prove, that Sweden was the country whence all the antient Pagan divinities and our firſt parents were derived; and that the Germans, Engliſh, French, Danes, Greeks, and Romans, with all other nations, originally came from thence.

RUDBECKIA, in botany: a genus of the polygamia fruſtranea order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is paleaceous and conical; the pappus conſiſts of a quadridentate margin; the calyx of a double ſeries of ſcaly leaves.

RUDDER, in navigation, a piece of timber turning on hinges in the ſtern of the ſhip, and which, oppoſing ſometimes one ſide in the water and ſometimes another, turns or directs the veſſel this way or that. See HELM. In the ſeventh volume of the Tranſactions of the Society inſtituted at London for the Encouragement of Arts, Manufactures, and Commerce, there is explained a method of ſupplying the loſs of a ſhip's rudder at ſea. The invention, which is captain Pakenham's of the royal navy, has been approved by admiral Cornwallis, the commiſſioners of the admiralty, by the ſociety in whoſe Tranſactions the account of it was firſt publiſhed, and who preſented to captain Pakenham their gold medal, by the Trinity-houſe, by the managing owners of Eaſt India ſhipping, by the duke of Sudermania the preſent regent of Sweden, and by the ſociety for the improvement of naval architecture. The ſubſtitute here recommended for a loſt rudder, ſays the inventor, is formed of thoſe materials without which no ſhip goes to ſea, and its conſtruction is ſimple and ſpeedy. Captain Pakenham, however, did not give a particular account of his invention to the ſociety whom he addreſſed, and to whom he ſent a model of his invention, till ſuch time as he had an opportunity of reducing the theory he had conceived to practice. On the 7th of July 1788, he made this trial with the Merlin of Newfoundland; and he declares that, during the different manœuvres of tacking and wearing, he could not diſcover the leaſt variation between the operation of the machine and that of the ſhip's rudder: ſhe was ſteered with the ſame eaſe by one man, and anſwered the helm in every ſituation fully as quick. Admiral Cornwallis certifies the ſame with reſpect to the Crown of 64 guns, which loſt her rudder on the Kentiſh Knock, when with the ſubſtitute ſhe was ſteered to Portſmouth with the utmoſt eaſe in a heavy gale; and, as the admiral aſſerts, it would have taken her to the Eaſt Indies.

The materials and conſtruction are thus deſcribed: "Fig. A. top-maſt inverted; the fid-hole to ſhip the tiller in, and ſecured with hoops from the anchor-ſtocks; the heel forming the head of the rudder. 2. The inner half of a jibb-boom. 3. The outer half of a jibb-boom. 4. A fiſh: the whole of theſe materials well bolted together:—in a merchantman her ruff-tree. 5. A cap, with the ſquare part cut out to fit the ſtern-poſt, and acting as a lower gudgeon, ſecured to the ſtern-poſt with hawſers, leading from the bolts of the cap, under the ſhip's bottom, into the hawſe-holes, and hove well tort. 6. A plank, or, if none on board the ſhips, gangboards. 7. Anchor ſtocks, made to fit the topmaſt as partners, ſecured to the deck, and ſupplying the place of the upper gudgeon, and in a merchant ſhip the clamps of her windlaſs. 8. A ſtern poſt. 9. Hoops from the anchor-ſtocks. 10. Pigs of ballaſt, to ſink the lower part. The head of the rudder to paſs through as many decks as you wiſh." See plate 8. Vol. VIII.

On this the captain makes the following remarks: "It might probably be ſuppoſed, that a difficulty would occur in bringing the jaws of the cap to embrace the ſtern-poſt; but this will at once be obviated, when it is remembered that the top-chains, or hawſers, leading from each end of the jaws, under the ſhip's bottom, are in fact a continuance of the jaws themſelves. Nor can it be apprehended that the cap, when fixed, may be impelled from its ſtation, either by the efforts of the ſea or the courſe of the ſhip through the water, though even the hawſers, which confine it in the firſt inſtance, ſhould be relaxed.—the experiment proves, that the partners muſt be firſt torn away, or the main-piece broken off.

"Since the improved ſtate of navigation, notwithſtanding remedies have been found in general for the moſt diſaſtrous accidents at ſea, experience has evinced that nothing complete had been hitherto invented to ſupply the loſs of a rudder. The firſt expedient within my knowledge were cables veered aſtern, with tackles leading from them to the ſhip's quarters. This practice was ſuperſeded by the invention of the machine uſually called *the Ipſwich machine*; but the conſtruction of it is complex and unwieldy, and veſſels are ſeldom found in poſſeſſion of the materials which form it. Commodore Byron, in the Journal of his Voyage round the World, ſays, that the Tamer, with every aſſiſtance from his own ſhip, was five days in conſtructing it. Beſides, like the before-mentioned ſcheme, it can only operate to ſteer a ſhip large (and that but very wildly), and of courſe, under the circumſtances of a lee-ſhore, defeat the moſt ſkilful exertions of a ſeaman. Several other expedients have been adopted, which I ſhall not mention here, as the ſame defects equally appear in all.

"Thus it was apparent, that ample room was left for the diſcovery of ſome more certain reſource than any of the former; and the ſcheme which has ſuggeſted itſelf to me, will, I truſt, be found fully to anſwer the purpoſe intended. The materials are ſuch as ſcarcely any ſhip can venture to ſea without; and the conſtruction ſo ſpeedy, eaſy, and ſimple, that the capacity of the meaneſt ſailor will at once conceive it. I need not, from mathematical principles, ſhow the certainty of its effect, as it is formed and managed in the ſame manner as a ſhip's common rudder: and as the common rudder is certainly of all inventions the beſt calculated for guiding a veſſel through the water, it will of courſe follow, that whatever ſubſtitute the neareſt reſembles that, muſt be beſt adapted to ſupply its loſs."

RUDDIMAN (THOMAS), one of the moſt eminent grammarians which Scotland has produced, was born in October 1674 at Raggel, in the pariſh of Boyndie and county of Banff. His father James Ruddiman was a farmer, and ſtrongly attached to the houſe of Stuart.

Mr. Ruddiman was inſtructed in the principles of Latin grammar at the pariſh-ſchool of Boyndie, where his application was ſo vigorous, and his progreſs ſo rapid, that he quickly ſurpaſſed all his claſs-fellows. His maſter, George Moriſon, who was a ſkilful and attentive teacher, being unwilling to check his ardour for learning, permitted him to follow the impulſe of his genius, and to advance without waiting the ſlow progreſs of the other boys.

The pleaſure which the youthful mind receives from vivid deſcription, though wild and romantic, approaches to ecſtaſy,

and often makes an impreſſion which remains indelible. While at ſchool, the firſt book which charmed the opening mind of Ruddiman was Ovid's Metamorphoſes; nor did he ceaſe to reliſh the beauties of this author when his judgment was mature, for during the reſt of his life Ovid was his favourite poet.

At the age of ſixteen he became anxious to purſue his ſtudies at the univerſity; but his father, thinking him too young, oppoſed his inclination. Hearing of the competition trial, which was annually held at King's college, Aberdeen, for a certain number of burſaries on the foundation of that univerſity, Ruddiman's ambition was kindled. Without the knowledge of his father, and with only a ſingle guinea in his pocket, which his ſiſter had privately given him, he ſet out for that place. On the road he was met by a company of gipſies, who robbed him of his coat, his ſhoes, his ſtockings, and his guinea. This misfortune did not damp his enterpriſing ſpirit: he continued his journey to Aberdeen, preſented himſelf before the profeſſors as a candidate; and though he had neither clothes to give him a decent appearance, nor friends to recommend him, he gained the firſt prize.

After attending the univerſity four years, he obtained the degree of maſter of arts; an honour of which he was always proud. The theſis ſays, the diſputation on this occaſion laſted *ab aurora uſque ad veſperum,* i. e. "from morning till night." Though Ruddiman was only twenty years of age when he left the univerſity, it appears from a book entitled *Rhetoricorum Libri tres,* compoſed before this period, but never publiſhed, that he had then read the Roman claſſics with uncommon attention and advantage.

He was ſoon after engaged as a tutor to the ſon of Robert Young, Eſq. of Auldbar, the great grandſon of Sir Peter Young, who under the direction of Buchanan had been preceptor of James VI. His income muſt have been very ſmall, or his ſituation unpleaſant; for within a year he accepted the office of ſchoolmaſter in the pariſh of Laurence-kirk. The profeſſion of a ſchoolmaſter in a country pariſh at that period could open no field for ambition, nor proſpect of great emolument; for, by an act of parliament paſſed in 1633, the ſalary appropriated to this office could not be increaſed above 200 merks Scots, or 11l. 2s. 2⅔d. ſterling. In diſcharging the duties of this humble but important ſtation, it is probable that he uſed Simpſon's *Rudimenta Grammatica,* which was then generally taught in the northern ſchools, and by which he himſelf had been inſtructed in the principles of Latin grammar.

When Ruddiman had ſpent three years and a half in this employment, the celebrated Dr. Pitcairne, happening to paſs through Laurence-kirk, was detained in that village by a violent ſtorm. Pitcairne, wanting amuſement, inquired of the hoſteſs if ſhe could procure an agreeable companion to bear him company at dinner. She replied, that the ſchoolmaſter, though young, was ſaid to be learned, and, though modeſt, ſhe was ſure could talk. Pitcairne was delighted with the converſation and learning of his new companion, invited him to Edinburgh, and promiſed him his patronage.

When Ruddiman arrived in Edinburgh, the advocates library, which had been founded eighteen years before by Sir George Mackenzie, attracted his curioſity and attention, and he was ſoon after appointed aſſiſtant keeper under Mr. Spottiſwoode the principal librarian. His ſalary for executing this laborious office was 8l. 6s. 8d. He had beſides a ſmall honorary preſent from thoſe who were admitted advocates, for correcting their theſes: he was alſo paid for copying manuſcripts for the uſe of the library. And the faculty, before he had held the office two years, were ſo highly pleaſed with his conduct, that they made him a preſent of 50 pounds Scots, or 4l. 3s. 4d. ſterling.

During the ſitting of the court of ſeſſion he attended the library from ten till three. But this confinement did not prevent him from engaging in other laborious duties: a part of his time was occupied in teaching young gentlemen the Latin language. Some he attended at their lodgings, ſome waited upon him, and ſome reſided in his own houſe. An exact liſt of the names of thoſe who attended him, expreſſing the date of their entry, and the ſums which he was to receive from each, has been found in his pocket-book; a curious relic, which is ſtill preſerved.

When Ruddiman's merit as a ſcholar became better known, his aſſiſtance was anxiouſly ſolicited by thoſe who were engaged in literary publications. Freebairne, a reſpectable bookſeller of that period, prevailed upon him to correct and prepare for the preſs Sir Robert Sibbald's *Introductio ad hiſtoriam rerum a Romanis geſtarum in ea Borealis Britanniæ parte quæ ultra murum Picticum eſt.* He received for his labour 3l. ſterling. At the requeſt of Mr. Spottiſwoode, librarian, for 5l. ſterling, he contributed his aid to the publication of Sir Robert Spottiſwoode's Practiques of the Laws of Scotland.

In 1707 he commenced auctioneer, an employment not very ſuitable to the dignified character of a man of letters: but to this occupation he was probably impelled by neceſſity; for, upon balancing his accounts at the end of the preceding year, the whole ſurplus was 28l. 2s. with proſpects of 236l. 7s. 6d. Scots. Ruddiman had a family; and ſeems to have been a ſtranger to that fooliſh pride which has ſeduced ſome literary men into the opinion, that it is more honourable to ſtarve than to have recourſe to an occupation which men of rank and opulence are accuſtomed to deſpiſe. The ſame year he publiſhed an edition of *Voluſeni de Animi Tranquillitate Dialogus,* to which he prefixed the Life of Voluſenus. Voluſenus or Wilſon was a learned Scotſman, and had the honour to be patroniſed by Cardinal Wolſey (ſee WILSON). In 1709 he publiſhed *Johnſtoni Cantici Solomonis Paraphraſis Poetica,* and *Johnſtoni Cantica* with notes, which he dedicated in verſe to his friend and patron Dr. Pitcairne. The edition conſiſted of 200 copies. The expenſe of printing amounted to 5l. 10s. ſterling, and he ſold them at a ſhilling each copy.

The philological talents of Ruddiman were next directed to a more important object, in which they became more conſpicuous and uſeful. Freebairne the bookſeller propoſed to publiſh a new edition of the Scottiſh tranſlation of Virgil's Æneid by Gawin Douglas biſhop of Dunkeld. Of the contributions which ſome eminent characters of the age preſented, the moſt valuable were ſupplied by Ruddiman. Freebairne acknowledged in general terms this obligation, but has not done him the juſtice to inform the reader what theſe valuable contributions were, and Ruddiman's modeſty reſtrained him from publicly aſſerting his claim. From the pocket-book which has been already mentioned, it appears that Ruddiman corrected the work and wrote the gloſſary; and there is ſtrong reaſon to believe that he was the author of the 42 general rules for aſſiſting the reader to underſtand the language of Douglas. To thoſe who wiſh to be acquainted with the antient language of this iſland, the gloſſary will be a treaſure, as it forms a compendious dictionary of the Anglo-Saxon. For this elaborate work Ruddiman was allowed 8l. 6s. 8d. ſterling.

The reputation of Ruddiman had now extended to a diſtance. He was invited by the magiſtrates of Dundee to be rector of the grammar-ſchool of that town; but the faculty of advocates, anxious to retain him, augmented his ſalary to 30l. 6s. 8d. ſterling, and he declined the offer.

In 1711 he aſſiſted biſhop Sage in publiſhing Drummond of Hawthornden's works; and performed the ſame favour to Dr. Abercrombie, who was then preparing for the preſs his Martial Atchievements.

In 1713 he was deprived of his friend Dr. Pitcairne. On this occaſion he teſtified all the reſpect which friendſhip could inſpire to the memory of his deceaſed patron and ſurviving

family. He compoſed Pitcairne's epitaph, and conducted the ſale of his library, which was diſpoſed of to Peter the Great.

In 1714 the Rudiments of the Latin tongue were publiſhed. Eighteen or nineteen Latin grammars, compoſed by Scotchmen, had appeared before this period; yet ſuch is the intrinſic value of this little treatiſe, that it ſoon ſuperſeded all other books on the ſubject, and is now taught in all the grammar-ſchools in Scotland. It has alſo been tranſlated into other languages.

He was next called upon to publiſh the works of Buchanan. The value of theſe he enhanced much by an elaborate preface, his *Tabula Regum Scotiæ Chronologica*, and *Propriorum Nominum Interpretatio*. The interpretation of proper names was highly requiſite; for Buchanan has ſo diſguiſed them in the Roman dreſs, that the original name is ſcarcely diſcernible; and the preface puts the reader on his guard againſt the chronological errors and factious ſpirit of the hiſtory. Ruddiman alſo added a learned diſſertation, entitled *De Metris Buchananæis Libellus*, and ſubjoined annotations critical and political on the Hiſtory of Scotland. As he eſpouſed the cauſe of queen Mary, he raiſed againſt himſelf a hoſt of enemies, and gave occaſion to that celebrated controverſy which has been carried on with much keenneſs and animoſity, and with little intermiſſion, even to the preſent times. For this work Ruddiman was promiſed 40l. ſterling.

He had now been ſo long accuſtomed to ſuperintend the preſs, that he was led to form the plan of erecting a printing-office himſelf *. Accordingly, in the year 1715 he commenced printer in partnerſhip with his brother Walter, who had been regularly bred to the buſineſs. Some years after he was appointed printer to the univerſity, along with James Davidſon, bookſeller.

The firſt literary ſociety formed in Scotland was inſtituted in the year 1718. It probably derived its origin from the factious and turbulent ſpirit of the times. The learned, anxious perhaps to find ſome reſpite from the political diſſenſions of the day, endeavoured to procure it in elegant amuſement; for one of the fundamental articles of the new aſſociation was, that the "affairs of church and ſtate ſhould not be introduced." Ruddiman and the maſters of the high-ſchool had the honour to found this ſociety. They were afterwards joined by lord Kaimes.

In 1725 the firſt part of his *Grammaticæ Latinæ Inſtitutiones*, which treated of etymology, was publiſhed. The ſecond part, which explained the nature and principles of ſyntax, appeared in 1731. He alſo wrote a third part on proſody, which is ſaid to be more copious and correct than any other publication on the ſubject. When urged to give it to the public, he ſaid dryly, "The age has ſo little taſte, the ſale would not pay the expenſe." Of this work he publiſhed an abridgement, to which he ſubjoined an abſtract of his proſody.

Ruddiman next engaged in the management of a newſpaper, an employment for which his genius and induſtry ſeemed to render him well qualified. But thoſe who ſhould expect either much information or amuſement from this publication, would perhaps be greatly diſappointed. The newſpaper which he conducted was the Caledonian Mercury, and was eſtabliſhed in 1720 by William Rolland, a lawyer. Ruddiman acted only in the capacity of printer for five years; but upon the death of Mr. Rolland in 1729, the property was transferred to him, or to his brother Walter and him conjunctly. This paper continued in the family of Ruddiman till the year 1772, when it was ſold by the truſtees of his grandchildren to Mr. John Robertſon.

The Caledonian Mercury was at firſt printed three times a week, on Monday, Tueſday, and Thurſday, in a ſmall 4to of four pages, with two columns in each page, and 50 lines in each column; ſo that the whole paper contained only 400 lines. It now contains in its folio ſize 2480 lines.

Mr. Ruddiman, after the death of Mr. Spottiſwoode librarian, remained for ſome time in his former ſtation; but was at length appointed keeper of the library, though without any increaſe of ſalary; and ſome years after Mr. Goodal, the defender of queen Mary, ſucceeded him in the office of ſub-librarian.

The aſſiduous application of Ruddiman, ſupported by ſuch learning, was entitled to wealth, which now indeed flowed upon him in what was at that period deemed great abundance. On the 1ſt of October 1735, it appeared from an exact ſtatement of his affairs, that he was worth 1882*l.* 5*s.* 2*d.* ſterling; and on the 20th of May, the enſuing year, his wealth had increaſed to 1985*l.* 6*s.* 3*d.* ſterling. In 1710 he valued his effects at 24*l.* 14*s.* 9*d.* ſterling.

In 1737 the ſchoolmaſters and teachers in Edinburgh formed themſelves into a ſociety, in order to eſtabliſh a fund for the ſupport of their wives and children. Of this ſcheme Ruddiman was an active promoter, and was choſen treaſurer. Perhaps it was this aſſociation which in 1742 gave the idea to the Scots clergy of forming their widows' fund.

In 1739 he publiſhed *Selectus Diplomatum et Numiſmatum Scotiæ Theſaurus*. This work was projected and begun by Anderſon (hence called *Anderſon's Diplomata)*, but was finiſhed by Ruddiman. The preface, which is an excellent commentary on Anderſon's performance, was written by Ruddiman, and diſplays a greater extent of knowledge than any of his other productions.

As Ruddiman had imbibed from his father thoſe political principles which attached him to the family of Stuart, he probably did not remain an unconcerned ſpectator of the civil commotions which in 1745 agitated Scotland. He did not, however, take any active part in the rebellion. His principles, he has been heard to ſay, induced him to be a quiet ſubject and a good citizen. He retired to the country during the ſummer of 1745; and while his fellow-citizens were ſpilling each others' blood, he was more happily engaged in writing Critical Obſervations on Burman's Commentaries on Lucan's Pharſalia. The Caledonian Mercury was in the mean time marked with a jealous eye. His ſon, who had for ſome time been the principal manager of that newſpaper, having copied a paragraph which was reckoned ſeditious from an Engliſh paper, was impriſoned. The ſolicitation of his father procured his releaſe: but it was too late; for the unhappy young man had contracted a diſtemper in the tolbooth of Edinburgh which brought him to his grave.

During the laſt ſeventeen years of his life Ruddiman was almoſt inceſſantly engaged in controverſy. To this he was in ſome meaſure compelled by the violent attacks which ſome critics of the times had ſucceſſively made upon his works. He was firſt called upon by Benſon, auditor in the exchequer, to determine the comparative merit of Buchanan and Johnſton as poets. He gave a decided preference to Buchanan in perſpicuity, purity and variety of ſtyle; but, like a candid critic, allowed Johnſton to be ſuperior in the harmony of his numbers. His next antagoniſt was Logan, one of the miniſters of Edinburgh, a weak illiterate man, but an obſtinate polemic. The ſubject of con-

* It has long been an object of curioſity to aſcertain the time at which the art of printing was introduced into Scotland. Mr. Robertſon, the keeper of the records, has lately diſcovered a patent of king James IV. which renders it certain that a printing-preſs was firſt eſtabliſhed at Edinburgh during the year 1507, 30 years after Caxton had brought it into England. See Printing.

teſt was, Whether the crown of Scotland was ſtrictly hereditary, and whether the birth of Robert III. was legitimate. Ruddiman maintained the affirmative in both points, and certainly far ſurpaſſed his antagoniſt in the powers of reaſoning. He proved the legitimacy of Robert by the public records of the kingdom, with a force of argument which admits of no reply; but in diſcuſſing the firſt queſtion (by which he was led to conſider the conteſt between Bruce and Baliol) he was not ſo ſucceſsful: for there are many inſtances in the hiſtory of Scotland in which the brother ſucceeded to the crown in preference to the ſon. He ſhowed, however, that the Scottiſh crown was at no period properly elective; and that, according to the old licentious conſtitution of the kingdom, the right of Bruce, who was the neareſt in blood to the royal ſtock, was preferable to the claim of Baliol, though deſcended from the eldeſt daughter.

But the labours of Ruddiman did not end when the pen dropped from the feeble hand of Logan. He was ſoon called upon to repel the attacks of Love ſchoolmaſter of Dalkeith, who maintained, in oppoſition to him, that Buchanan had neither repented of his treatment of queen Mary, nor had been guilty of ingratitude to that princeſs. That Buchanan ever repented there is reaſon to doubt. Whether he was guilty of ingratitude, let the unbiaſſed determine, when they are aſſured by authentic records that Mary conferred on him a penſion for life of 500 pounds Scots.

When Ruddiman had arrived at his eightieth year, and was almoſt blind, he was aſſailed by James Man, maſter of an hoſpital at Aberdeen, with a degree of rancour and virulence, united with ſome learning and ability, which muſt have touched him in a ſenſible manner, and alarmed his fears for his reputation after his deceaſe. He was called a *finiſhed pedant*, a *furious calumniator*, and a *corrupter of Buchanan's works*. The venerable old man again put on his armour, entered the liſts, and gained a complete victory. Man, with all his acuteneſs, could only point out twenty errors in two folio volumes. Some of theſe were typographical, ſome trifling, and ſome doubtful. Ruddiman, with much pleaſantry, drew up againſt Man an account of 469 errors, conſiſting of 14 articles, of which two or three may be produced as a ſpecimen. 1. Falſehoods and prevarications, 20. 2. Abſurdities, 69. 3. Paſſages from claſſic authors which were miſunderſtood by Man, 10. The triumph which he gained over this virulent adverſary he did not long enjoy; for he died at Edinburgh on the 19th of January 1757, in the 83d year of his age, and was burried in the Gray Friars churchyard without any monument to diſtinguiſh his grave.

He was three times married, but left behind him only one daughter, Aliſon, who was married in 1747 to James Stewart, Eſq. He is ſuppoſed to have died worth 3000*l.* ſterling.

He was of the middle ſize, of a thin and ſtraight make, and had eyes remarkably piercing. Of his talents and learning his works afford the moſt ſatisfactory proofs. His memory was tenacious and exact. He could repeat long paſſages of his favourite poet Ovid, to the amount of 60 lines, and without omitting a word. He was ſo great a maſter in the Latin language, that he has perhaps been equalled by none ſince the days of Buchanan.

Ruddiman has left a character unſtained by vice, and diſtinguiſhed by many virtues. His piety was exemplary. He ſpent Sunday in religious employment; and, we are informed, had prayers read to him every morning by his amanuenſis when the infirmities of age required ſuch an aſſiſtant. He was frugal of his time, neither indolent nor fond of amuſement; and ſo remarkably temperate, that it is ſaid he was never intoxicated. Though often forced into controverſy, and treated with inſolence, he never deſcended to ſcurrility and abuſe, nor cheriſhed reſentment againſt his enemies. His candour was much admired in one inſtance in the favourable character which he publiſhed in the Caledonian Mercury of his antagoniſt Love, after his deceaſe. Upon the whole, it muſt be allowed that Ruddiman has been of great ſervice to claſſical literature, and an honour to his native country.

RUDESHEIM, a town of Germany, in the electorate of Mentz, ſituated three miles from Bingen. E. lon. 7. 56. N. lat. 49. 49.

RUDIMENTS, the firſt principles or grounds of any art or ſcience, called alſo the elements thereof.

RUE, in botany. See Ruta.

Rue (Charles de la), a French orator and poet, was born at Paris in 1643. He was educated at the college of the Jeſuits, where he afterwards became a profeſſor of humanity and rhetoric. At an early age his talent for poetry diſcloſed itſelf. In 1667, when he was only 24 years old, he compoſed a Latin poem on the conqueſts of Louis XIV. which was ſo much eſteemed by the celebrated Peter Corneille, that he tranſlated it into French, preſented it to the king, and at the ſame time paſſed ſo high encomiums on the ſuperior merit of the original, that the author was received into the favour of that monarch, and ever after treated by him with ſingular reſpect.

De la Rue, anxious to preach the goſpel to the Canadians, requeſted leave of abſence from his ſuperiors: but having deſtined him for the pulpit, they refuſed to comply with his requeſt. Accordingly he commenced preacher, and became one of the moſt eminent orators of his age. In his diſcourſes he would probably have been too laviſh of his wit, if he had not been cautioned againſt it by a judicious courtier. "Continue (ſaid he) to preach as you do. We will hear you with pleaſure as long as you reaſon with us; but avoid wit. We value the wit contained in two verſes of a ſong, more than all that is contained in moſt of the ſermons in Lent."

Reſpecting the delivery of ſermons, he entertained an opinion quite oppoſite to the eſtabliſhed practice of his countrymen. In France it was cuſtomary not to read ſermons from the pulpit, but to recite them from memory. This he conſidered as a laborious taſk, not compenſated by any advantages. On the contrary, he was of opinion that reading ſermons was preferable.—The preacher, with his diſcourſe before him, could read it with eaſe, free from that timidity and embarraſſment which frequently attends the act of recollection; and he would ſave a conſiderable time which is uſually ſpent in committing it to memory. In theſe ſentiments many will not be diſpoſed to acquieſce: but, without pretending to determine the queſtion, it may be aſſerted, that a ſermon, whether read or recited, if ſpoken in a ſerious manner, and with proper inflections and tones of voice, will produce all the effects for which a ſermon is calculated.

De la Rue died at Paris on the 27th of May 1725, at the age of 82.

He was as amiable in ſociety as he was venerable in the pulpit. His converſation was pleaſant and inſtructive. His taſte and knowledge enabled him to converſe with eaſe, and to expreſs himſelf with propriety on every ſubject. He charmed his ſuperiors by his wit, and his inferiors by his affability. Though living amidſt the buſtle of the world, he was always prepared for the ſolitude of the cloſet and the retreat of the cloiſter. In the pulpit he poured forth the fineſt effuſions of eloquence in the moſt animated and impreſſive manner.—He publiſhed Panegyrics, Funeral Orations, and Sermons. His beſt ſermon is that entitled *Des Calamités Publiques*, and his moſt admired funeral oration was compoſed on the Prince of Luxemburg. There are alſo tragedies of his writing, both in Latin and French, which were approved by Corneille. He was one of thoſe who publiſhed editions of the claſſics for the uſe of the

Dauphin. Virgil, which fell to his ſhare, was publiſhed with notes, and a Life of the poet, in 1675, 4to. and is a valuable and uſeful edition.

RUELLIA, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is quinquepartite; the corolla ſub-campanulated; the ſtamina approaching together in pairs; the capſule ſpringing aſunder by means of its elaſtic ſegments.

RUFF, in ichthyology; a ſpecies of PERCA.

RUFF, in ornithology, a ſpecies of TRINGA.

RUFFHEAD (Dr. OWEN), was the ſon of his majeſty's baker, in Piccadilly; who buying a lottery ticket for him in his infancy, which happened to be drawn a prize of 500l. this ſum was applied to educate him for the law. He accordingly entered in the Middle Temple; and ſeconded ſo well the views of his father, that he became a good ſcholar and an acute barriſter. While he was waiting for opportunities to diſtinguiſh himſelf in his profeſſion, he wrote a variety of pamphlets on temporary politics; and was afterwards diſtinguiſhed by his accurate edition of *The Statutes at Large*, in 4to. He now obtained good buſineſs, though more as a chamber counſellor in framing bills for parliament than as a pleader; but his cloſe application to ſtudy, with the variety of works he engaged in as an author, ſo impaired his conſtitution, that after the laſt exertion of his abilities to defend the conduct of adminiſtration toward Mr. Wilkes, by a pamphlet intitled "The Caſe of the late election for the county of Middleſex conſidered," he was prevented from receiving the reward of a place in the Treaſury, by dying in 1769, at about 46 years of age. Some time before his death, biſhop Warburton engaged him to write his long promiſed *Life of Alexander Pope;* which, however, when executed, was very far from giving general ſatisfaction. The author attributed his ill ſucceſs to the deficiency of his materials; while the public ſeemed rather to be of opinion that, as a lawyer, he ventured beyond his proper line when he aſſumed the taſk of a critic in poetry.

RUFFLING, or RUFFING, a beat on the drum. Lieutenant-generals have three ruffles, major-generals two, brigadiers one, and governors one, as they paſs by the regiment, guard, &c.

RUFINUS, was born about the middle of the fourth century at Concordia, an inconſiderable town in Italy. At firſt he applied himſelf to the belles lettres, and particularly to the ſtudy of eloquence. To accompliſh himſelf in this elegant art, he removed to Aquileia, a town at that time ſo celebrated that it was called a ſecond Rome. Having made himſelf acquainted with the polite literature of the age, he withdrew into a monaſtery, where he devoted himſelf to the ſtudy of theology. While thus occupied, St. Jerome happened to paſs through Aquileia. Rufinus formed an intimate friendſhip with him; but, to his inexpreſſible grief, was ſoon deprived of the company of his new friend, who continued his travels through France and Germany, and then ſet out for the eaſt. Rufinus, unable to bear his abſence, reſolved to follow him. Accordingly he embarked for Egypt; and having viſited the hermits who inhabit the deſerts of that country, he repaired to Alexandria to hear the renowned Didymus. Here he was gratified with a ſight of St. Melania, of whoſe virtue and charity he had heard much. The ſanctity of his manners ſoon obtained the confidence of St. Melania, which continued without interruption during their reſidence in the eaſt, a period of 30 years. The Arians, who ſwayed the eccleſiaſtical ſceptre in the reign of Valens, perſecuted Rufinus with great cruelty. They threw him into a dungeon, loaded him with chains, and, after almoſt ſtarving him to death, baniſhed him to the deſerts of Paleſtine. From this exile he was relieved by the pecuniary aid of St. Melania, who employed her wealth in ranſoming thoſe confeſſors who had been condemned to priſon or baniſhment.

St. Jerome, ſuppoſing that Rufinus would immediately proceed to Jeruſalem, wrote to one of his friends there, congratulating him on the proſpect of ſo illuſtrious a viſitor. To Jeruſalem he went; and having built a monaſtery on the Mount of Olives, he there aſſembled a great number of hermits, whom he animated to virtue by his exhortations. He converted many to the Chriſtian faith, and perſuaded more than 400 hermits who had taken part in the ſchiſm of Antioch to return to the church. He prevailed on many Macedonians and Arians to renounce their errors.

His attachment to the opinions of Origen ſet him at variance with St. Jerome, who, being of a temper peculiarly irritable, not only retracted all the praiſes which he had laviſhed upon him, but loaded him with ſevere reproaches. Their diſputes, which were carried to a very indecent height, tended to injure Chriſtianity in the eyes of the weak. Theophilus, their mutual friend, ſettled their differences; but the reconciliation was of ſhort continuance. Rufinus, having publiſhed a tranſlation of the principles of Origen at Rome, was ſummoned to appear before pope Anaſtaſius. But he made a ſpecious apology for not appearing, and ſent a vindication of his work, in which he attempted to prove that certain errors, of which Origen had been accuſed, were perfectly conſiſtent with the opinions of the orthodox. St. Jerome attacked Rufinus's tranſlation. Rufinus compoſed an eloquent reply, in which he declared that he was only the tranſlator of Origen, and did not conſider himſelf bound to ſanction all his errors. Moſt eccleſiaſtical hiſtorians ſay that Rufinus was excommunicated by pope Anaſtaſius; but for this no good evidence has been brought. In 407 he returned to Rome; but the year after, that city being threatened by Alaric, he retired to Sicily, where he died in 410.

His works are, 1. A Tranſlation of Joſephus; 2. A Tranſlation of ſeveral works of Origen; 3. A Latin Verſion of Ten Diſcourſes of Gregory Nazianzen, and Eight of Baſil's; 4. Chromatius of Aquileia prevailed on him to undertake a Tranſlation of the Eccleſiaſtical Hiſtory of Euſebius, which engaged him almoſt ten years. He made many additions to the body of the work, and continued the hiſtory from the 20th year of Conſtantine to the death of Theodoſius the Great. Many parts of this work are negligently written, many things are recorded as facts without any authority but common report, and many things of great importance are entirely omitted. 5. A Vindication of Origen. 6. Two Apologies addreſſed to St. Jerome. 7. Commentaries on the Prophets Hoſea, Joel, and Amos. 8. Lives of the Hermits. 9. An Explanation of the Creed.

RUGEN, an iſland in the Baltic ſea, on the coaſt of Pomerania, over againſt Stralſund, about 23 miles in length and 15 in breadth, with the title of a principality. It is ſtrong both by art and nature, abounds in corn and cattle, and belongs to Sweden. The chief town is Bergen. E. lon. 14. 30. N. lat. 54. 32.

RUINS, a term particularly uſed for magnificent buildings fallen into decay by length of time, and whereof there only remains a confuſed heap of materials. Such are the ruins of the tower of Babel, of the tower of Belus, two days journey from Bagdat in Syria, on the banks of the Euphrates; which are now no more than a heap of bricks, cemented with bitumen, and whereof we only perceive the plan to have been ſquare. Such alſo are the ruins of a famous temple, or palace, near Schiras, in Perſia, which the antiquaries will have to have been built by Ahaſuerus, and which the Perſians now call Tchelminar, or Chelminar; *q. d.* the 40 columns; becauſe there are ſo many columns remaining pretty entire with the

traces of others; a great quantity of baſſo-relievos, and unknown characters, ſufficient to ſhow the magnificence of the antique architecture. The moſt remarkable ruins now exiſting of whole cities are thoſe of PALMYRA and PERSEPOLIS, of the grandeur of which ſome idea may be formed from the views given in the plates referred to from theſe articles, to which may be added thoſe of HERCULANEUM and POMPEIUM. The magnificent ruins ſtill remaining in Rome, Athens, &c. of particular edifices, as temples, palaces, amphitheatres, aqueducts, baths, &c. it were endleſs to enumerate, and beyond the plan of this work to repreſent.

RUIZIA, in botany: A genus of the polyandria order, belonging to the monadelphia claſs of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The calyx is double; the external are triphyllous; the internal are parted into five. The corolla conſiſts of five petals, inclining to the right hand ſide, and adhering to the ſtamina, which are from 30 to 40. It has ten ſtyli, and as many capſulæ. Theſe are compreſſed and membranous. In each capſule are two ſeeds. There are four ſpecies, viz. 1. *Cordata*; 2. *Lobata*; 3. *Palmata*; 4. *Laciniata*: all natives of Aſia and the Cape of Good Hope.

RULE, in a matters of literature, a maxim, canon, or precept to be obſerved in any art or ſcience.

RULE, in a monaſtic ſenſe, a ſyſtem of laws or regulations, whereby religious houſes are governed, and which the religious make a vow at their entrance to obſerve. Such are the rules of the Auguſtins, Benedictins, Carthuſians, Franciſcans, &c. See AUGUSTINS, &c.

RULES *of Court*, in law, are certain orders made from time to time in the courts of law, which attorneys are bound to obſerve, in order to avoid confuſion; and both the plaintiff and defendant are at their peril alſo bound to pay obedience to rules made in court relating to the cauſe depending between them. It is to be obſerved, that no court will make a rule for any thing that may be done in the ordinary courſe; and that if a rule be made, grounded upon an affidavit, the other ſide may move the court againſt it, in order to vacate the ſame, and thereupon ſhall bring into court a copy of the affidavit and rule. On the breach and contempt of a rule of court an attachment lies; but it is not granted for diſobedience to a rule, when the party has not been perſonally ſerved; nor for diſobeying a rule made by a judge in his chamber, which is not of force to ground a motion upon, unleſs the ſame be entered. A rule of court is granted every day the courts at Weſtminſter ſit, to priſoners of the King's-bench or Fleet priſons, to go at large about their private affairs.

RULE *of Three*. See ARITHMETIC and PROPORTION.

RULE, or *Ruler*, an inſtrument of wood or metal, with ſeveral lines delineated on it; of great uſe in practical menſuration. When a ruler has the lines of chords, tangents, ſines, &c. it is called a *plane ſcale*.

RUM, a ſpecies of brandy or vinous ſpirits, diſtilled from ſugar canes. Rum, according to Dr. Shaw, differs from ſimple ſugar-ſpirit, in that it contains more of the natural flavour or eſſential oil of the ſugar-cane; a great deal of raw juice and parts of the cane itſelf being often fermented in the liquor or ſolution of which the rum is prepared. The unctuous or oily flavour of rum is often ſuppoſed to proceed from the large quantity of fat uſed in boiling the ſugar; which fat, indeed, if coarſe, will uſually give a ſtinking flavour to the ſpirit in our diſtillations of the ſugar liquor or waſh, from our refining ſugar-houſes; but this is nothing of kin to the flavour of the rum, which is really the effect of the natural flavour of the cane.

The method of making rum is this: When a ſufficient ſtock of the materials is got together, they add water to them, and ferment them in the common method, though the fermentation is always carried on very ſlowly at firſt: becauſe, at the beginning of the ſeaſon for making rum in the iſlands, they want yeaſt or ſome other ferment to make it work: but by degrees, after this, they procure a ſufficient quantity of the ferment, which riſes up as a head to the liquor in the operation; and thus they are able afterwards to ferment and make their rum with a great deal of expedition, and in large quantities.

When the waſh is fully fermented, or to a due degree of acidity, the diſtillation is carried on in the common way, and the ſpirit is made up proof: though ſometimes it is reduced to a much greater ſtrength, nearly approaching to that of alcohol or ſpirit of wine; and it is then called *double-diſtilled rum*. It might be eaſy to rectify the ſpirit, and bring it to much greater purity than we uſually find it to be of: for it brings over in the diſtillation a very large quantity of the oil; and this is often ſo diſagreeable, that the rum muſt be ſuffered to lie by a long time to mellow before it can be uſed; whereas, if well rectified, it would grow mellow much ſooner, and would have a much leſs potent flavour.

The beſt ſtate to keep rum in, both for exportation and other uſes, is doubtleſs that of alcohol or rectified ſpirit. In this manner it would be tranſported in one half the bulk it uſually is, and might be let down to the common proof-ſtrength with water when neceſſary: for the common uſe of making punch, it would likewiſe ſerve much better in the ſtate of alcohol; as the taſte would be cleaner, and the ſtrength might always be regulated to a much greater exactneſs than in the ordinary way.

The only uſe to which it would not ſo well ſerve in this ſtate, would be the common practice of adulteration among our diſtillers; for, when they want to mix a large portion of cheaper ſpirit with the rum, their buſineſs is to have it of the proof-ſtrength, and as full of the flavouring oil as they can, that it may drown the flavour of the ſpirits they mix with it, and extend its own. If the buſineſs of rectifying rum were more nicely managed, it ſeems a very practicable ſcheme to throw out ſo much of the oil, as to have it in the fine light ſtate of a clear ſpirit, but lightly impregnated with it: in this caſe it would very nearly reſemble arrack, as is proved by the mixing a very ſmall quantity of it with a a taſteleſs ſpirit, in which caſe the whole bears a very near reſemblance to arrack in flavour.

Rum is uſually very much adulterated in Britain; ſome are ſo bare-faced as to do it with malt ſpirit; but when it is done with molaſſes ſpirit, the taſtes of both are ſo nearly allied, that it is not eaſily diſcovered. The beſt method of judging of it is by ſetting fire to a little of it; and, when it has burnt away all the inflammable part, examining the phlegm both by the taſte and ſmell.

RUMELIA, in geography, the ſame with antient Greece; now a part of Turkey in Europe.

RUMEN, the paunch, or firſt ſtomach of ſuch animals as chew the cud; thence called RUMINANT *Animals*. See COMPARATIVE *Anatomy*.

RUMEX, DOCK, in botany: A genus of the trigynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The calyx is triphyllous; there are three connivent petals, and one triquetrous ſeed. There are 27 ſpecies; of which the moſt remarkable are, 1. The *patientia*, commonly called *patience rhubarb*. This was formerly much more cultivated in the Britiſh gardens than at preſent: the roots of this have been generally uſed for the monk's rhubarb, and it

has even been thought to be the true kind; but others suppose the second sort should be used as such. The root is large, and divides into many thick fibres; their outer cover is brown, but they are yellow within, with some reddish veins; the leaves are broad, long, and acute-pointed; their footstalks are of a reddish colour; the stalks rise six or seven feet high, and divide towards the top into several erect branches garnished with a few narrow leaves terminating with loose spikes of large staminous flowers. These appear in June, and are succeeded by pretty large three-cornered seeds, whose coverings are entire, which ripen in autumn. 2. The *alpinus*, or monk's rhubarb, grows naturally on the Alps, but has long been cultivated in the gardens of this country. This hath large roots, which spread and multiply by their offsets: they are shorter and thicker than the former, are of a very dark brown on the outside, and yellow within. The leaves are of the round heart-shape, standing upon long footstalks. The stalks rise from two to three feet high; they are thick, and have a few small roundish leaves on the lower part; but the upper part is closely garnished with spikes of white flowers standing erect close to the stalks. These appear in the latter end of May, and are succeeded by large triangular seeds which ripen in August. 3. The *aquaticus*, or water-dock, grows naturally in ponds, ditches, and standing waters, in many parts of Britain. It is supposed to be the herba Britannica of the antients. It hath large roots which strike deep into the loose mud, sending out leaves which are above two feet long. The stalks rise five or six feet high when the plants grow in water, but in dry land seldom more than three: these are garnished with narrow leaves among the spikes of flowers to the top. The flowers stand upon slender footstalks, which are reflexed: they are of a herbaceous colour, appear in June, and the seeds ripen in autumn. 4. The *acutus*, or sharp-pointed dock, (the oxylapathum of the shops); but the markets are supplied with roots of the common docks, which are indifferently gathered by those who collect them in the fields, where the kind commonly called *butter dock* (from its leaves being used to wrap up butter) is much more common than this. The roots of this are slender, and run downright, sending out a few small fibres; the stalks rise about two feet high, garnished at bottom with leaves four inches long, and one and a half broad in the middle. They are rounded at their base, where they are slightly indented, but end in acute points. From the joints of the stalks come out alternately long foot-stalks, which sustain the spikes of flowers, which grow in small whorls round the stalks, at about an inch distant. These plants are but seldom cultivated; and so easily multiply by their numerous seeds, that they soon become troublesome weeds where they once get an entrance.

RUMINANT, in natural history, is applied to an animal which chews over again what it has eaten before; which is popularly called *chewing the cud*. Peyer, in a treatise *De Ruminantibus et Ruminatione*, shows that there are some animals which really ruminate; as oxen, sheep, deer, goats, camels, hares, and squirrels; and that there are others which only appear to do so, as moles, crickets, bees, beetles, crabs, mullets, &c. The latter class, he observes, have their stomachs composed of muscular fibres, by which the food is ground up and down as in those which really ruminate. Mr. Ray observes that ruminants are all four-footed, hairy, and viviparous; some with hollow and perpetual horns, others with deciduous ones.

RUMP OF THE SACRIFICES. Moses had ordained, that the rump and fat of the sheep that were offered for a peace-offering should be put upon the fire of the altar (Lev. iii. 9. vii. 3. viii. 25. ix. 19.). The rump was esteemed the most delicate part of the animal.

RUMPHIA, in botany: A genus of the monogynia order, belonging to the triandria class of plants; and in the natural method ranking with those of which the order is doubtful. The calyx is trifid; the petals three; the fruit a trilocular plum.

RUNDLET, or RUNLET, a small vessel, containing an uncertain quantity of any liquor, from three to 20 gallons.

RUNGS, in a ship, the same with the floor or ground timbers; being the timbers which constitute her floor; and are bolted to the keel, whose ends are rung-heads.

RUNG-*Heads*, in a ship, are made a little bending to direct the sweep or mold of the futtocks and navel-timbers; for here the lines begin which make the compass and bearing of the ship.

RUNIC, a term applied to the language and letters of the antient Goths, Danes, and other northern nations. See ALPHABET.

RUNNER, in the sea-language, a rope belonging to the garnet and the two bolt-tackles. It is reeved in a single block joined to the end of a pendant: it has at one end a hook to hitch into any thing; and at the other, a double block, into which is reeved the fall of the tackle, or the garnet, by which means it purchases more than the tackle would without it.

RUNNING-THRUSH, among farriers. See FARRIERY.

RUNNET, or RENNET, is the concreted milk found in the stomachs of sucking quadrupeds, which as yet have received no other nourishment than their mother's milk. In ruminating animals, which have several stomachs, it is generally found in the last, though sometimes in the next to it. If the runnet is dried in the sun, and then kept close, it may be preserved in perfection for years. Not only the runnet itself, but also the stomach in which it is found, curdles milk without any previous preparation. But the common method is, to take the inner membrane of a calf's stomach, to clean it well, to salt and hang it up in brown paper: when this is used the salt is washed off, then it is macerated in a little water during the night, and in the morning the infusion is poured into the milk to curdle it. But see more particularly the article CHEESE for a proper receipt to make runnet, upon which the quality of the cheese greatly depends.—The medicinal qualities of runnet are its acrimony, its resolvent power, and its usefulness in surfeits from food of difficult digestion.

RUPEE, a silver coin current in the East Indies, worth about 2s. 6d.

RUPERT, prince palatine of the Rhine, &c. son of Frederic prince elector palatine of the Rhine and Elisabeth daughter to king James I. of England, was born in 1619. He gave proofs of his bravery at the age of 13; and in 1642 came over into England, and offered his service to king Charles I. his uncle, who gave him a command in his army. At Edgehill he charged with incredible bravery, and made a great slaughter of the parliamentarians. In 1643 he seized the town of Cirencester; obliged the governor of Litchfield to surrender; and, having joined his brother prince Maurice, reduced Bristol in three days, and passed to the relief of Newark. In 1644 he marched to relieve York, where he gave the parliamentarians battle, and entirely defeated their right wing; but Cromwell charged the marquis of Newcastle with such an irresistible force, that prince Rupert was entirely defeated. After this the prince put himself into Bristol, which surrendered to Fairfax after a gallant resistance. The king was so enraged at the loss of this city, so contrary to his expectation, that he recalled all prince Rupert's commissions, and sent him a pass to go out of the kingdom. In 1648 he went to France, was highly complimented by that court, and kindly received by king Charles II.

who ſojourned there for the time. Afterwards he was conſtituted admiral of the king's navy; infeſted the Dutch ſhips, many of which he took; and, having engaged with De Ruyter, obliged him to fly. He died in 1682, and was interred in king Henry VII's chapel, Weſtminſter, with great magnificence. Mr. Grainger obſerves, that he poſſeſſed in a high degree that kind of courage which is better in an attack than a defence; and is leſs adapted to the land-ſervice than that of the ſea, where precipitate valour is in its element. He ſeldom engaged but he gained the advantage, which he generally loſt by purſuing it too far. He was better qualified to ſtorm a citadel, or even to mount a breach, than patiently to ſuſtain a ſiege; and would have furniſhed an excellent hand to a general of a cooler head. This prince is celebrated for the invention of prints in mezzotinto, of which he is ſaid to have taken the hint from a ſoldier's ſcraping his ruſty fuſil. The firſt print of this kind ever publiſhed was done by his highneſs, and may be ſeen in the firſt edition of Evelyn's Sculptura. The ſecret is ſaid to have been ſoon after diſcovered by Sherwin an engraver, who made uſe of a loaded file for laying the ground. The prince, upon ſeeing one of his prints, ſuſpected that his ſervant had lent him his tool, which was a channelled roller; but, upon receiving full ſatisfaction to the contrary, he made him a preſent of it. The roller was afterwards laid aſide; and an inſtrument with a crenelled edge, ſhaped like a ſhoemaker's cutting-knife, was uſed inſtead of it. He alſo invented a metal called by his name, in which guns were caſt; and contrived an excellent method of boring them, for which purpoſe a water-mill was erected at Hackney-marſh, to the great detriment of the undertaker, as the ſecret died with the illuſtrious inventor.

Rupert's *Drops*, a ſort of glaſs-drops with long and ſlender tails, which burſt to pieces on the breaking off thoſe tails in any part; ſaid to have been invented by prince Rupert, and therefore called by his name. Concerning the cauſe of this ſurpriſing phænomenon ſcarce any thing that bears the leaſt appearance of probability has been offered. Their exploſion is attended in the dark with a flaſh of light; and, by being boiled in oil, the drops are deprived of their exploſive quality.

RUPIN, or Rapin, a town of Germany, in the marquiſate of Brandenburgh, and capital of a duchy of the ſame name. It is divided into the Old and the New. The Old was nothing but an antient caſtle, very well furniſhed, the late king of Pruſſia, before his father's death, reſiding there. New Rupin is ſeated on a lake, and become a conſiderable place of trade, with a manufactory of cloth. It is alſo noted for brewers. E. lon. 13. 23. N. lat. 53. 0.

RUPPIA, in botany: A genus of the tetragynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 15th order, *Inundatæ*. There is neither calyx nor corolla; but four pedicellated ſeeds.

RUSCUS, knee-holly, or *Butcher's broom*: A genus of the ſyngeneſia order, belonging to the dioecia claſs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The male calyx is hexaphyllous; there is no corolla; the nectarium is central, ovate, and perforated at the top. The female calyx, corolla, and nectarium, are the ſame as in the male; there is one ſtyle, with a trilocular two-ſeeded berry. The moſt remarkable ſpecies is the *aculeatus*, or common butcher's broom, common in the woods in many parts of England. It has roots compoſed of many thick fibres which twine about each other; from which ariſe ſeveral ſtiff green ſtalks about three feet high, ſending out from their ſides ſeveral ſhort branches, garniſhed with ſtiff, oval, heart-ſhaped leaves, placed alternately on every part of the ſtalk, ending with ſharp prickly points. The flowers are produced in the middle, on the upper ſide of the leaves; they are ſmall, and cut into ſix parts; of a purple colour, ſitting cloſe to the midrib. They appear in June; and the female flowers are ſucceeded by berries as large as cherries, of a ſweetiſh taſte, which ripen in winter; when they are of a beautiful red colour. As this plant grows wild in moſt parts of England, it is rarely admitted into gardens; but if ſome of the roots are planted under tall trees in large plantations, they will ſpread into large clumps; and as they retain their leaves in winter, at that ſeaſon they will have a good effect. The ſeeds of this plant generally lie a year in the ground before they vegetate; and the plants ſo raiſed are long before they arrive at a ſize big enough to make any figure, and therefore it is much better to tranſplant the roots.—The root of this plant is accounted aperient, and in this intention is ſometimes made an ingredient in apozems and diet-drinks, for opening ſlight obſtructions of the viſcera, and promoting the fluid ſecretions. This plant is uſed by the butchers for beſoms to ſweep their blocks. Huckſters place the boughs round their bacon and cheeſe to defend them from the mice; for they cannot make their way through the prickly leaves.

RUSH, in botany. See Juncus.

Rush-*Candles*. See *Ruſh*-Candles.

RUSHWORTH (John), the compiler of ſome uſeful collections reſpecting the affairs of ſtate, was born in Northumberland about the year 1607, and was deſcended of honourable anceſtors. After attending the univerſity of Oxford for ſome time, he removed to Lincoln's Inn; but the ſtudy of law not ſuiting his genius, he ſoon deſerted it, in order to ſeek a ſituation where he might more eaſily gratify his love for political information. He frequented the meetings of parliament, and wrote down the ſpeeches both of the king and members. During the ſpace of 11 years, from 1630 to 1640, when no parliament was held, he was an attentive obſerver of the great tranſactions of ſtate in the ſtar-chamber, the court of honour, and exchequer chamber, when all the judges of England aſſembled there on caſes of great emergency. Nor did he neglect to obſerve with a watchful eye thoſe events which happened at a diſtance from the capital. He viſited the camp at Berwick, was preſent at the battle of Newborn, at the treaty of Rippon, and at the great council of York.

In 1640 he was appointed aſſiſtant to Henry Elſynge clerk to the houſe of commons, and thus had the beſt opportunities of being acquainted with their debates and proceedings. The commons conſidered him as a perſon worthy of confidence. In particular, they truſted him with carrying their meſſages to the king while he remained at York. And when the parliament created Sir Thomas Fairfax their general, Ruſhworth was appointed his ſecretary, and diſcharged the office much to the advantage of his maſter. When Fairfax reſigned his commiſſion, his ſecretary returned to Lincoln's Inn, and was ſoon after (in 1651-2) choſen one of the committee that was appointed to deliberate concerning the propriety and means of altering or new-modelling the common law. He was elected one of the repreſentatives for Berwick upon Tweed to the parliament which Richard Cromwell aſſembled in 1658, and was re-elected by the ſame town to the parliament which reſtored Charles II. to the crown.

After the Reſtoration, he delivered to the king ſeveral books of the privy council, which he had preſerved in his own poſſeſſion during the commotions which then agitated the country. Sir Orlando Bridgeman, keeper of the great ſeal, choſe him his ſecretary in 1677, an office which he enjoyed as long as Sir Orlando kept the ſeals. In 1678 he was a third time choſen member for Berwick, and a fourth time in the enſuing parliament in 1679. He was alſo a member of the parliament which was convened at Oxford. The different offices he had held afforded

him favourable opportunities of acquiring a fortune, or at leaft an independance; yet, whether from negligence or prodigality, he was never poffeffed of wealth. Having run himfelf into debt, he was arrefted, and committed to the King's Bench prifon, Southwark, where he lingered for the laft fix years of his life in the moft deplorable condition. His memory and judgment were much impaired, partly by age and partly by the too frequent ufe of fpirituous liquors. He died on the 12th of May 1690.

His "Hiftorical Collections of private Paffages in State, weighty Matters in Law, remarkable Proceedings in Parliament," were publifhed in folio at different times. The firft part, comprehending the years between 1618 and 1629, appeared in 1659. The copy had been entrufted by Oliver Cromwell to Whitelock, with inftructions to perufe and examine it. Upon perufing it, he thought it neceffary to make fome alterations and additions. The fecond part was publifhed in 1680; the third in 1692; the fourth and laft, which comes down to the year 1648, was publifhed in 1701; and altogether made feven volumes. Thefe underwent a fecond edition in 1721; and the trial of the earl of Strafford was added, which made the eighth. This work has been much applauded by thofe who condemn the conduct of Charles I. and accufed of partiality by thofe who favour the caufe of that unhappy monarch. One perfon in particular, Dr. John Nelfon of Cambridge, in a Collection of the Affairs of State publifhed by the command of Charles II. undertook to prove, "that Rufhworth has concealed truth, endeavoured to vindicate the prevailing detractions of the late times, as well as their barbarous actions, and with a kind of rebound to libel the government at fecond-hand." This accufation feems to be carried too far. His principles indeed led him to fhow the king and his adherents in an unfavourable light, and to vindicate the proceedings of parliament; yet it cannot be juftly affirmed that he has mifreprefented or falfified any of the fpeeches or facts which he has admitted into his collection. Perhaps he may have omitted fome papers merely becaufe they were unfavourable to the party which he had efpoufed; and is therefore not to be confidered as an impartial hiftorian who relates the whole truth, but as an honeft lawyer, who ftates all his facts fairly and candidly, but paffes over fuch as are injurious to his client's caufe.

RUSSELIA, in botany: A genus of the trigynia order, belonging to the pentandria clafs of plants. The calyx is five-leaved; the petals five above; the capfule is one-celled and many-feeded.

RUSSIA. This vaft empire extends from the 41ft to the 205th degree of longitude eaft from Ferro, and from the 43d to the 78th degree of north latitude. On the north it is bounded by the Frozen Sea, on the eaft by the North Pacific Ocean, on the fouth by the Pacific Ocean, Chinefe and other parts of Tartary, the dominions of Perfia, the Cafpian Sea, Afiatic and European Turkey, and on the weft by Poland, Lithuania, Baltic, Finland, and Lapland. It is divided into forty-two governments, the names of which are, Peterfburg, Archangel, Olonetz, Viborg, Revel, Riga, Pfkov, Tver, Novgorod, Vologda, Jaroflavl, Koftrom, Viatka, Perm, Tobolfk, Mofcow, Smolenfk, Polotfk, Mogilev, Tchernigov, Novgorod, Sieverfkoi, Charkov, Kurfk, Orel, Kaluga, Tula, Riazan, Vladimir, Niznei Novgorod, Kazan, Simbirfk, Penza, Tambov, Voronez, Saratov, Upha, Kolivan, Irkutfk, Kiev, Ekaterinoflav, Caucafus, and the country of the Cofacs. As this empire confifts of fo great a number of provinces, many of which are very extenfive, the foil and temperature of the air muft vary confiderably in different parts of it; and, confequently, one province may fupply what is wanting in another. In thofe parts which lie beyond the 60th degree of latitude, there are but few places where corn will grow to maturity; and in the northern part of the empire no garden fruits are produced, except in the country about Archangel, where horned cattle are alfo bred, and a great many bufhes and fhrubs grow fpontaneoufly, which yield feveral forts of berries. There is alfo plenty of wild beafts and fowls, and feveral forts of fifh in the neighbourhood of that city. In thofe provinces which lie in the middle of the empire, the air is mild and temperate, and the foil produces all kinds of trees and garden fruits, corn, honey, &c. They are alfo well ftocked with horned cattle, the woods abound in game, and the rivers are navigable, and full of the beft forts of fifh. In the fouthern provinces the climate is hot: and though many barren waftes are to be met with in fome parts of them, yet in other places they are covered with verdure and flowers. Tobacco, wine, and filk, might be produced in them, and they are well watered with rivers, which afford plenty of fifh: nor are they deftitute of game, in proportion to the extent and number of the woods. Medicinal and faline fprings are not uncommon in Ruffia. Fine filver, which alfo yields fome gold, is dug out of the mines in this country, and likewife exceedingly fine copper, iron, and many other minerals; as the famous marien-glafs, called by fome Mufcovy-glafs, or ifing-glafs, &c. with feveral precious ftones. In the middle and northern parts of the empire, the cold is very fevere, and the days extremely fhort in winter; but the fummers are warm and delightful; and even in the fhorteft nights the twilight is very luminous. At the winter folftice, when the day is at the fhorteft, the fun rifes and fets on the horizon of fome of the principal cities in the Ruffian empire according to the following table:

		H.	M.		H.	M.
At Aftrachan	fun rifes	7	48	fun fets	4	12
Kiev		8	7		3	53
Mofcow		8	37		3	23
Riga		8	47		3	13
Tobolfk		8	56		3	4
Peterfburg		9	15		2	45
Archangel		10	24		1	36

At the fummer folftice, when the day is at its greateft length, this order is reverfed. A perfon may travel cheap and with great expedition in Ruffia, both in fummer and winter, efpecially in the fledges during the latter feafon. The draught-horfes are extremely fwift, and the roads very good, particularly in the winter time, between the principal cities of this country. It is nothing extraordinary to go with poft-horfes from Peterfburg to Mofcow, which is about 440 miles, in feventy-two hours; and a commodious fledge, drawn by a pair of poft-horfes, for this diftance, may be hired for fourteen or fifteen rubles. Not one-third of the Ruffian empire is fufficiently peopled, or properly cultivated. The number of inhabitants who pay the poll-tax and furnifh recruits, is computed at near 13,000,000, and of the whole at near 27,000,000. Before the time of Peter I, the Ruffians were, and in fome refpects not undefervedly, looked upon as mere favages. But that wife and great prince, by incredible application, and a proper temperature of feverity and mildnefs, brought about fuch a happy change in their manners, as in a great meafure fets them on a level with the other civilized nations of Europe. The infatiable eagernefs of the common people after fpirituous and other ftrong liquors, efpecially in the carnival time, is by Dr. Bufching imputed in a great meafure to the rigorous fafts they obferve, and the flender diet they live upon throughout the year. Their food chiefly confifts of turnips, cabbage, peas, large cucumbers, onions, and coarfe ill-tafted fifh. Their drink is quas, which is a kind of fmall beer; and even among the gentry brandy always makes a part of every repaft. Among the lower fort, it is generally the men who give themfelves up to thefe exceffes; though, indeed, it is no uncommon fight at Peterfburg to fee a drunken woman ftaggering along the ftreets. The Ruffian women are extremely fond of paint, and look upon

a ruddy complexion as the very effence of beauty; fo that in the Ruffian language red and beautiful are fynonymous terms. Perfons of diftinction drefs after the German and French manner, and are very fond of ftate and fplendour. The drefs of the common people in Ruffia is mean, but they are neat and cleanly in their apparel. Perfons of both fexes wear a crofs on their breafts, which is put on when they are baptized, and never laid afide as long as they live. The peafants' croffes are of lead, but thofe worn by the better fort are of gold or filver. The peafants let their beards grow to their full length. The Ruffians feldom fail of bathing twice a week; for which purpofe almoft every houfe-keeper is provided with a bath; and he that has none of his own goes to the public baths. They often fally out naked from the warm bath, run about in the cold, and roll themfelves in the fnow; and then they plunge again into the bath: this viciffitude of heat and cold they look upon as beneficial to the conftitution, by rendering them hardy and robuft. There is commonly a brick ftove or large oven in every room in the houfe of a peafant, which takes up the fourth part of the area, and is flat at the top and boarded; on which, and a kind of fhelves round the room, the whole family fleep. Their furniture confifts of three benches, an oblong table, and a picture of a faint or two. The peafants are but vaffals to the great, and groan under many oppreffions; but they are fo far from being dull and ftupid, that they are remarkably acute and witty, and do not want for natural parts. The Ruffian nobility formerly confifted folely of knefes, or princes, and gentlemen. Bojar is not a title of nobility, but antiently denoted a poft or office, as a privy counfellor, &c. Peter the Great added the titles of the counts and barons to the former; and, in 1714, ordered that the eftates of the nobility fhould not be divided; and alfo invefted the proprietors with full power to leave their eftates to that child or heir whom they fhould think moft worthy of the inheritance: however, this law was repealed in the year 1731. The nobility, with regard to unlimited fubjection to their fovereign, are on a level with the reft of the people; neither does their rank entitle them to high pofts in the ftate; but they are promoted only according to their merit. The Ruffian language derives its origin from the Sclavonian; but differs greatly from it at prefent, and, with regard to religious fubjects, is enriched with a great number of Greek words. The alphabet confifts of forty-two letters; and moft of them are Greek characters, as they were written in the 9th century. But as the latter did not exprefs every particular found in the Sclavonian language, recourfe was had to feveral Hebrew letters, and fome arbitrary figns. There are various dialects ufed in the different parts of the Ruffian empire, namely the Mofcovite, the Novogrodian, the Ukranian, and that of Archangel. The Siberian dialect is much the fame with the laft. The Ruffians profefs the religion of the Greek church, which was firft embraced by the great duchefs Olga, in the year of Chrift 955, and afterwards by her grandfon, the great duke Wladimir, in 988, whofe example was followed by his fubjects. The inhabitants of the provinces conquered from Sweden profefs Lutheranifm; and the Proteftants, of whom there are great numbers among the Ruffians, as alfo the Papifts, enjoy a full liberty of confcience, and the public exercife of their religion; fo that they have churches and priefts or minifters at Peterfburg, Cronftadt, Mofcow, Archangel, and Aftrachan: but the Papifts have no longer the privilege of hanging up bells in their churches. The Arminians have their public places of worfhip only at Aftrachan. A confiderable number of the Ruffian fubjects profefs the Mahometan religion, and greater numbers are ftill Pagans. In order to promote their converfion, the fynod has inftituted a peculiar fociety for propagating Chriftian knowledge, called *Collegium de propaganda Fide;* and we are informed by the public papers, that many thoufands of them have been converted to Chriftianity. There are great numbers of convents for the religious of both fexes in the Ruffian empire: but Peter I. very prudently ordered, that no man fhould be permitted to enter on a monaftic life before he is thirty years of age, and that no woman fhould take the veil under fifty, and then not without the exprefs approbation and licenfe of the holy fynod. Before the reign of Peter I, the feveral branches of learning were but little known in Ruffia; but that illuftrious monarch fpared neither expenfe nor trouble to difpel the clouds of ignorance in which his fubjects were involved, and to infpire them with a tafte for arts and fciences. That great prince founded an academy of fciences, an univerfity, and a gymnafium or feminary at Peterfburg, befides other fchools in the different parts of his empire: invited feveral perfons of diftinguifhed learning from Germany, France, and Holland, to fettle at Peterfburg; collected a great number of books, and encouraged his fubjects to travel into thofe countries where arts and fciences were known to flourifh. Thefe wife and laudable meafures are ftill continued; and have cultivated many geniufes among the Ruffians, who have made a confiderable figure in the republic of letters. The members of the academy of fciences at St. Peterfburg not only publifh collections of their own memoirs; but compofe a variety of books for the inftruction of youth in the fciences, befides tranflations of the moft ufeful books publifhed in foreign countries.

All mechanic arts and trades are continually improving in Ruffia; and thofe improvements are not entirely owing to foreigners who refide there, but even the natives are fpurred on by emulation to equal, and fometimes exceed, their mafters. Formerly, the Ruffians were wholly employed in agriculture, feeding of cattle, hunting, and fifhing. What they moftly excelled in was making yuchte, or Ruffia leather, which had been a fecret of a long ftanding among them; but they were entirely unacquainted with the more ingenious mechanic trades. Great numbers of excellent artificers having been invited to Peterfburgh by Peter the Great, the Ruffians fhowed that, with proper inftructions, they did not want a capacity for all kind of handicraft trades: for they have now flourifhing manufactures of velvet, filk, woollen ftuffs, and linen; alfo copper, brafs, iron, fteel, and tin, are wrought; and great guns, arms, wire, cordage, and fail-cloth, paper, parchment, glafs, gun-powder, &c. are made in Ruffia. Ruffia affords a variety of commodities, which are of great ufe to foreigners; and as the exports of this country greatly exceed its imports, there is a confiderable annual balance of trade in its favour. The Ruffian home-commodities are fables and black furs, the fkins of blue and white foxes, ermines, hyænas, lynxes, fquirrels, bears, panthers, wolves, martens, wild-cats, white hares, &c. Likewife Ruffia-leather, copper, iron, a tranfparent foffil called marien-glafs or Mufcovy-glafs, tallow, wax, honey, pot-afh, tar, linfeed-oil, rofin, pitch, train-oil, caviar, falt-fifh, caftor, ifinglafs, hemp, flax, thread, Ruffia-linen, fail-cloth, callimanco, matting, Siberian mufk, foap, feathers, hogs' briftles, timber, &c. To thefe commodities may be added the Chinefe goods, as rhubarb and other drugs, filks, &c. with which the Ruffians partly furnifh the other countries of Europe. The red and black juchte, or Ruffia-leather, for colour, fmell, and foftnefs, cannot be equalled in any other part of the world. The quantity of bar and other unwrought iron, annually exported from Ruffia, amounts, one year with another, to 300,000 puds, each thirty-fix pounds Englifh. The goods imported into Ruffia are filks, chintz and cotton cloth, and other woollen ftuffs, fine linen, toys, French brandy, wines, herrings and other fifh, fpices, hard-ware, &c. The Ruffians, at firft, were ftrangers to any courfe of exchange, which was not introduced among them till the year 1670; and money was fo very fcarce in this country, that foreigners were obliged to barter their goods for thofe of Ruffia, and even to give the Ruffians money in exchange for their commodities. Moft of

the foreign merchants used to reside at Moscow, and took a journey in summer-time to Archangel, where they had their warehouses and factors. This practice continued till the year 1721, when, by order of Peter the Great, the seat of commerce was transferred from Archangel to Petersburgh; and the foreign traders accordingly were obliged to remove their factories to the latter. The English enjoyed here considerable privileges in trade, so early as the reign of the czar Iwan Basilowitz, which were renewed by Peter the Great, who gave them great encouragements; however, that monarch permitted them to send their goods only to Moscow. In 1752, a treaty of commerce was concluded betwixt Russia and England, by which it was stipulated that the English should be allowed the privilege of sending through Russia into Persia; but capt. Elton, an Englishman, having entered into the service of Shah Nadir, in 1746, and built ships on the Caspian Sea for that monarch, the Russians put a stop to this trade to Persia. The English still have a considerable trade with Russia, which exceeds that of any other nation. Russia is by some called *Muscovy*; but this way of speaking is very improper. For to give this empire the name of Moscovy, from Moscow, its capital, is as absurd as if we should term it the Petersburghian empire. The etymology of the word Russia is uncertain. This, however, is certain, that before the ninth century the name of Russia was entirely unknown; not the least mention of it being made in the preceding ages. The Russians are colonists in the country which they now inhabit. The aborigines, or antient inhabitants, not only in Russia, but all over Siberia, even as far as the borders of China, are called *Tschudi*; for the ingenious professor Muller, upon inquiring by whom the antient buildings and sepulchral monuments were erected, and whether they were the work of the Russians? was every where answered by the inhabitants, that these monuments, &c. were set up by the Tshudi, who in antient times had lived in that country. But the Tshudi, who, as the Russian history informs us, inhabited the north part of Russia, antecedent to the present possessors, are properly the Finns, Carelians, and Finnean Esthlanders. The nation from which the Russians derive their origin, were the Slavians, or Sclavonians, who first settled along the banks of the Volga, and afterwards near the Danube, in the countries now called Bulgaria and Hungary. But, according to the account of the Russian historians, being driven from thence by the Wolochers, or Wolotaners, that is the Romans, they first removed to the river Borysthenes, or Dnieper, over-ran all Poland, and, as it is said, built the city of Kiev. Afterwards they extended their colonies further north, to the rivers which run into the Ilmen lake; confined the Finns within narrower limits; and laid the foundation of the city of Novogorod. The towns of Smolensk and Tchernikov appear also to have been built by the Sclavonians. Indeed, the dates of these events cannot be properly ascertained. In the ninth century, the Scandinavians, who were the Danes, Normans or Norwegians, and Swedes, emigrated from the north, and, crossing the Baltic, came to seek for habitations in Russia. They first subdued the Courlanders, Livonians, and Esthonians; and extending their conquests still further, they exacted tribute from the Novogrodians, and settled kings over them; and traded as far as Kiev, and even to Greece. They were called *Wareger*, which name, according to M. Muller, signifies "seafaring people," and probably was first used by the Scandinavians, but afterwards by the Russians; and with people unacquainted with the northern language, this word came, in time, to pass for a proper name. Not to mention other etymologies, it may possibly be derived from the old northern word War, that is war, and may be rendered "warlike." To these Warregers the name of Russes or Russians owes its origin. The three Warregerian brothers, Rurik, Sineus, and Truwor, were elected as chiefs by the Russians. After the decease of the two last, Rurik became the sole sovereign. In the year of Christ 955, Olga, who was the consort of his son and successor, the great duke Igor, was baptized at Constantinople; and, in the year 988, Wladimir, Rurik's grandson, likewise embraced the Christian religion. The city of Kiev was the residence of all the great dukes or sovereigns of Russia till the 12th century. Jaroslaw, who died in the year 1055, divided his dominions among his twelve sons. The Tartars, who lived on plunder, took advantage of the weakness of the brothers on this partition of the Russian dominions, by making frequent inroads into their territories. These incursions, with the establishment of the knights of the Teutonic order in Livonia, brought the great duchy of Russia to the brink of ruin in the beginning of the 13th century. When the state was in the utmost danger of being lost, the brave and wise prince Alexander exerted himself against his enemies; and by his courage and conduct, partly in his father's lifetime, when he was hereditary prince, and partly after his death, while he was great duke, rescued his country from the calamities under which it groaned. In the year 1241. he obtained a signal victory, near the river Neva, over the Swedes and the Teutonic knights of Livonia, and on that account he was honoured with the surname of Nevski. In 1245, he succeeded his father, Jaroslaw, as great duke; and, after a glorious and happy reign, ended his days in 1263. In the 14th century, Russia fell almost entirely under the dominion of the Tartars and Poles, and about the close of the 15th century, Iwan Basilowitz I. shook off the Tartarian yoke, subdued the petty princes of Russia, and laid the first foundation of the present grandeur of the Russian monarchy. Peter I. whose name will be remembered with honour to the latest posterity, added Livonia, Ingermania, and a part of Carelia, to his dominions by the peace of Nystadt. He also brought about a wonderful change in the manners of his subjects, built the city of Petersburgh, put trade and manufactures on an excellent footing, established the right of the Russian czar to nominate a successor, took upon him the title of emperor, and by his actions justly acquired the surname of Great. He finished his glorious course in the year 1725. On the 5th of February, 1722, the emperor, Peter the Great, published an ordinance, by which the succession was entirely to depend on the will and pleasure of the reigning sovereign; and this is the only written fundamental law with regard to the succession in Russia. The power of the Russian emperor is absolute and unlimited. The antient sovereigns of Russia styled themselves great dukes, and afterwards were called czars; but Peter I. assumed the title of emperor, which was offered him by his subjects, and is now acknowledged by all Europe.

Black Russia, a province of Lithuania, which included the palatinate of Novogrodek.

Red Russia, called also *Little* Russia, This country was formerly governed by its own dukes, but on the decease of the last duke, which happened in 1340, king Casimir, by right of consanguinity, laid claim to Red Russia, and rendered it a province of Poland. King Louis divided the territories of Red Russia among the Hungarians; however, they were again driven out of them in 1396; and though Uladislaus Jagelly, by a treaty of alliance concluded with Sigismund, king of Hungary, by an oversight, relinquished all right and claim to Russia and Podolia, the country still remained under the dominion of Poland, till the year 1772, when it became subject to Austria, under the title of the *New Kingdom of Gallicia*. Little Russia included the palatinates of Chelm, Belz, and Lemberg.

RUST, the flower or calx of any metal, procured by corroding and dissolving its superficial parts by some menstruum. Water is the great instrument or agent in producing rust: and hence oils, and other fatty bodies, secure metals from rust; water being no menstruum for oil, and therefore not able to make

its way through it. All metals except gold are liable to rust; and even this also if exposed to the fumes of sea-salt. For remedies against rust, see Iron, *par. ult.*

RUSTIC, in architecture, implies a manner of building in imitation of nature, rather than according to the rules of art. See Architecture.

Rustic *Gods*, *dii rustici*, in antiquity, were the gods of the country, or those who presided over agriculture, &c. Varro invokes the 12 *dii consentes*, as the principal among the rustic gods; viz. Jupiter, Tellus, the Sun, Moon, Ceres, Bacchus, Rubigus, Flora, Minerva, Venus, Lympha, and Good Luck. Besides these 12 arch-rustic gods, there were an infinity of lesser ones; as Pales, Vertumnus, Tutelina, Fulgor, Sterculius, Mellona, Jugatinus, Collinus, Vallonia, Terminus, Sylvanus, and Priapus. Struvius adds the Satyrs, Fauns, Sileni, Nymphs, and even Tritons; and gives the empire over all the rustic gods to Pan.

Rustic *Order*, that decorated with rustic quoins, rustic work, &c.

Rustic *Work*, is where the stones in the face, &c. of a building, instead of being smooth, are hatched, or picked with the point of a hammer.

RUSTRE, in heraldry, a bearing of a diamond shape, pierced through in the middle with a round hole. See Heraldry.

RUT, in hunting, the venery or copulation of deer.

RUTA, rue: A genus of the monogynia order, belonging to the decandria class of plants; and in the natural method ranking under the 26th order, *Multisiliquæ*. The calyx is quinquepartite; the petals concave; the receptacle surrounded with 10 melliferous pores; the capsule is lobed. In some flowers, a fifth part of the number is excluded. There are several species; of which the most remarkable is the hortensis, or common broad-leaved garden rue, which has been long cultivated for medicinal use. This rises with a shrubby stalk to the height of five or six feet, sending out branches on every side, garnished with decompounded leaves, whose small lobes are wedge-shaped, of a gray colour, and have a strong odour. The flowers are produced at the end of the branches in bunches almost in the form of umbels: they are composed of four yellow concave petals which are cut on their edges, and eight yellow stamina which are longer than the petals, terminated by roundish summits. The germen becomes a roundish capsule, with four lobes punched full of holes containing rough black seeds.

Rue has a strong ungrateful smell, and a bitterish penetrating taste: the leaves, when full of vigour, are extremely acrid, insomuch as to inflame and blister the skin, if much handled.

The writers on the materia medica in general have entertained a very high opinion of the virtues of this plant. Boerhaave is full of its praises; particularly of the essential oil, and the distilled water cohobated or re-distilled several times from fresh parcels of the herb. After extravagantly commending other waters prepared in this manner, he adds, with regard to that of rue, that the greatest commendations he can bestow upon it fall short of its merit: "What medicine (says he) can be more efficacious for promoting sweat and perspiration, for the cure of the hysteric passion and of epilepsies?" Whatever service rue may be of in the last case, it undoubtedly has its use in the others: the cohobated water, however, is not the most efficacious preparation of it. An extract made by rectified spirit contains in a small compass the whole virtues of the rue; this menstruum taking up by infusion all the pungency and flavour of the plant, and elevating nothing in distillation. With water, its peculiar flavour and warmth arise; the bitterness, and a considerable share of the pungency, remaining behind.

Ruta *Baga*, or Swedish turnip. See Husbandry.

Book of RUTH, a canonical book of the Old Testament; being a kind of appendix to the book of Judges, and an introduction to those of Samuel; and having its title from the person whose story is here principally related. In this story are observable the antient rights of kindred and redemption; and the manner of buying the inheritance of the deceased, with other particulars of great note and antiquity. The canonicalness of this book was never disputed; but the learned are not agreed about the epocha of the history it relates. Ruth the Moabitess is found in the genealogy of our Saviour. Matth. i. 5.

RUTILUS. See Cyprinus.

RUTHERGLEN, or by contraction Ruglen, the head borough of the netherward of Lanarkshire in Scotland, is situated in N. lat. 55° 51′, and W. lon. 4° 13′; about two miles south-east of Glasgow, and nine west of Hamilton. Few towns in Scotland can lay greater claim to antiquity than Rutherglen. In conjunction with Glasgow, Renfrew, and Dumbarton, it sends a member to the British parliament.

RUTLANDSHIRE, is the least county in England, it being but 40 miles in circumference; in which are two towns, 48 parishes, and 3263 houses. However, for quality it may be compared with any other county; the air being good, and the soil fertile both for tillage and pastures; and it not only affords plenty of corn, but feeds a great number of horned cattle and sheep. It is well watered with brooks and rivulets; and the principal rivers are the Weland and the Wash. It is bounded on the east by Lincolnshire; on the south by the river Weland, which parts it from Northamptonshire; and on the west and north by Leicestershire. It has only two market-towns; namely, Okeham, where the assizes and sessions are held, and Uppingham.

RUYSCH (Frederic), one of the most eminent anatomists of which Holland can boast, was born at the Hague in 1638. After making great progress at home, he repaired to Leyden, and there prosecuted the study of anatomy and botany. He studied next at Franeker, where he obtained the degree of doctor of physic. He then returned to the Hague; and marrying in 1661, dedicated his whole time to the study of his profession. In 1665 he published a treatise, entitled *Dilucidatio valvularum de variis lymphaticis et lacteis*; which raised his reputation so high, that he was chosen professor of anatomy at Amsterdam. This honour he accepted with the more pleasure, because his situation at Amsterdam would give him easy access to every requisite help for cultivating anatomy and natural history. After he settled in Amsterdam, he was perpetually engaged in dissecting and in examining with the most inquisitive eye the various parts of the human body. He improved the science of anatomy by new discoveries; in particular, he found out a way to preserve dead bodies many years from putrefaction. His anatomical collection was curious and valuable. He had a series of fœtuses of all sizes, from the length of the little finger to that of a new-born infant. He had also bodies of full grown persons of all ages, and a vast number of animals almost of every species on the globe, besides a great many other natural curiosities. Peter the Great of Russia, in his tour through Holland in the year 1698, visited Ruysch, and was so charmed with his conversation, that he passed whole days with him; and when the hour of departure came, he left him with regret. He set so high a value on Ruysch's cabinet of curiosities, that, when he returned to Holland in 1717, he purchased it for 30,000 florins, and sent it to Petersburg.

In 1685 he was made professor of medicine, an office which he discharged with great ability. In 1728 he got his thigh-bone broken by a fall in his chamber. The year before this misfortune happened he had been deprived of his son Henry, a youth of talents, and well skilled in anatomy and botany. He had been created a doctor of physic, and was supposed to have assisted his father in his discoveries and publications. Ruysch's family now consisted only of his youngest daughter. This lady had been early inspired with a passion for anatomy, the favourite

ſcience of her father and brother, and had ſtudied it with ſucceſs. She was therefore well qualified to aſſiſt her father in forming a ſecond collection of curioſities in natural hiſtory and anatomy, which he began to make after the emperor of Ruſſia had purchaſed the firſt. Ruyſch is ſaid to have been of ſo healthy a conſtitution, that though he lived to the age of 93, yet during that long period he did not labour under the infirmities of diſeaſe above a month. From the time he broke his thigh he was indeed diſabled from walking without a ſupport; yet he retained his vigour both of mind and body without any ſenſible alteration, till in 1731 his ſtrength at once deſerted him. He died on the 22d of February the ſame year. His anatomical works are printed in 4 vols. 4to.

The ſtyle of his writings is ſimple and conciſe, but ſometimes inaccurate. Inſtruction, and not oſtentation, ſeems to be his only aim. In anatomy he undoubtedly made many diſcoveries; but from not being ſufficiently converſant in the writings of other anatomiſts, he publiſhed as diſcoveries what had been known before. The academy of ſciences at Paris in 1727 elected him a member in place of Sir Iſaac Newton, who was lately deceaſed. He was alſo a member of the Royal Society of London.

RUYTER (Michael Adrian), a diſtinguiſhed naval officer, was born at Fleſſingue, a town of Zealand, in 1607. He entered on a ſea-faring life when he was only 11 years old, and was firſt a cabin-boy. While he advanced ſucceſſively to the rank of mate, maſter, and captain, he acquitted himſelf with ability and honour in all theſe employments. He repulſed the Iriſh, who attempted to take Dublin out of the hands of the Engliſh. He made eight voyages to the Weſt Indies, and ten to Brazil. He was then promoted to the rank of rear-admiral, and ſent to aſſiſt the Portugueſe againſt the Spaniards. When the enemy came in ſight, he advanced boldly to meet them, and gave ſuch unqueſtionable proofs of valour as drew from the Portugueſe monarch the warmeſt applauſe. His gallantry was ſtill more conſpicuous before Salee, a town of Barbary. With one ſingle veſſel he ſailed through the roads of that place in defiance of five Algerine corſairs who came to attack him.

In 1653 a ſquadron of ſeventy veſſels was diſpatched againſt the Engliſh, under the command of Van Tromp. Ruyter, who accompanied the admiral in this expedition, ſeconded him with great ſkill and bravery in the three battles which the Engliſh ſo glorioufly won. He was afterwards ſtationed in the Mediterranean, where he captured ſeveral Turkiſh veſſels. In 1659 he received a commiſſion to join the king of Denmark in his war with the Swedes; and he not only maintained his former reputation, but even raiſed it higher. As the reward of his ſervices, the king of Denmark ennobled him, and gave him a penſion. In 1661 he ran aſhore a veſſel belonging to Tunis, releaſed 40 Chriſtian ſlaves, made a treaty with the Tuniſians, and reduced the Algerine corſairs to ſubmiſſion. His country, as a teſtimony of her gratitude for ſuch illuſtrious ſervices, raiſed him to the rank of vice-admiral and commander in chief. To the latter dignity, the higheſt that could be conferred upon him, he was well entitled by the ſignal victory which he obtained over the combined fleets of France and Spain. This battle was fought in 1672 about the time of the conqueſt of Holland. The fight was maintained between the Engliſh and Dutch with the obſtinate bravery of nations which were accuſtomed to diſpute the empire of the main. Ruyter having thus made himſelf maſter of the ſea, conducted a fleet of Indiamen ſafely into the Texel; thus defending and enriching his country, while it was become the prey of hoſtile invaders. The next year he had three engagements with the fleets of France and England, in which, if poſſible, his bravery was ſtill more diſtinguiſhed than ever. D'Eſtrées the French vice-admiral wrote to Colbert in theſe words: "I would purchaſe with my life the glory of De Ruyter." But he did not long enjoy the triumphs which he had ſo honourably won. In an engagement with the French fleet off the coaſt of Sicily, he loſt the day, and received a mortal wound, which put an end to his life in a few days. His corpſe was carried to Amſterdam, and a magnificent monument was there erected by the command of the States-general. The Spaniſh council beſtowed on him the title of duke, and tranſmitted a patent inveſting him with that dignity; but he died before it arrived.

When ſome perſon was congratulating Louis XIV. upon De Ruyter's death, telling him he had now got rid of one dangerous enemy; he replied, "Every one muſt be ſorry at the death of ſo great a man."

RYE, in botany. See Secale.

Rye-*Graſs*. See Husbandry.

Rye, a town in Suſſex, with two markets on Wedneſdays and Saturdays, but no fair. It is one of the cinque-ports; is a handſome well-built place, governed by a mayor and jurats, and ſends two members to parliament. It has a church built with ſtone, and a town-hall; and conſiſts of three ſtreets, paved with ſtone. One ſide of the town has been walled in, and the other is guarded by the ſea. It has two gates, and is a place of conſiderable trade in the ſhipping way. From thence large quantities of corn are exported, and many of the inhabitants are fiſhermen. It is 34 miles ſouth-eaſt by ſouth of Tunbridge, and 64 on the ſame point from London. The mouth of the harbour is of late choaked up with ſand; but, if well opened, it would be a good ſtation for privateers that cruize againſt the French. E. lon. 0. 50. N. lat. 51. 0.

RYMER (Thomas), Eſq. the author of the *Fœdera*, was born in the north of England, and educated at the grammar-ſchool of Northallerton. He was admitted a ſcholar at Cambridge, then became a member of Gray's Inn, and at length was appointed hiſtoriographer to King William in place of Mr. Shadwell. He wrote A View of the Tragedies of the laſt Age, and afterwards publiſhed a tragedy named *Edgar*. For a critic he was certainly not well qualified, for he wanted candour; nor is his judgment much to be relied on, who could condemn Shakeſpeare with ſuch rigid ſeverity. His tragedy will ſhow, that his talents for poetry were by no means equal to thoſe whoſe poems he has publicly cenſured. But though he has no title to the appellation of *poet* or *critic*, as an antiquarian and hiſtorian his memory will long be preſerved. His *Fœdera*, which is a collection of all the public tranſactions, treaties, &c. of the kings of England with foreign princes, is eſteemed one of our moſt authentic and valuable records, and is oftener referred to by the beſt Engliſh hiſtorians than perhaps any other book in the language. It was publiſhed at London in the beginning of the preſent century in 17 volumes folio. Three volumes more were added by Sanderſon after Rymer's death. The whole were reprinted at the Hague in 10 vols. in 1739. They were abridged by Rapin in French, and inſerted in Le Clerc's *Bibliotheque*, a tranſlation of which was made by Stephen Whatley, and printed in 4 vols. 8vo. 1731.

Rymer died 14th December 1713, and was buried in the pariſh church of St. Clement's Danes. Some ſpecimens of his poetry are preſerved in the firſt volume of Mr. Nicholls's Select Collection of Miſcellaneous Poems, 1780.

RYNCHOPS, in ornithology, a genus belonging to the order of anſeres. The bill is ſtraight: and the ſuperior mandible much ſhorter than the inferior, which is truncated at the point. The ſpecies are two, viz. the figra and fulva, both natives of America.

RYOTS, in the policy of Hindoſtan, the modern name by which the renters of land are diſtinguiſhed. They hold their poſſeſſions by a leaſe, which may be conſidered as perpetual, and at a rate fixed by antient ſurveys and valuations. This arrangement has been ſo long eſtabliſhed, and accords ſo well with

the ideas of the natives, concerning the diſtinction of caſts, and the functions allotted to each, that it has been invariably maintained in all the provinces ſubject either to Mahometans or Europeans; and to both it ſerves as the baſis on which their whole ſyſtem of finance is founded. Reſpecting the preciſe mode, however, in which the ryots of Hindoſtan held their poſſeſſions, there is much diverſity of opinion; the chief of which are very impartially delineated in note iv. to the Appendix of Robertſon's Hiſtorical Diſquiſition, &c. concerning India, p. 345. to which we refer ſuch of our readers as are intereſted in this ſubject of finance.

RYSCHIA, in botany: a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking with thoſe that are doubtful. The calyx is pentaphyllous; the corolla is pentapetalous; and the apices turned back, about three times the length of the calyx; the filaments are five, awl-ſhaped, and ſhorter than the petals. The ſeed-veſſel is quadrilocular, and contains many ſeeds. Of this there are two ſpecies, viz. the *Clauſifolia* and *Souroubea*.

RYSWICK, a large village in Holland, ſeated between the Hague and Delft, where the prince of Orange has a palace, which ſtands about a quarter of a mile further. It is a very noble ſtructure, all of hewn ſtone, of great extent in front, but perhaps not proportionably high. It is adorned with a marble ſtair-caſe, marble floors, and a magnificent terrace. There is a good proſpect of it from the canal between Delft and the Hague. This place is remarkable for a treaty concluded here in 1697 between England, Germany, Holland, France, and Spain. It is ſituated in E. lon. 4. 20. N. lat. 52. 8.

S.

S, ſ, or s, the 18th letter and 14th conſonant of our alphabet; the ſound of which is formed by driving the breath through a narrow paſſage between the palate and the tongue elevated near it, together with a motion of the lower jaw and teeth towards the upper, the lips being a little way open; with ſuch a configuration, of every part of the mouth and larynx, as renders the voice ſomewhat ſibilous and hiſſing. Its ſound, however, varies, being ſtrong in ſome words, as *this*, *thus*, &c. and ſoft in words which have a final *e*, as *muſe*, *wiſe*, &c. It is generally doubled at the end of words, whereby they become hard and harſh, as in *kiſs*, *loſs*, &c. In ſome words it is ſilent, as *iſle*, *iſland*, *viſcount*, &c. In writing or printing, the long character *ſ* is generally uſed at the begining and middle of words, but the ſhort *s* at the end.

In abbreviations, S ſtands for *ſocietas* or *ſocius*; as, R. S. S. for *regiæ ſocietatis ſocius*, i. e. fellow of the royal ſociety. In medicinal preſcriptions, S. A. ſignifies *ſecundum artem*, i. e. according to the rules of art: And in the notes of the ancients, S ſtands for *Sextus*; S. P. for *Spurius*; S. C. for *ſenatus conſultum*; S. P. Q. R. for *ſenatus populuſque Romanus*; S. S. S. for *ſtratum ſuper ſtratum*, i. e. one layer above another alternately; S. V. B. E. E. Q. V. for *ſi vales bene eſt, ego quoque valeo*, a form uſed in Cicero's time, in the beginning of letters. Uſed as a numeral, S anciently denoted ſeven; in the Italian muſic, S ſignifies *ſolo*: And in books of navigation, S. ſtands for ſouth; S. E. for ſouth-eaſt; S. W. for ſouth-weſt; S. S. E. for ſouth ſouth-eaſt; S. S. W. for ſouth ſouth-weſt, &c.

SAAVEDRA (Michael de Cervantes), a celebrated Spaniſh writer, and the inimitable author of Don Quixote, was born at Madrid in the year 1549. From his infancy he was fond of books; but he applied himſelf wholly to books of entertainment, ſuch as novels and poetry of all kinds, eſpecially Spaniſh and Italian authors. From Spain he went to Italy, either to ſerve cardinal Aquaviva, to whom he was chamberlain at Rome; or elſe to follow the profeſſion of a ſoldier, as he did ſome years under the victorious banners of Marco Antonio Colonna. He was preſent at the battle of Lepanto, fought in the year 1571; in which he either loſt his left hand by the ſhot of a harquebus, or had it ſo maimed that he loſt the uſe of it. After this he was taken by the Moors, and carried to Algiers, where he continued a captive five years and a half. Then he returned to Spain, and applied himſelf to the writing of comedies and tragedies; and he compoſed ſeveral, all of which were well received by the public, and acted with great applauſe. In the year 1584 he publiſhed his Galatea, a novel in ſix books; which he preſented to Aſcanio Colonna, a man of high rank in the church, as the firſt fruits of his wit. But the work which has done him the greateſt honour, and will immortalize his name, is the hiſtory of Don Quixote; the firſt part of which was printed at Madrid in the year 1605. This is a ſatire upon books of knight errantry; and the principal, if not the ſole, end of it was to deſtroy the reputation of theſe books, which had ſo infatuated the greater part of mankind, eſpecially thoſe of the Spaniſh nation. This work was univerſally read; and the moſt eminent painters, tapeſtry-workers, engravers, and ſculptors, have been employed in repreſenting the hiſtory of Don Quixote. Cervantes, even in his lifetime, obtained the glory of having his work receive a royal approbation. As king Philip III. was ſtanding in a balcony of his palace at Madrid, and viewing the country, he obſerved a ſtudent on the banks of the river Manzanares reading in a book, and from time to time breaking off and beating his forehead with extraordinary tokens of pleaſure and delight: upon which the king ſaid to thoſe about him, "That ſcholar is either mad, or reading Don Quixote:" the latter of which proved to be the caſe. But *virtus laudatur et alget*: notwithſtanding the vaſt applauſe his book everywhere met with, he had not intereſt enough to procure a ſmall penſion, but had much ado to keep himſelf from ſtarving. In the year 1615, he publiſhed a ſecond part; to which he was partly moved by the preſumption of ſome ſcribbler, who had publiſhed a continuation of this work the year before. He wrote alſo ſeveral novels; and among the reſt, "The Troubles of Perſiles and Sigiſmunda." He had employed many years in writing this novel, and finiſhed it but juſt before his death; for he did not live to ſee it publiſhed. His ſickneſs was of ſuch a nature, that he himſelf was able to be, and actually was, his own hiſtorian. At the end of the preface to the Troubles of Perſiles and Sigiſmunda, he repreſents himſelf on horſeback upon the road, and a ſtudent, who had overtaken him, engaged in converſation with him: "And happening to talk of my illneſs (ſays he), the ſtudent ſoon let me know my doom, by ſaying it was a dropſy I had got; the thirſt attending which all the water of the ocean, though it were not ſalt, would not ſuffice to quench. Therefore, Señor Cervantes, ſays he, you muſt drink nothing at all, but do not forget to eat; for this alone will recover you without any other phyſic. I have been told the ſame by others, anſwered I; but I can no more forbear tippling, than if I were born to do nothing elſe. My life is drawing to an end; and from the daily journal of my pulſe, I ſhall have finiſhed my courſe by next Sunday at the furtheſt.—But adieu, my merry friends all, for I am going to die; and I hope to ſee you ere long in the other world, as happy as heart can wiſh." His dropſy increaſed, and at laſt proved fatal to him; yet he continued to ſay and to write bons mots. He received the laſt ſacrament on the 18th of April 1616; yet the day after wrote a Dedication of the Troubles of

Perſiles and Sigiſmunda to the condé de Lemos. The particular day of his death is not known.

SABA, a fertile iſland of W. Indies, 12 miles in circumference, inhabited by a few Dutch families from the iſland of St. Euſtatia, almoſt all ſhoemakers. It lies a little to the W. of St. Chriſtopher. W. lon. 63. 17. N. lat. 17. 39.

SABÆANS. See SABIANS.

SABAZIA, in Greek antiquity, were nocturnal myſteries in honour of Jupiter Sabazius. All the initiated had a golden ſerpent put in at their breaſts, and taken out at the lower part of their garments, in memory of Jupiter's raviſhing Proſerpina in the form of a ſerpent. There were alſo other feaſts and ſacrifices diſtinguiſhed by this appellation in honour of Mithras, the deity of the Perſians, and of Bacchus, who was thus denominated by the Sabians, a people of Thrace.

SABBATARIANS, or SEVENTH DAY BAPTISTS, a ſect of anabaptiſts; thus called, becauſe they obſerved the Jewiſh or Saturday-Sabbath, from a perſuaſion that it was never abrogated in the New Teſtament by the inſtitution of any other.

SABBATH, in the Hebrew language, ſignifies *reſt*. The ſeventh day was denominated the *Sabbath*, or *day of reſt*, becauſe that in it God had reſted from all his works which he created and made. From that time the ſeventh day ſeems to have been ſet apart for religious ſervices; and, in conſequence of a particular injunction, was afterwards obſerved by the Hebrews as a holyday. They were commanded to ſet it apart for ſacred purpoſes in honour of the creation, and likewiſe in memorial of their own redemption from Egyptian bondage.

The importance of the inſtitution may be gathered from the different laws reſpecting it. When the ten commandments were publiſhed from Mount Sinai in tremendous pomp, the law of the Sabbath held a place in what is commonly called the firſt table, and by ſubſequent ſtatutes the violation of it was to be puniſhed with death. Six days were allowed for the uſe and ſervice of man; but the ſeventh day God reſerved to himſelf, and appointed it to be obſerved as a ſtated time for holy offices, and to be ſpent in the duties of piety and devotion. On this day the miniſters of the temple entered upon their week; and thoſe who had attended on the temple ſervice the preceding week went out at the ſame time. New loaves of ſhew-bread were placed upon the golden table, and the old ones taken away. Two lambs for a burnt-offering, with a certain proportion of fine-flour, mingled with oil, for a bread-offering, and wine for a libation, were offered. The Sabbath, as all other feſtivals, was celebrated from evening to evening. It began at ſix in the evening on Friday, and ended at the ſame time the next day.

Concerning the time at which the Sabbath was firſt inſtituted, different opinions have been held. Some have maintained, that the ſanctification of the ſeventh day, mentioned in Gen. ii. is only there ſpoken of διὰ πρόληψιν or by anticipation; and is to be underſtood of the Sabbath afterwards enjoined the children of Iſrael at the commencement of the Moſaic diſpenſation. But without entering into a particular examination of all the arguments adduced to ſupport this opinion, a few obſervations, it is preſumed, will be ſufficient to ſhow that it reſts on no ſolid foundation.

It cannot eaſily be ſuppoſed that the inſpired penman would have mentioned the ſanctification of the ſeventh day amongſt the primeval tranſactions, if ſuch ſanctification had not taken place until 2500 years afterwards. Writers, ambitious of that artificial elegance which the rules of criticiſm have eſtabliſhed, often bring together in their narratives events which were themſelves far diſtant, for the ſake of giving form to their diſcourſe; but Moſes appears to have deſpiſed all ſuch flimſy refinements, and to have conſtructed his narrative in great conformity to the ſeries of events.

From the accounts we have of the religious ſervice practiſed in the patriarchal age, it appears that, immediately after the Fall, when Adam was reſtored to favour through a Mediator, a ſtated form of public worſhip was inſtituted, which man was required to obſerve, in teſtimony, not only of his dependance on the Creator, but alſo of his *faith* and *hope* in the promiſe made to our firſt parents, and ſeen afar off. Of an inſtitution then ſo grand and important, no circumſtance would be omitted that is neceſſary to preſerve it, or that contributes to render the obſervance of it regular and ſolemn.

That determined times are neceſſary for the due celebration of divine ſervice, cannot be denied. Such is the conſtitution of man, that he muſt have particular times ſet apart for particular ſervices. He is doomed to toil and labour; to earn his bread in the ſweat of his face; and is capable of performing religious duties only in ſuch a manner as is conſiſtent with his ſituation in the world. If ſtated times for religious ſolemnities had not been enjoined, the conſequence would have been, that ſuch ſolemnities would have been altogether neglected; for experience ſhows, that if mankind were left at liberty when and how often they ſhould perform religious offices, theſe offices would not be performed at all. It is the obſervation of holy times that preſerves the practice of holy ſervices; and without the frequent and regular returns of hallowed days, man would quickly forget the duty which he owes to God, and in a ſhort time no veſtige of religion would be found in the world.

Among the ordinances which God vouchſafed his antient people, we find that the pious obſervation of holydays was particularly inſiſted upon; and the ſabbath was enjoined to be kept holy, in the moſt ſolemn manner, and under the ſevereſt penalties. Can it then be ſuppoſed that he would ſuffer mankind, from the creation of the world to the Moſaic era, to remain without an inſtitution ſo expedient in itſelf, and as well fitted to anſwer the end propoſed by it, under the one diſpenſation, as ever it could be under the other? No; we have every imaginable reaſon to conclude, that when religious ſervices were enjoined, religious times were appointed alſo; for the one neceſſarily implies the other.

It is no objection to the early inſtitution of the Sabbath, that there is no mention of it in the hiſtory of the patriarchal age. It would have ſwelled the Bible to a moſt enormous ſize had the ſacred hiſtorian given a particular account of all the tranſactions of thoſe times; beſides, it would have anſwered no end. When Moſes wrote the book of Geneſis, it was unneceſſary to relate minutely tranſactions and inſtitutions already well known by tradition: accordingly we ſee, that his narrative is everywhere very conciſe, and calculated only to preſerve the memory of the moſt important facts. However, if we take a view of the church-ſervice of the patriarchal age, we ſhall find that what is called the *legal* diſpenſation, at leaſt the liturgic part of it, was no new ſyſtem, but a collection of inſtitutions obſerved from the beginning, and republiſhed in form by Moſes. The Scriptures inform us that Cain and Abel offered ſacrifices; and the account which is given of the acceptance of the one, and the rejection of the other, evidently ſhows that ſtated laws reſpecting the ſervice had then taken place. "In proceſs of time," *at the end of the days*, "Abel brought an offering." Here was *prieſt*, *altar*, *matter of ſacrifice*, *appointed time*, *motive to ſacrifice*, *atonement made*, and *accepted*. The diſtinction of animals into clean and unclean before the Flood, and Noah's ſacrifice immediately after his deliverance, without any new direction, is an unanſwerable proof of the ſame truth. It is teſtified of Abraham, by God himſelf, that he kept his *charge*, his *commandments*, his *ſtatutes*, and his *laws*. Theſe expreſſions comprehend the various branches into which the law given at Sinai was divided. They contain the moral precepts, affirmative and negative, the matter of religious ſervice, a body of laws to direct obedience, and to which man was to conform his conduct in every part of duty.

Agreeably to this, we find that ſacrifices were offered, altars and places of worſhip conſecrated, and the *Sabbath* alſo mentioned as a well known ſolemnity, before the promulgation of the law. It is expreſsly taken notice of at the Fall of Manna; and the incidental manner in which it is then mentioned, is a convincing proof that the Iſraelites were no ſtrangers to the inſtitution: for, had it been a *new* one, it muſt have been enjoined in a poſitive and particular manner, and the nature of it muſt have been laid open and explained, otherwiſe the term would have conveyed no meaning.

The diviſion of time into *weeks*, or periods of ſeven days, which obtained ſo early and almoſt univerſally, is a ſtrong indication that *one* day in ſeven was always diſtinguiſhed in a particular manner. *Week*, and *ſeven days*, are in ſcripture language ſynonymous terms. God commanded Noah, *ſeven days* before he entered the ark, to introduce into it all ſorts of living creatures. When the waters of the Flood began to abate, Noah ſent forth a dove, which, finding no reſt for the ſole of her foot, returned to him. After *ſeven days* he ſent forth the dove a ſecond time, and again ſhe returned to the ark. At the expiration of other *ſeven days* he let go the dove a third time: and a *week* is ſpoken of (Gen. xxix.) as a well known ſpace of time.

This ſeptenary diviſion of time has been, from the earlieſt ages, uniformly obſerved over all the eaſtern world. The Iſraelites, Aſſyrians, Egyptians, Indians, Arabians, and Perſians, have always made uſe of a week, conſiſting of ſeven days. Many vain attempts have been made to account for this uniformity; but a practice ſo general and prevalent could never have taken place, had not the ſeptenary diſtribution of time been inſtituted from the beginning, and handed down by tradition.

From the ſame ſource alſo muſt the antient heathens have derived their notions of the ſacredneſs of the ſeventh day. That they had ſuch notions of it is evident from ſeveral paſſages of the Greek poets quoted by Ariſtobulus, a learned Jew, by Clement of Alexandria, and Euſebius.

——— ἑβδομη, ἱερον ἡμαρ. Heſiod.
The ſeventh, the *ſacred* day.

Ἑβδοματη δ᾽επειτα κατηλυθεν, ἱερον ἡμαρ. Homer.
Afterwards came the ſeventh, the *ſacred* day.

Again:
Ἑβδομον ἡμαρ εην, και τω τετελεστο παντα.
On the *ſeventh* day all things were *completed*.

Ἑβδοματη δ᾽ηοι τετελησμενα παντα τετυκται. Linus.
All things were made *perfect* on the *ſeventh* day.

That they likewiſe held the number *ſeven* in high eſtimation has been ſhown by a learned, though ſometimes fanciful, author, with ſuch evidence as to enforce conviction. The Pythagoreans call it the *venerable* number, σεβασμου αξιος, *worthy of veneration*, and held it to be *perfect* and *moſt proper* to religion. They denominated it *fortune*, and alſo ſtyled it *voice*, *ſound*, *muſe*, becauſe, no doubt, *ſeven* diſtinct notes comprehend the whole ſcale of muſic, beyond which neither voice nor inſtrument can go, but muſt return from the ſeventh, and begin again anew. They likewiſe deſigned it τελεσφορος, *leading to the end*. *Seven*, in the Hebrew language, is expreſſed by a word that primarily ſignifies *fulneſs*, *completion*, *ſufficiency*, and is applied to a *week*, or *ſeven days*, becauſe that was the *full* time employed in the work of creation; to the *Sabbath*, becauſe on it all things were completed; and to an oath, becauſe it is ſufficient to put an end to all ſtriſe. This opening of the Hebrew root will enable us to come at the meaning of thoſe expreſſions of the heathens, and alſo let us ſee whence they derived their ideas and modes of ſpeaking, and that the knowledge of the tranſactions at the creation, though much perverted, was never entirely loſt by them.

It has been ſuppoſed by ſome, that the heathens borrowed the notion of the *ſacredneſs* of the ſeventh day from the Jews. But this opinion will not readily be admitted, when it is conſidered that the Jews were held in the greateſt contempt by the ſurrounding nations, who derided them no leſs for their ſabbaths than for their circumciſion. All ſorts of writers ridiculed them on this account. Seneca charged them with ſpending the ſeventh part of their time in ſloth. Tacitus ſaid, that not only the ſeventh day, but alſo the ſeventh year, was unprofitably waſted. Juvenal brings forward the ſame charge; and Perſius upbraided them with their *recutita ſabbata*. Plutarch ſaid that they kept it in honour of Bacchus. Tacitus affirmed, that it was in honour of Saturn; but the moſt abominable aſſertion of all is that of Apion, who ſaid that they obſerved the Sabbath in memory of their being cured on that day of a ſhameful diſeaſe, called by the Egyptians *ſabbo*.

Some perceiving the force of this objection have contended, that time was divided into weeks of ſeven days, that each of the planetary gods, the Sun, Moon, Mercury, Venus, Mars, Jupiter, and Saturn, who were the *Dii majorum gentium*, might have a day appropriated to his ſervice. But if ſuch was the origin of weeks, how came the great and antient goddeſs *Tellus* to be omitted? She was worſhipped by the early idolaters as well as the other planets, and muſt ſurely have been deemed by them as worthy of a particular day ſet apart to her honour as the planet Saturn, who was long undiſcovered, afterwards ſeen but occaſionally, and at all times conſidered as of malign aſpect. (See Remphan.)

Others have ſuppoſed, that as the year was divided into lunar months of ſomething more than 28 days, it was natural to divide the month into quarters from the different phaſes of the moon, which would produce as many weeks of ſeven days. But this ſuppoſition is leſs tenable than the former. The phaſes of the moon are not ſo preciſely marked at the quarters as to attract to them any particular notice, nor are the quarterly appearances of one month commonly like thoſe of another. We cannot, therefore, conceive what ſhould have induced the earlieſt obſervers of the phaſes of the moon to divide the month into four parts rather than into three, or five, or ſeven. Had the antient week conſiſted of 14 days, it might have been inferred, with ſome degree of plauſibility, that its length was regulated by the phaſes of the moon, becauſe the ſhape of that luminary, at the end of the ſecond quarter, is very preciſely marked; but there is nothing which, in the preſent hypotheſis, could have everywhere led mankind to make their weeks conſiſt of ſeven days. This diviſion of time, therefore, can be accounted for only by admitting the primeval inſtitution of the Sabbath, as related by Moſes in the book of Geneſis. That inſtitution was abſolutely neceſſary to preſerve among men a ſenſe of religion; and it was renewed to the Jews at the giving of the law, and its obſervance enforced by the ſevereſt penalties. It was accordingly obſerved by them with more or leſs ſtrictneſs in every period of their commonwealth, and there is none of the inſtitutions of their divine lawgiver which, in their preſent ſtate of diſperſion, they more highly honour. They regard it, indeed, with a ſuperſtitious reverence, call it their *ſpouſe*, their *delight*, and ſpeak of it in the moſt magnificent terms. They have often varied in their opinions of the manner in which it ought to be kept. In the time of the Maccabees, they carried their reſpect for the ſabbath ſo very high, that they would not on that day defend themſelves from the attacks of their enemies. But afterwards they did not ſcruple to ſtand upon their neceſſary defence, although they would do nothing to prevent the enemy from carrying on their operations. When our Saviour was on earth, it was no ſin to looſe a beaſt from the ſtall, and lead him to water; and if he chanced to fall into a ditch, they pulled him out: but now it is abſolutely unlawful to give a creature in that ſituation any other aſſiſtance than that of food; and if they lead an animal to water, they muſt take care not to let the bridle or halter hang looſe, otherwiſe they are tranſgreſſors.

As the law enjoins reſt on that day from all ſervile employments, in order to comply with the injunction, they undertake no kind of work on Friday but ſuch as can eaſily be accompliſhed before evening. In the afternoon they put into proper places the meat that they have prepared to eat the day following. They afterwards ſet out a table covered with a clean cloth, and place bread upon it, which they alſo cover with another cloth; and during the ſabbath the table is never moved out of its place. About an hour before ſunſet, the women light the ſabbath lamps, which hang in the places where they eat. They then ſtretch forth their hands to the light, and pronounce the following benediction: "Bleſſed be thou, O God, king of the world, who haſt enjoined us, that are ſanctified by thy commandments, to light the ſabbath lamp." Theſe lamps are two or more in number, according to the ſize of the chamber in which they are ſuſpended, and continue to burn during the greateſt part of the night. In order to begin the ſabbath well, they waſh their hands and faces, trim their hair, and pare their nails, beginning at the fourth finger, then going to the ſecond, then the fifth, then the third, and ending with the thumb. If a Jew caſts the parings of his nails to the ground, he is *raſcah*, that is, a *wicked* man; for Satan has great power over thoſe parings of nails; and it ſeems they are of great uſe to the wizards, who know how to employ them in their enchantments. If he buries them in the earth, he is *tzedic*, that is, a *juſt* man: if he burns them in the fire, he is *chaſid*, that is, worthy of honour, a holy man. When they have performed theſe preparatory ceremonies, they repair to the ſynagogue, and enter upon their devotions. As ſoon as prayers begin, the departed ſouls ſpring out of the purgatorial flames, and have liberty to cool themſelves in water while the ſabbath laſts; for which reaſon the Jews prolong the continuance of it as much as they can; and the Rabbins have ſtrictly commanded them not to exhauſt all the water on the ſabbath day, leſt thoſe miſerable ſouls ſhould by that means be deprived of the refreſhing element. When they have ended their prayers, they return home, and ſalute one another, by wiſhing a good ſabbath. They then ſit down to table. The maſter of the family takes a cup full of wine, and, lifting up his hand, ſays, "Bleſſed be thou, O God our Lord, king of the world, who haſt created the fruit of the vine.—Bleſſed be thou, O God our Lord, king of the world, who haſt ſanctified us by thy commandments, and given us thy holy ſabbath; and of thy good will and pleaſure haſt left it to us an inheritance, the memorial of thy works of creation. For it is the beginning of the congregation of ſaints, and the memorial of the coming out of Egypt. And thou haſt alſo choſen us from all other people, and ſanctified us, and with love and pleaſure haſt left thy holy ſabbath an inheritance. Bleſſed be thou, O God, who ſanctifieſt the ſabbath." After this benediction is ended, he drinks, and gives the cup to all that are preſent. He then removes the cloth, and, taking bread, ſays, "Bleſſed be thou, O God our Lord, king of the world, who bringeſt bread out of the earth." Then he breaks off a bit, and eats, and alſo gives a piece of it to every one of the company.

On the morning of the ſabbath the Jews do not riſe ſo early as they do at other times, thinking, the greater pleaſure they take on that day, the more devoutly they keep it. When they come into the ſynagogue, they pray as uſual, only the devotions are ſomewhat longer, being intermingled with pſalmody, in honour of the ſabbath. The Pentateuch is then produced, and ſeven ſections of it are read in order by ſeven perſons choſen for the purpoſe. Several leſſons are likewiſe read out of the prophets, which have ſome relation to what was read out of the law. After morning prayers they return to their houſes, and eat the ſecond ſabbath-meal, ſhowing every token of joy, in honour of the feſtival. But if one has ſeen any thing ominous in his ſleep; if he has dreamed that he burnt the book of the law; that a beam has come out of the walls of his houſe; that his teeth have fallen out;—then he faſts until very late at night, for all ſuch dreams are bad ones. In the afternoon they go again to the ſynagogue, and perform the evening ſervice, adding to the ordinary prayers ſome leſſons that reſpect the ſabbath. When the devotional duties are ended, they return home, and light a candle reſembling a torch, and again ſit down to eat. They remain eating until near ſix, and then the maſter of the family takes a cup, and pouring wine into it rehearſes ſome benedictions; after which he pours a little of the wine upon the ground, and ſays, "Bleſſed be thou O Lord, King of the world, who haſt created the fruit of the vine." Then holding the cup in his left hand, with the right he takes a box of ſweet ſpices, and ſays, "Bleſſed be thou, O Lord God, who haſt created various kinds of ſweet ſpices." He ſmells the ſpices, and holds them out to the reſt, that they may do the ſame. He then takes the cup in his right hand, and going to the candle views the left very narrowly, and pronounces a bleſſing. With the cup in the left hand, he examines the right in the ſame manner. Again, holding the cup in his right hand, he rehearſes another benediction, and at the ſame time pours ſome of the wine on the ground. After this he drinks a little of it, and then hands it about to the reſt of the family, who finiſh what remains. In this manner the ſabbath is ended by the Jews, and they may return to their ordinary employments. Thoſe who meet pay their compliments, by wiſhing one another a happy week.

The Rabbins have reckoned up nine-and-thirty primary prohibitions, which ought to be obſerved on the ſabbatic feſtival; but their circumſtances and dependents, which are alſo obligatory, are almoſt innumerable. The 39 articles are, Not to till the ground; to ſow; to reap; to make hay; to bind up ſheaves of corn; to threſh; to winnow; to grind; to ſift meal; to knead the dough; to bake; to ſhear; to whiten; to comb or card wool; to ſpin; to twine or twiſt; to warp; to dye; to tie; to untie; to ſew; to tear or pull in pieces; to build; to pull down; to beat with a hammer, to hunt or fiſh; to kill a beaſt; to flay it; to dreſs it; to ſcrape the ſkin; to tan it; to cut leather; to write; to ſcratch out; to rule paper for writing; to kindle a fire; to extinguiſh it; to carry a thing from place to place; to expoſe any thing to ſale. Theſe are the primary prohibitions, and each of theſe has its proper conſequences, which amount to an incredible number; and the Jews themſelves ſay, that if they could keep but two ſabbaths as they ought, they would ſoon be delivered out of all their troubles.

If a Jew on a journey is overtaken by the ſabbath in a wood, or on the highway, no matter where, nor under what circumſtances, he ſits down; he will not ſtir out of the ſpot. If he falls down in the dirt, he lies there; he will not riſe up. If he ſhould tumble into a privy, he would reſt there; he would not be taken out*. If he ſees a flea ſkipping upon his clothes, he muſt not catch it. If it bites him, he may only remove it with his hand; he muſt not kill it; but a louſe meets with no ſuch indulgence, for it may be deſtroyed. He muſt not wipe his hands with a towel or cloth, but he may do it very lawfully with a cow's tail. A freſh wound muſt not be bound up on the ſabbath-day; a plaſter that had been formerly applied to a ſore may remain on it; but if it falls off, it muſt not be put on anew. The lame

* This, it ſeems, was once really the caſe. A Jew of Magdeburg fell into a privy on a Saturday. He might have been taken out; but he told thoſe who offered him their aſſiſtance to give themſelves no trouble, for there he was determined to keep holy the ſabbath day. The biſhop, when he heard of it, reſolved that he ſhould ſanctify the next day alſo in the ſame place; and ſo, betwixt them, the poor Jew loſt his life.

may use a staff, but the blind must not. These particulars, and a great many more of the same nature, are observed by the Jews in the strictest manner. But if any one wishes to know more of the practice of that devoted race, he may consult Buxtorf's *Judaica Synagoga*, chap. x. xi. where he will find a complete detail of their customs and ceremonies on the sabbath; and likewise see the primary prohibitions branched out into their respective circumstances.

As the seventh day was observed by the Jewish church, in memory of the rest of God after the works of creation, and their own deliverance from Pharaoh's tyranny; so the first day of the week has always been observed by the Christian church, in memory of the resurrection of Jesus Christ, by which he completed the work of man's redemption on earth, and rescued him from the dominion of him who has the power of death.

This day was denominated by the primitive Christians the *Lord's day*. It was also sometimes called *Sunday;* which was the name given to it by the heathens, who dedicated it to the sun. And indeed, although it was originally called *Sunday* by the heathens, yet it may very properly retain that name among Christians, because it is dedicated to the honour of "The true light," which lighteth every man that cometh into the world, of Him who is styled by the prophet "The Sun of righteousness," and who on this day arose from the dead. But although it was, in the primitive times, indifferently called the *Lord's day* or *Sunday*, yet it was never denominated the *sabbath*; a name constantly appropriated to Saturday, or the *seventh* day, both by sacred and ecclesiastical writers.

Of the change from the *seventh* to the *first* day of the week, or even of the institution of the *Lord's day* festival, there is no account in the New Testament. However, it may be fairly inferred from it, that the first day of the week was, in the apostolic age, a stated time for public worship. On this day the apostles were assembled, when the Holy Ghost came down so visibly upon them to qualify them for the conversion of the world. On this day we find St. Paul preaching at Troas, when the disciples came to break bread: and the directions which the same apostle gives to the Corinthians concerning their contributions for the relief of their suffering brethren, plainly allude to their religious assemblies on the first day of the week.

Thus it would appear from several passages in the New Testament, that the religious observation of the first day of the week is of apostolical appointment; and may indeed be very reasonably supposed to be among those directions and instructions which our blessed Lord himself gave to his disciples, during the 40 days between his resurrection and ascension, wherein he conversed with them, and spoke of the things pertaining to the kingdom of God. Still, however, it must be owned that those passages, although the plainest that occur, are not sufficient to prove the apostolical institution of the Lord's day, or even the actual observation of it. In order, therefore, to place the matter beyond all controversy, recourse must be had to ecclesiastical testimony.

From the consentient evidence and uniform practice of the primitive church, and also from the attestation of Pliny, a heathen of no mean figure both in learning and power, we find that the first day of the week was observed in the earliest ages as a holyday or festival, in honour of the resurrection of Christ. Now there are but two sources whence the custom could possibly have arisen. It must have been instituted either by *human* or *divine* authority: by human authority it was not instituted; for there was no general council in those early times, and without the decree of a general council it was impossible that any ecclesiastical institution could have been universally established at once. It remains, therefore, that it must have been instituted by divine authority: and that it really was so, will further appear from the following considerations. It is certain that the apostles travelled over the greatest part of the world, and planted churches in the remotest parts of it. It is certain also that they were all led by the same *spirit*; and their desire was, that unity and uniformity should be observed in all the churches which they had founded. It is not therefore surprising that, in the primitive times, the same doctrine, the same worship, the same rites and customs, should prevail all over the Christian world; nay, it would have been unaccountable had the case been otherwise. For this reason we may conclude that every custom, universally observed in the early ages of the Christian church, and not instituted by a general council, was of original appointment.

As the *Lord's day* is sanctified, that is, *set apart* to Christians for the worship and service of God, their Creator, Redeemer, and Sanctifier, a little consideration will easily discover how it ought to be observed. Although a day separated from worldly business, yet it is in no sense a day of idleness, but a season appropriated to the works of salvation and labours of charity.

In the primitive times this holy day was observed in the most solemn manner. From the monuments of those early ages we learn, that it was spent in a due and constant attendance on all the offices of divine worship. On it they held their religious assemblies, in which the writings of the apostles and prophets were read to the people, and the doctrines of Christianity further pressed upon them by the exhortations of the clergy. Solemn prayers and praises were offered up to God, and hymns sung in honour of Christ; the Lord's supper was constantly celebrated; and collections were made for the maintenance of the clergy and the relief of the poor. On this day they abstained, as much as they could, from bodily labour. They looked upon it as a day of joy and gladness; and therefore all fasting on it was prohibited, even during the season of Lent, their great annual fast. —Such was the zeal of those times, that nothing, no not the severest persecutions, hindered them from celebrating holy offices on this day. They were often beset and betrayed, and as often slaughtered in consequence of cruel edicts from emperors, those very emperors for whose happiness and prosperity they always offered up their fervent prayers. For this cause, when they could not meet in the day-time, they assembled in the morning before it was light; and when sick, in exile, or in prison, nothing troubled them more than that they could not attend the service of the church. No trivial pretences were then admitted for any one's absence from public worship; for severe censures were passed upon all who were absent without some urgent necessity. When the empire became Christian, Constantine and his successors made laws for the more solemn observation of the Lord's day. They prohibited all prosecutions and pleadings and other juridical matters to be transacted on it, and also all unnecessary labour; not that it was looked upon as a Jewish sabbath, but because these things were considered as inconsistent with the duties of the festival.

But although the primitive Christians did not indulge themselves in the practice of unnecessary labour or trifling amusements, yet they did not wholly abstain from working, if great necessity required it. The council of *Laodicea* enjoined that men should abstain from work on the Lord's day *if possible*; but if any were found to *judaize*, they were to be censured as great transgressors. So circumspect were the primitive Christians about their conduct on this festival, that on the one hand they avoided all things which tended to profane it, whilst on the other they censured all those who insisted it should be observed with Pharisaical rigour.

The primary duty of the Lord's day is *public worship*. The nature and design of the Christian religion sufficiently shows the necessity and importance of assembling for the duties of devotion. The whole scope of Christianity is to bring us to an union with God, which cannot be obtained or preserved without frequent

communications with him; and the reafons which fhow religious intercourfe to be the indifpenfable duty of Chriftians in a private capacity, will bind it with equal or more force on them confidered as a community.

The advantages of public worfhip, when duly performed, are many and great. There are two, however, which deferve to be confidered in a particular manner. It gives Chriftians an opportunity of openly profeffing their faith, and teftifying their obedience to their Redeemer in the wifeft and beft manner; and in an age when atheifm has arifen to an alarming height, when the Son of God is crucified afrefh, and put to open fhame, every man, who has any regard for religion, will cheerfully embrace all opportunities of declaring his abhorrence of the vicious courfes purfued by thofe degenerate apoftates. He will with pleafure lay hold on every occafion to teftify that he is neither afraid nor afhamed to confefs the truth; and will think it his indifpenfable duty openly to difavow the fins of others, that he may not incur the guilt of partaking of them.

Public worfhip preferves in the minds of men a fenfe of religion, without which fociety could not exift. Nothing can keep a body of men together and unite them in promoting the public good, but fuch principles of action as may reach and govern the heart. But thefe can be derived only from a fenfe of religious duties, which can never be fo ftrongly impreffed upon the mind as by a conftant attendance upon public worfhip. Nothing can be more weak than to neglect the public worfhip of God, under the pretence that we can employ ourfelves as acceptably to our Maker at home in our clofets. Both kinds of worfhip are indeed neceffary; but one debt cannot be paid by the difcharge of another. By public worfhip every man profeffes his belief in that God whom he adores, and appeals to Him for his fincerity, of which his neighbour cannot judge. By this appeal he endears himfelf more or lefs to others. It creates confidence; it roots in the heart benevolence, and all other Chriftian virtues, which produce, in common life, the fruits of mutual love and general peace.

People in general are of opinion that the duties of the Lord's day are over when public worfhip is ended. But they feem to forget for what purpofes the day was fet apart. It is not only appropriated to the duties of public worfhip, but alfo fanctified to our improvement in the knowledge of the doctrines of Chriftianity. It is an inftitution calculated to alleviate the condition of the laborious claffes of mankind, and, in confequence of that, to afford reft to *beafts* alfo. It is proper, it is neceffary, that man fhould reflect on his condition in the world, that he fhould examine the ftate of his foul, and inquire what progrefs he has made in that work which was given him to do. Thofe that have children or fervants are obliged to look after *their* inftruction as well as their own. Thefe are the ends which the inftitution of Sunday was defigned to anfwer. Every man muft allow that thefe things muft be done at fome time or other; but unlefs there be *fet* times for doing them, the generality of mankind would wholly neglect them.

Vifiting and *travelling* (though very common) are enormous profanations of this holy day. Families are thereby robbed of their *time*; a lofs for which no amends can ever be made them: fervants, inftead of having leifure to improve themfelves in fpiritual knowledge, are burthened with additional labour: and in a man of any humanity, it muft excite many painful fenfations, when he reflects how often the ufeful horfe on that day experiences all the anguifh of hunger, torn fides, and battered knees. Every kind of *amufement*, every kind of *common* labour, is an encroachment on the particular duties of the Lord's day; and confequently men profane the day by fpending it in any amufements, or undertaking upon it any ordinary employment, unlefs it be a work of abfolute neceffity.

Sabbath-*Breaking*, or profanation of the Lord's day, is punifhed by the municipal laws of England. For, befides the notorious indecency and fcandal of permitting any fecular bufinefs to be publicly tranfacted on that day in a country profeffing Chriftianity, and the corruption of morals which ufually follows its profanation, the keeping one day in feven holy, as a time of relaxation and refrefhment, as well as for public worfhip, is of admirable fervice to a ftate, confidered merely as a civil inftitution. It humanizes, by the help of converfation and fociety, the manners of the lower claffes; which would otherwife degenerate into a fordid ferocity and favage felfifhnefs of fpirit: it enables the induftrious workman to purfue his occupation in the enfuing week with health and cheerfulnefs: it imprints on the minds of the people that fenfe of their duty to God fo neceffary to make them good citizens; but which yet would be worn out and defaced by an unremitted continuance of labour, without any ftated times of recalling them to the worfhip of their Maker. And therefore the laws of king Athelftan forbad all merchandizing on the Lord's day, under very fevere penalties. And by the ftatute 27 Hen. VI. c. 5. no fair or market fhall be held on the principal feftivals, Goodfriday, or any Sunday (except the four Sundays in harveft), on pain of forfeiting the goods expofed to fale. And, fince, by the ftatute 1 Car. I. c. 1. no perfons fhall affemble, out of their own parifhes, for any fport whatfoever, upon this day; nor, in their parifhes, fhall ufe any bull or bear baiting, interludes, plays, or other unlawful exercifes or paftimes: on pain that every offender fhall pay 3s. 4d. to the poor. This ftatute does not prohibit, but rather impliedly allows, any innocent recreation or amufement, within their refpective parifhes, even on the Lord's day, after divine fervice is over. But by ftatute 29 Car. II. c. 7. no perfon is allowed to work on the Lord's day, or ufe any boat or barge, or expofe any goods to fale, except meat in public houfes, milk at certain hours, and works of neceffity or charity, on forfeiture of 5s. Nor fhall any drover, carrier, or the like, travel upon that day, under pain of 20s.

SABELLIANS, a fect of Chriftians of the 3d century, that embraced the opinions of Sabellius, a philofopher of Egypt, who openly taught that there is but one perfon in the Godhead. The Sabellians maintained, that the Word and the Holy Spirit are only virtues, emanations, or functions of the Deity; and held, that he who is in heaven is the Father of all things, that he defcended into the virgin, became a child, and was born of her as a fon; and that, having accomplifhed the myftery of our falvation, he diffufed himfelf on the apoftles in tongues of fire, and was then denominated the *Holy Ghoft*. This they explained by refembling God to the fun, the illuminative virtue or quality of which was the Word, and its warming virtue the Holy Spirit. The Word, they taught, was darted, like a divine ray, to accomplifh the work of redemption; and that, being re-afcended to heaven, the influences of the Father were communicated after a like manner to the apoftles.

SABIANS, an early fect of idolaters, which continues to this day, and worfhips the fun, moon, and ftars. See Polytheism.

SABINA, a province of Italy, in the territories of the church; bounded on the north by Umbria, on the eaft by Further Abruzzo, on the fouth by the Campagna of Rome, and on the weft by the patrimony of St. Peter. It is 22 miles in length, and almoft as much in breadth; watered by feveral fmall rivers, and abounding in oil and wine. There is no walled town in it, and Magliano is the principal place.

SABINUS (George), a celebrated Latin poet, born in the electorate of Brandenburg in 1508. His poem *Res geftæ Cæfarum Germanorum* fpread his reputation all over Germany, and procured him the patronage of all the princes who had any

regard for polite literature: he was made profeſſor of the belles lettres at Frankfort on the Oder, rector of the new academy of Koningſburg, and counſellor to the elector of Brandenburg. He married two wives, the firſt of which was the eldeſt daughter of the famous reformer Melancthon; and died in 1560. His poems are well known, and have been often printed.

SABLE, or Sable *Animal*, in zoology, a creature of the weaſel-kind, called by authors *muſtela zibellina*. See Mustela. The chace of theſe animals, in the more barbarous times of the Ruſſian empire, was the employ, or rather taſk, of the unhappy exiles in Siberia. As that country is now become more populous, the ſables have in a great meaſure quitted it, and retired further north and eaſt, to live in deſert foreſts and mountains: they live near the banks of rivers, or in the little iſlands in them; on this account they have, by ſome, been ſuppoſed to be the Σαθεριον of Ariſtotle (*Hiſt. An. lib.* viii. *c.* 5.) which he claſſes with the animals converſant among waters.

At preſent the hunters of ſables form themſelves into troops, from five to 40 each: the laſt ſubdivide into leſſer parties, and each chooſes a leader; but there is one that directs the whole: a ſmall covered boat is provided for each party, loaded with proviſions, a dog and net for every two men, and a veſſel to bake their bread in: each party alſo has an interpreter for the country they penetrate into. Every party then ſets out according to the courſe their chief points out: they go againſt the ſtream of the rivers, drawing their boats up, till they arrive in the hunting country; there they ſtop, build huts, and wait till the waters are frozen, and the ſeaſon commences: before they begin the chace, their leader aſſembles them, they unite in a prayer to the Almighty for ſucceſs, and then ſeparate: the firſt ſable they take is called *God's ſable*, and is dedicated to the church.

They then penetrate into the woods; mark the trees as they advance, that they may know their way back; and in their hunting-quarters form huts of trees, and bank up the ſnow round them: near theſe they lay their traps; then advance further, and lay more traps, ſtill building new huts in every quarter, and return ſucceſſively to every old one to viſit the traps and take out the game to ſkin it, which none but the chief of the party muſt do: during this time they are ſupplied with proviſions by perſons who are employed to bring it on ſledges, from the places on the road, where they are obliged to form magazines, by reaſon of the impracticability of bringing quantities through the rough country they muſt paſs. The traps are a ſort of pitfall, with a looſe board placed over it, baited with fiſh or fleſh: when ſables grow ſcarce, the hunters trace them in the new fallen ſnow to their holes; place their nets at the entrance; and ſometimes wait, watching two or three days for the coming out of the animal: it has happened that theſe poor people have, by the failure of their proviſions, been ſo pinched with hunger, that, to prevent the cravings of appetite, they have been reduced to take two thin boards, one of which they applied to the pit of the ſtomach, the other to the back, drawing them tight together by cords placed at the ends: ſuch are the hardſhips our fellow-creatures undergo to ſupply the wantonneſs of luxury.

The ſeaſon of chace being finiſhed, the hunters re-aſſemble, make a report to their leader of the number of ſables each has taken; make complaints of offenders againſt their regulations; puniſh delinquents; ſhare the booty; then continue at the head-quarters till the rivers are clear of ice; return home, and give to every church the dedicated furs.

Sable *Cape*, the moſt ſoutherly province of Nova Scotia, in North America, near which is a fine cod-fiſhery. W. lon. 65. 34. N. lat. 43. 24.

Sable *Iſle* is adjoined to this cape, and the coaſts of both are moſt commodiouſly ſituated for fiſheries.

Sable *Trade*, the trade carried on in the ſkins or furs of ſables; of which the following commercial hiſtory was tranſlated by Mr. J. R. Forſter from a Ruſſian performance on that ſubject by Mr. Muller. "*Sable, ſoble*, in Ruſſian; *zobel* in German. Their price varies from 1*l.* to 10*l.* ſterling, and above: fine and middling ſable ſkins are without bellies, and the coarſe ones are with them. Forty ſkins make a collection called *zimmer*. The fineſt ſables are ſold in pairs perfectly ſimilar, and are dearer than ſingle ones of the ſame goodneſs; for the Ruſſians want thoſe in pairs for facing caps, cloaks, tippets, &c. the blackeſt are reputed the beſt. Sables are in ſeaſon from November to February; for thoſe caught at any other time of the year are ſhort-haired, and then called *nedoſoboli*. The hair of ſables differs in length and quality: the long hairs, which reach far beyond the inferior ones, are called *os*; the more a ſkin has of ſuch long hairs, the blacker it is, and the more valuable is the fur; the very beſt have no other but thoſe long and black hairs. *Motchka* is a technical term uſed in the Ruſſian fur-trade, expreſſing the lower part of the long hairs; and ſometimes it comprehends likewiſe the lower and ſhorter hairs: the above-mentioned beſt ſable furs are ſaid to have a black motchka. Below the long hairs are, in the greater part of the ſable-furs, ſome ſhorter hairs, called *podoſie*, i. e. under-os; the more podoſie a fur has, it is the leſs valuable: in the better kind of ſables the podoſie has black tips, and a gray or ruſty motchka. The firſt kind of motchka makes the middling kind of ſable-furs; the red one the worſt, eſpecially if it has but few os. Between the os and podoſie is a low woolly kind of hair, called *podſada*. The more podſada a fur has, the leſs valuable: for the long hair will, in ſuch caſe, take no other direction than the natural one; for the character of ſable is, that notwithſtanding the hair naturally lies from the head towards the tail, yet it will lie equally in any direction as you ſtrike your hand over it. The various combinations of theſe characters, in regard to os, motchka, podoſie, and podſada, make many ſpecial diviſions in the goodneſs of furs: beſides this, the furriers attend to the ſize, preferring always, *cæteris paribus*, the biggeſt, and thoſe that have the greateſt gloſs. The ſize depends upon the animal being a male or a female, the latter being always ſmaller. The gloſs vaniſhes in old furs: the freſh ones have a kind of bloomy appearance, as they expreſs it; the old ones are ſaid to have done blooming: the dyed ſables always loſe their gloſs; become leſs uniform, whether the lower hairs have taken the dye or not; and commonly the hairs are ſomewhat twiſted or criſped, and not ſo ſtraight as in the natural ones. Some fumigate the ſkins, to make them look blacker; but the ſmell, and the criſped condition of the long hair, betray the cheat; and both ways are detected by rubbing the fur with a moiſt linen cloth, which grows black in ſuch caſes.

"The Chineſe have a way of dyeing the ſables, ſo that the colour not only laſts (which the Ruſſian cheats cannot do), but the fur keeps its gloſs, and the criſped hairs only diſcover it. This is the reaſon that all the ſables, which are of the beſt kind, either in pairs or ſeparate, are carried to Ruſſia; the reſt go to China. The very beſt ſables come from the environs of Nertchitſk and Yakutſk; and in this latter diſtrict, the country about the river Ud affords ſometimes ſables, of whom one ſingle fur is often ſold at the rate of 60 or 70 rubles, 12*l.* or 14*l.* The bellies of ſables, which are ſold in pairs, are about two fingers breadth, and are tied together by 40 pieces, which are ſold from 1*l.* to 2*l.* ſterling. Tails are ſold by the hundred. The very beſt ſable-furs muſt have their tails; but ordinary ſables are often cropped, and 100 ſold from 4*l.* to 8*l.* ſterling. The legs or feet of ſables are ſeldom ſold ſeparately; white ſables are rare, and no common merchandize, but bought only as curioſities: ſome are yellowiſh, and are bleached in the ſpring on the ſnow."

Sable, in heraldry, ſignifies "black;" and is borrowed from the French, as are moſt terms in this ſcience: in engraving it is expreſſed by both horizontal and perpendicular lines croſſing each other. The occaſion that introduced this colour into heraldry is thus related by Alexander Niſbet, p. 8. The duke of Anjou, king of Sicily, after the loſs of that kingdom, appeared at a tournament in Germany all in black, with his ſhield of that tincture, *ſemé de larmes*, i. e. beſprinkled with drops of water, to repreſent tears, indicating by that both his grief and loſs. See Heraldry.

SABLESTAN, or Sablustan, a province of Aſia, in Perſia, on the frontiers of Indoſtan; bounded on the north by Khoraſan: on the eaſt, by the mountains of Balk and Candahar; on the ſouth, by Sageſtan or Segeſtan; and on the weſt, by Heri. It is a mountainous country, very little known to Europeans; nor is it certain which is the capital town.

SABRE, a kind of ſword or cimeter, with a very broad and heavy blade, thick at the back, and a little falcated or crooked towards the point. It is the ordinary weapon worn by the Turks, who are ſaid to be very expert in the uſe of it.

SABURRA, in medicine, uſually denotes any collection of half putrid indigeſted matter in the ſtomach and inteſtines, by which the operation of digeſtion is impeded.

SABURRÆ, gritts, in natural hiſtory; a genus of foſſils, found in minute maſſes, forming together a kind of powder, the ſeveral particles of which are of no determinate ſhape, nor have any tendency to the figure of cryſtal, but ſeem rudely broken fragments of larger maſſes; not to be diſſolved or diſunited by water, but retaining their figure in it, and not cohering by means of it into a maſs; conſiderably opake, and in many ſpecies fermenting with acids; often fouled with heterogene matters, and not unfrequently taken in the coarſer ſtony and mineral or metalline particles. *Gritts* are of various colours, as, 1. The ſtony and ſparry gritts, of a bright or grayiſh white colour. 2. The red ſtony gritts. 3. The green ſtony gritts, compoſed of homogene ſparry particles. 4. The yellow gritt, of which there is only one ſpecies. 5. The black and blackiſh gritts, compoſed of ſtony or talcky particles.

SACÆA, a feaſt which the antient Babylonians and other orientals held annually in honour of the deity Anaitis. The Sacæa were in the Eaſt what the Saturnalia were at Rome, viz. a feaſt for the ſlaves. One of the ceremonies was to chooſe a priſoner condemned to death, and allow him all the pleaſures and gratifications he would wiſh, before he was carried to execution.

SACCADE, in the manege, is a jerk more or leſs violent, given by the horſeman to the horſe, in pulling or twitching the reins of the bridle all on a ſudden and with one pull, and that when a horſe lies heavy upon the hand, or obſtinately arms himſelf. This is a correction uſed to make a horſe carry well; but it ought to be uſed diſcreetly, and but ſeldom.

SACERDOTAL, ſomething belonging to prieſts. See Priest.

SACCULUS, in anatomy, a diminutive of ſaccus, ſignifies a little bag, and is applied to many parts of the body.

SACCHARUM, Sugar, or the *Sugar-Cane*, in botany: a genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order, *Gramina*. There is no calyx, but a long down; the corolla is bivalved. There is but one ſpecies of this genus, viz. the officina. It is a native of Africa, the Eaſt Indies, and of Brazil; from whence it was introduced into our Weſt India iſlands ſoon after they were ſettled. The ſugar-cane is the glory and the pride of thoſe iſlands. It amply rewards the induſtrious planter, enriches the Britiſh merchant, gives bread to thouſands of manufacturers and ſeamen, and brings an immenſe revenue to the crown. For the proceſs of making ſugar, ſee Sugar. Sugar, formerly a luxury, is now become one of the neceſſaries of life. In crop-time every negro on the plantations, and every animal, even the dogs, grow fat. This ſufficiently points out the nouriſhing and healthy qualities of ſugar. It has been alleged, that the eating of ſugar ſpoils the colour of, and corrupts, the teeth: this, however, proves to be a miſtake, for no people on the earth have finer teeth than the negroes in Jamaica. Dr. Alſton, formerly profeſſor of botany and materia medica at Edinburgh, endeavoured to obviate this vulgar opinion: he had a fine ſet of teeth, which he aſcribed ſolely to his eating great quantities of ſugar. Externally too it is often uſeful: mixed with pulp of roaſted oranges, and applied to putrid or ill-diſpoſed ulcers, it proves a powerful corrector.

SACCHI (Andrea), a celebrated painter, born at Rome in 1594. He was the diſciple of Franciſco Albano, whom he afterwards ſurpaſſed in taſte and correctneſs. He diſtinguiſhed himſelf in a very eminent degree by his paintings in freſco; and a ſtrong emulation ſubſiſting between him and Pietro de Cortona, they each arrived at a degree of perfection that neither of them might have known without ſuch a competition. The works of Sacchi have ſuch intrinſic merit, and are finiſhed with ſuch uncommon care and ſkill, as will always ſecure the applauſe of the judicious, and preſerve their true value. He died in 1668.

SACHEVEREL (Dr. Henry), a famous clergyman of the Tory faction in the reign of queen Anne; who diſtinguiſhed himſelf by indecent and ſcurrilous ſermons and writings againſt the diſſenters and revolution principles. He owed his conſequence, however, to being indiſcreetly proſecuted by the houſe of lords for his aſſize ſermon at Derby, and his 5th of November ſermon at St. Paul's in 1709; in which he aſſerted the doctrine of non-reſiſtance to government in its utmoſt extent; and reflected ſeverely on the act of toleration. The high and low church parties were very violent at that time; and the trial of Sacheverel inflamed the high-church party to dangerous riots and exceſſes: he was, however, ſuſpended for three years, and his ſermons burned by the common hangman. The Tories being in adminiſtration when Sacheverel's ſuſpenſion expired, he was freed with every circumſtance of honour and public rejoicing; was ordered to preach before the commons on the 29th of May, had the thanks of the houſe for his diſcourſe, and obtained the valuable rectory of St. Andrew's, Holborn.

SACK, a wine uſed by our anceſtors, which ſome have taken to be Rheniſh and ſome Canary wine. Venner, in his *Via Recta ad Vitam Longam*, printed in 1628, ſays that ſack is "completely hot in the third degree, and that ſome affect to drink ſack with ſugar and ſome without; and upon no other ground, as I think, but as it is beſt pleaſing to their palate." He goes on to ſay, "that ſack, taken by itſelf, is very hot and very penetrative; being taken with ſugar, the heat is both ſomewhat allayed, and the penetrative quality thereof alſo retarded." He adds further, that Rheniſh, &c. decline after a twelvemonth, but ſack and the other ſtronger wines are beſt when they are two or three years old. It appears to be highly probable that ſack was not a ſweet wine, from its being taken with ſugar, and that it did not receive its name from having a ſaccharine flavour, but from its being originally ſtored in ſacks or borachios. It does not appear to have been a French wine, but a ſtrong wine the production of a hot climate. Probably it was what is called dry mountain, or ſome Spaniſh wine of that kind. This conjecture is the more plauſible, as Howell, in his French and Engliſh Dictionary, printed in the year 1650, tranſlates ſack by the words *vin d'Eſpagne, vin ſec*.

Sack *of Wool*, a quantity of wool containing juſt 22 ſtone, and every ſtone 14 pounds. In Scotland, a ſack is 24 ſtone, each ſtone containing 16 pounds.

SACK *of Cotton Wool*, a quantity from one hundied and a half to four hundred weight.

SACKS *of Earth*, in fortification, are canvas bags filled with earth. They are ufed in making retrenchments in hafte, to place on parapets, or the head of the breaches, &c. to repair them, when beaten down.

SACKBUT, a mufical inftrument of the wind kind, being a fort of trumpet, though different from the common trumpet both in form and fize; it is fit to play a bafs, and is contrived to be drawn out or fhortened, according to the tone required, whether grave or acute. The Italians call it *trombone*, and the Latins *tuba ductilis*.

SACKVILLE (THOMAS, LORD BUCKHURST, AND EARL OF DORSET), a ftatefman and poet, the fon of Richard Sackville, Efq. of Buckhurft, in the parifh of Withian in Suffex, was born in the year 1536. He was fent to Hart-hall in Oxford, in the latter end of the reign of Edward VI. whence he removed to Cambridge, where he took a mafter of arts degree, and thence to the Inner Temple. He now applied himfelf to the ftudy of the law, and was called to the bar. We are told that he commenced poet whilft at the univerfities, and that thefe his juvenile productions were much admired, none of which, however, have been preferved. In the fourth and fifth year of queen Mary, we find him a member of the houfe of commons; about which time, in 1557, he wrote a poetical piece, entitled *The Induction*, or *The Mirror of Magiftrates*. This laft was meant to comprehend all the unfortunate Great from the beginning of our hiftory; but the defign being dropped, it was inferted in the body of the work. The Mirror of Magiftrates is formed on a dramatic plan; in which the perfons are introduced fpeaking. The Induction is written much in the ftyle of Spenfer, who, with fome probability, is fuppofed to have imitated this author.

In 1561, his tragedy of *Gorboduc* was acted before queen Elizabeth by the gentlemen of the Inner Temple. This was the firft tolerable tragedy in our language. The Companion to the Play-houfe tells us, that the three firft acts were written by Mr. Tho. Norton. Sir Philip Sidney, in his Apology for Poetry, fays, "it is full of ftately fpeeches, and well-founding phrafes, climbing to the height of Seneca in his ftyle, &c." Rymer fpeaks highly in its commendation. Mr. Spence, at the inftigation of Mr. Pope, republifhed it in 1736, with a pompous preface. It is faid to be our firft dramatic piece written in verfe.

In the firft parliament of this reign, Mr. Sackville was member for Suffex, and for Bucks in the fecond. In the mean time he made the tour of France and Italy, and in 1566 was imprifoned at Rome, when he was informed of his father's death, by which he became poffeffed of a very confiderable fortune.

Having now obtained his liberty, he returned to England; and being firft knighted was created lord Buckhurft. In 1570 he was fent ambaffador to France. In 1586 he was one of the commiffioners appointed to try the unfortunate Mary queen of Scots; and was the meffenger employed to report the confirmation of her fentence, and to fee it executed. The year following he went ambaffador to the States General, in confequence of their complaint againft the earl of Leicefter; who, difliking his impartiality, prevailed on the queen to recall him, and confine him to his houfe. In this ftate of confinement he continued about ten months, when Leicefter dying, he was reftored to favour, and in 1580 was inftalled knight of the garter; but the moft incontrovertible proof of the queen's partiality for lord Buckhurft appeared in the year 1591, when fhe caufed him to be elected chancellor in the univerfity of Oxford, in oppofition to her favourite Effex. In 1598, on the death of the treafurer Burleigh, lord Buckhurft fucceeded him, and by virtue of his office became in effect prime minifter; and when, in 1601, the earls of Effex and Sonthampton were brought to trial, he fat as lord high fteward on that awful occafion.

On the acceffion of James I. he was gracioufly received, had the office of lord high treafurer confirmed to him for life, and was created earl of Dorfet. He continued in high favour with the king till the day of his death; which happened fuddenly, on the 19th of April 1608, in the council-chamber at Whitehall. He was interred with great folemnity in Weftminfter-abbey. He was a good poet, an able minifter, and an honeft man. From him is defcended the prefent noble family of the Dorfets. "It were needlefs (fays Mr. Walpole) to add, that he was the patriarch of a race of genius and wit."

SACKVILLE (Charles, earl of Dorfet), a celebrated wit and poet, defcended from the foregoing, was born in 1637. He was, like Villiers, Rochefter, Sedley, &c. one of the libertines of king Charles's court, and fometimes indulged himfelf in inexcufable exceffes. He openly difcountenanced the violent meafures of James II. and engaged early for the prince of Orange, by whom he was made lord chamberlain of the houfehold, and taken into the privy-council. He died in 1706, and left feveral poetical pieces, which, though not confiderable enough to make a volume by themfelves, may be found among the works of the minor poets, publifhed in 1749.

SACRAMENT is derived from the Latin word *facramentum*, which fignifies an oath, particularly the oath taken by foldiers to be true to their country and general. The words of this oath, according to Polybius, were, *obtemperaturus fum et facturus quicquid mandabitur ab imperatoribus juxta vires.* The word was adopted by the writers of the Latin church, and employed, perhaps with no great propriety, to denote thofe ordinances of religion by which Chriftians came under an obligation, equally facred with that of an oath, to obferve their part of the covenant of grace, and in which they have the affurance of Chrift that he will fulfil his part of the fame covenant.

Of facraments, in this fenfe of the word, Proteftant churches admit of but two; and it is not eafy to conceive how a greater number can be made out from Scripture, if the definition of a facrament be juft which is given by the church of England. By that church, the meaning of the word facrament is declared to be "an outward and vifible fign of an inward and fpiritual grace given unto us, ordained by Chrift himfelf as a means whereby we receive the fame, and a pledge to affure us thereof." According to this definition, baptifm and the Lord's fupper are certainly facraments; for each confifts of an outward and vifible fign of what is believed to be an inward and fpiritual grace; both were ordained by Chrift himfelf, and by the reception of each does the Chriftian come under a folemn obligation to be true to his divine mafter, according to the terms of the covenant of grace. (See BAPTISM and SUPPER *of the Lord*.) The Romanifts, however, add to this number *confirmation*, *penance*, *extreme unction*, *ordination*, and *marriage*, holding in all feven facraments; but two of thofe rites not being peculiar to the Chriftian church cannot poffibly be *Chriftian* facraments, in contradiftinction to the facraments or obligations into which men of all religions enter. Marriage was inftituted from the beginning, when God made male and female, and commanded them to be fruitful, and multiply, and replenifh the earth; and penance, as far as it is of the fame import and repentance, has a place in all religions which teach that God is merciful, and men fallible. The external feverities impofed upon penitents by the church of Rome (fee PENANCE) may indeed be in fome refpects peculiar to the difcipline of that church, though the penances of the Hindoos are certainly as rigid; but none of thefe feverities were ordained by Chrift himfelf as the pledge of an inward and fpiritual grace; nor do they, like baptifm and the Lord's fupper, bring men under obligations which are fuppofed to be ana-

logous to the meaning of the word *facramentum*. Confirmation has a better title to the appellation of a facrament than any of the other five popifh rites of that name, though it certainly was not confidered as fuch by the earlieft writers of the Chriftian church, nor does it appear to have been ordained by Chrift himfelf, (fee CONFIRMATION). Ordination is by many churches confidered as a very important rite; but as it is not adminiftered to *all* men, nor has any particular form appropriated to it in the New Teftament, it cannot be confidered as a Chriftian facrament conferring grace generally neceffary to falvation. It is rather a form of authorifing certain perfons to perform certain offices, which refpect not themfelves but the whole church; and extreme unction is a rite which took its rife from the miraculous powers of the primitive church vainly claimed by the fucceeding clergy. (See ORDINATION and *Extreme* UNCTION.) Thefe confiderations feem to have fome weight with the Romifh clergy themfelves; for they call the eucharift, by way of eminence, the *holy facrament*. Thus, to expofe the holy facrament is to lay the confecrated hoft on the altar to be adored. The proceffion of the holy facrament is that in which this hoft is carried about the church, or about a town.

Numerous as we think the facraments of the Romifh church, a fect of Chriftians fprung up in England early in the current century, who increafed their number. The founder of this fect was a Dr. Deacon, we think, of Manchefter, where the remains of it fubfifted very lately, and probably do fo at prefent. According to thefe men, every *rite* and every *phrafe* in the book called the *Apoftolical Conftitutions* were certainly in ufe among the apoftles themfelves. Still, however, they make a diftinction between the greater and the leffer facraments. The greater facraments are only two, baptifm and the Lord's fupper. The leffer are no fewer than ten, viz. five belonging to baptifm, *exorcifm*, *anointing with oil*, *the white garment*, *a tafte of milk and honey*, and *anointing with chrifm* or *ointment*. The other five are, *the fign of the crofs*, *impofition of hands*, *unction of the fick*, *holy orders*, and *matrimony*. Of the nature of thefe leffer facraments, or the grace which they are fuppofed to confer, our limits will permit us to give no account. Nor is it neceffary that we fhould. The fect which taught them, if not extinguifhed, is certainly in its laft wane. It has produced, however, one or two learned men; and its founder's Full, True, and Comprehenfive View of Chriftianity, in two Catechifms, is a work which the Chriftian antiquary will read with pleafure for information, and the philofopher for the materials which it contains for meditation on the workings of the human mind. It was publifhed in 8vo, in the year 1748.

Congregation of the Holy SACRAMENT, a religious eftablifhment formed in France, whofe founder was Autherius, bifhop of Bethlehem, and which, in 1644, received an order from Urban VIII. to have always a number of ecclefiaftics ready to exercife their miniftry among pagan nations, wherever the pope, or congregation *de propaganda*, fhould appoint.

SACRAMENTARIANS, a general name given to all fuch as have publifhed or held erroneous doctrines of the facrament of the Lord's fupper. The term is chiefly applied among Roman Catholics, by way of reproach to the Lutherans, Calvinifts, and other Proteftants.

SACRAMENTARY, an ancient Romifh church book, which contains all the prayers and ceremonies practifed at the celebration of the facraments. It was written by pope Gelafius, and afterwards revifed, corrected, and abridged, by St. Gregory.

SACRE, or SAKER, in ornithology, the name of a fpecies of falcon, called by authors *falco facer*, and differently defcribed by different authors, but by all agreed to be an extremely bold and active bird. It is a native of the northern regions of Europe; and a variety called by fome writers the *fpeckled partridge hawk* is found at Hudfon's bay, North America.

SACRED, fomething holy, or that is folemnly offered and confecrated to God, with benedictions, unctions, &c. Kings, prelates, and priefts, are reckoned facred perfons; abbots are only bleffed. The deaconhood, fub-deaconhood, and priefthood are all facred orders, and are faid to imprefs a facred indelible character. The cuftom of confecrating kings with holy oil is derived (fays Gutlingius) from the Hebrews; among whom, he agrees with Grotius, it was never ufed but to kings who had not an evident right by fucceffion. He adds, that the Chriftian emperors never ufed it before Juftin the younger; from whom he takes it to have paffed to the Goths, &c.

SACRED is alfo applied to things belonging to God and the church. Church lands, ornaments, &c. are held facred.—The facred college is that of the cardinals.

SACRED *Majefty*, is applied to the emperor and to the king of England; yet Loyfeau fays it is blafphemy. See MAJESTY. The antients held a place ftruck with thunder as facred. In the civil law, facred place chiefly denotes that where a perfon deceafed has been interred.

SACRED *Elixir*. See ELIXIR.

SACRIFICE, an offering made to God on an altar, by means of a regular minifter, as an acknowledgement of his power, and a payment of homage. Sacrifices (though the term is fometimes ufed to comprehend all the offerings made to God, or in any way devoted to his fervice and honour) differ from mere oblations in this, that in a facrifice there is a real deftruction or change of the thing offered; whereas an oblation is only a fimple offering or gift, without any fuch change at all: thus, all forts of tythes, and firft fruits, and whatever of men's worldly fubftance is confecrated to God, for the fupport of his worfhip and the maintenance of his minifters, are offerings or oblations: and thefe, under the Jewifh law, were either of living creatures or other things: but facrifices, in the more peculiar fenfe of the term, were either wholly or in part confumed by fire. They have by divines been divided into bloody and unbloody. Bloody facrifices were made of living creatures; unbloody of the fruits of the earth. They have alfo been divided into *expiatory*, *impetratory*, and *eucharifical*. The firft kind were offered to obtain of God forgivenefs of fins; the fecond, to procure fome favour; and the third, to exprefs thankfulnefs for favours already received. Under one or other of thefe heads may all facrifices be arranged; though we are told, that the Egyptians had 666 different kinds, a number furpaffing all credibility.

Concerning the origin of facrifices very various opinions have been held. By many, the Phœnicians are fuppofed to have been the authors of them; though Porphyry attributes their invention to the Egyptians; and Ovid imagines, from the import of the name *victim* and *hoftia*, that no bloody facrifices were offered till wars prevailed in the world, and nations obtained victories over their enemies. Thefe are mere hypothefes, contradicted by the moft authentic records of antiquity, and entitled to no regard.

By modern deifts, facrifices are faid to have had their origin in fuperftition, which operates much in the fame way in every country. It is therefore weak, according to thofe men, to derive this practice from any particular people; fince the fame mode of reafoning would lead various nations, without any intercourfe with each other, to entertain the fame opinions refpecting the nature of their gods, and the proper means of appeafing their anger. Men of grofs conceptions imagine their deities to be like themfelves, covetous and cruel. They are accuftomed to appeafe an injured neighbour by a compofition in money; and they endeavoured to compound in the fame manner with their gods, by rich offerings to their temples and to their priefts. The moft valuable property of a fimple people is their cattle. Thefe offered in facrifice are fuppofed to be fed upon by the divinity, and are actually fed upon by his priefts. If a crime is committed which requires the punifhment of death, it is ac-

counted perfectly fair to appease the deity by offering one life for another; because, by savages, punishment is considered as a debt for which a man may compound in the best way that he can, and which one man may pay for another. Hence, it is said, arose the absurd notions of imputed guilt, and vicarious atonement. Among the Egyptians, a white bull was chosen as an expiatory sacrifice to their god Apis. After being killed at the altar his head was cut off, and cast into the river, with the following execration: "May all the evils impending over those who perform this sacrifice, or over the Egyptians in general, be averted on this head!"

Had sacrifice never prevailed in the world but among such gross idolaters as worshipped departed heroes, who were supposed to retain in their state of deification all the passions and appetites of their mortal state, this account of the origin of that mode of worship would have been to us perfectly satisfactory. We readily admit, that such mean notions of their gods may have actually led far distant tribes, who could not derive any thing from each other through the channel of tradition, to imagine that beings of human passions and appetites might be appeased or bribed by costly offerings. But we know from the most incontrovertible authority, that sacrifices of the three kinds that we have mentioned were in use among people who worshipped the true God, and who must have had very correct notions of his attributes. Now we think it impossible that such notions could have led any man to fancy that the taking away of the life of a harmless animal, or the burning of a cake or other fruits of the earth in the fire, would be acceptable to a Being self-existent, omnipotent, and omniscient, who can neither be injured by the crimes of his creatures, nor receive any accession of happiness from a thousand worlds.

Sensible of the force of such reasoning as this, some persons of great name, who admit the authenticity of the Jewish and Christian sacrifices, and firmly rely on the atonement made by Christ, are yet unwilling (it is difficult to conceive for what reason) to allow that sacrifices were originally instituted by God. Of this way of thinking were St. Chrysostom, Spencer, Grotius, and Warburton, as were likewise the Jews Maimonides, R. Levi, Ben Gerson, and Abarbanel. The greater part of these writers maintain, that sacrifices were at first a human institution; and that God, in order to prevent their being offered to idols, introduced them into his service, though he did not approve of them as good in themselves, or as proper rites of worship. That the infinitely wise and good God should introduce into his service improper rites of worship, appears to us so extremely improbable, that we cannot but wonder how such an opinion should have ever found its way into the minds of such men as those who held it. Warburton's theory of sacrifices is much more plausible, and, being more lately published, is worthy of particular examination.

According to this ingenious prelate, sacrifices had their origin in the sentiments of the human heart, and in the antient mode of conversing by action in aid of words. Gratitude to God for benefits received is natural to the mind of man, as well as his bounden duty. "This duty (says the bishop) was in the most early times discharged in expressive actions, the least equivocal of which was the offerer's bringing the first fruits of pasturage or agriculture to that sequestered place where the Deity used to be more solemnly invoked, at the stated times of public worship; and there presenting them in homage, with a demand which spoke to this purpose—'I do hereby acknowledge thee, O my God! to be the author and giver of all good: and do now, with humble gratitude, return my warmest thanks for these thy blessings particularly bestowed upon me.'"—Things thus devoted became thenceforth sacred: and to prevent their *desecration*, the readiest way was to send them to the table of the priest, or to consume them in the fire of the altar. Such, in the opinion of our author, was the origin of eucharistical sacrifices. *Impetratory* or *precative* sacrifices had, he thinks, the same origin, and were contrived to express by action an invocation for the continuance of God's favour. "Expiatory sacrifices (says the learned prelate) were in their own nature as intelligible, and in practice as rational, as either of the other two. Here, instead of presenting the first fruits of agriculture and pasturage, in corn, wine, oil, and wool, as in the eucharistical, or a portion of what was to be sown or otherwise propagated, as in the *impetratory*; some chosen animal, precious to the repenting criminal who deprecates, or supposed to be obnoxious to the Deity who is to be appeased, was offered up and slain at the altar, in an action which, in all languages, when translated into words, speaks to this purpose:—'I confess my transgressions at thy footstool, O my God! and with the deepest contrition implore thy pardon; confessing that I deserve death for those my offences.'—The latter part of the confession was more forcibly expressed by the *action* of striking the devoted animal, and depriving it of life; which, when put into words, concluded in this manner—'And I own that I myself deserve the death which I now inflict on this animal.'"

This system of sacrifice, which his lordship thinks so well supported by the most early movements of simple nature, we admit to be ingenious, but by no means satisfactory. That mankind in the earlier ages of the world were accustomed to supply the deficiencies of their language by expressive gesticulations we are not inclined to controvert: the custom prevails among savage nations, or nations half civilized, at the present day. His lordship, however, is of opinion, and we heartily agree with him, that our first parents were instructed by God to make articulate sounds significant of ideas, notions and things (see LANGUAGE), and not left to fabricate a language for themselves. That this heaven-taught language could be at first copious, no man will suppose who thinks of the paucity of ideas which those who spoke it had to express; but when we consider its origin, we cannot entertain a doubt but that it was precise and perspicuous, and admirably adapted to all the real purposes of life. Among these purposes must surely be included the worship of God as the most important of all. Every sentiment therefore which enters into worship, gratitude, invocation, confession, and deprecation, the progenitors of mankind were undoubtedly taught to clothe in words the most significant and unequivocal; but we know from Moses, whose divine legation the bishop surely admitted, that Cain and Abel, the eldest children of our first parents, worshipped God by the rites of sacrifice: and can we suppose that this practice occurred to *them* from their having so far forgotten the language taught them by their father, as to be under the necessity of denoting by action what they could not express by words? If this supposition be admitted, it will force another upon us still more extravagant. Even Adam himself must, in that case, have become dumb in consequence of his fall; for it is not conceivable, that as long as he was able to utter articulate sounds, and affix a meaning to them, he would cease, in the presence of his family, to confess his sins, implore forgiveness, and express his gratitude to God for all his mercies.

The right reverend writer, as if aware of some such objection as this to his theory, contends, that if sacrifices had arisen from any other source than the light of reason, the Scripture would not have been silent concerning that source; especially since we find Moses carefully recording what *God* immediately, and not *nature*, taught to Adam and his family. Had the original of sacrifice, says he, been prescribed, and directly commanded by the Deity, the sacred historian could never have omitted the express mention of that circumstance. The two capital observances in the Jewish ritual were the SABBATH and SACRIFICES. To impress the highest reverence and veneration

on the *Sabbath*, he is careful to record its divine original: and can we ſuppoſe that, had ſacrifices had the ſame original, he would have neglected to eſtabliſh this truth at the time that he recorded the other, ſince it is of equal uſe and of equal importance? I ſhould have ſaid, indeed, of much greater; for the multifarious *ſacrifices* of the LAW had not only a reference to the *forfeiture* of Adam, but likewiſe prefigured our redemption by Jeſus Chriſt."

But all this reaſoning was foreſeen, and completely anſwered before his lordſhip gave it to the public. It is probable, that though the diſtinction of weeks was well known over all the eaſtern world, the Hebrews, during their reſidence in Egypt, were very negligent in their obſervance of the Sabbath. To enforce a religious obſervance of that ſacred day, it became neceſſary to inform them of the time and occaſion of its firſt inſtitution that they might keep it holy in memory of the creation; but, in a country like Egypt, the people were in danger of holding ſacrifices rather in too high than too low veneration, ſo that there was not the ſame neceſſity for mentioning explicitly the early inſtitution of them. It was ſufficient that they knew the divine inſtitution of their own ſacrifices, and the purpoſes for which they were offered. Beſides this, there is reaſon to believe, that in order to guard the Hebrews from the infections of the heathen, the rite of ſacrificing was loaded with many additional ceremonies at its ſecond inſtitution under Moſes. It might, therefore, be improper to relate its original ſimplicity to a rebellious people, who would think themſelves ill-uſed by any additional burdens of trouble or expenſe, however really neceſſary to their happineſs. Biſhop Warburton ſees clearly the neceſſity of concealing from the Jews the ſpiritual and refined nature of the Chriſtian diſpenſation, leſt ſuch a backſliding people ſhould, from the contemplation of it, have held in contempt their own economy. This, he thinks, is the reaſon why the prophets, ſpeaking of the reign of the Meſſiah, borrow their images from the Moſaic diſpenſation, that the people living under that diſpenſation might not deſpiſe it from perceiving its end; and we think the reaſon will hold equally good for their law-giver concealing from them the ſimplicity of the firſt ſacrifices, leſt they ſhould be tempted to murmur at their own multifarious ritual.

But his lordſhip thinks that ſacrifices had their origin from the light of natural reaſon. We ſhould be glad to know what light natural reaſon can throw upon ſuch a ſubject. That ignorant pagans, adoring as gods departed heroes, who ſtill retained their ſenſual appetites, might naturally think of appeaſing ſuch beings with the fat of fed beaſts, and the perfumes of the altar, we have already admitted; but that Cain and Abel, who knew that the God whom they adored has neither body, parts, nor paſſions; that he created and ſuſtains the univerſe; and that from his very nature he muſt will the happineſs of all his creatures, ſhould be led by the light of natural reaſon to think of appeaſing him, or obtaining favours from him, by putting to death harmleſs animals, is a poſition which no arguments of his lordſhip can ever compel us to admit. That Abel's ſacrifice was indeed accepted, we know; but it was not accepted becauſe it proceeded from the movements of the human mind, and the deficiency of the original language, but becauſe it was offered through *faith*. The light of natural reaſon, however, doth not generate faith, but ſcience; and when it fails of that, its offſpring is abſurdity. "Faith is the ſubſtance of things hoped for, the evidence of things not ſeen," and comes not by reaſoning but by hearing. What things then were they of which Abel had heard, for which he hoped, and in the faith of which he offered ſacrifice? Undoubtedly it was a reſtoration to that immortality which was forfeited by the tranſgreſſion of his parents. Of ſuch redemption an obſcure intimation had been given to Adam, in the promiſe that the ſeed of the woman ſhould bruiſe the head of the ſerpent; and it was doubtleſs to impreſs upon his mind in more ſtriking colours the manner in which this was to be done, that bloody ſacrifices were firſt inſtituted. (See PROPHECY.) As long as the import of ſuch rites was thus underſtood, they conſtituted a perfectly rational worſhip, as they ſhowed the people that the wages of ſin is death; but when men ſunk into idolatry, and loſt all hopes of a reſurrection from the dead, the ſlaughtering of animals to appeaſe their deities was a practice groſsly ſuperſtitious. It reſted in itſelf without pointing to any further end, and the grovelling worſhippers believed that by their ſacrifices they purchaſed the favour of their deities. When once this notion was entertained, human ſacrifices were ſoon introduced; for it naturally occurred to thoſe who offered them, that what they moſt valued themſelves would be moſt acceptable to their offended gods, (ſee the next article.) By the Jewiſh law, theſe abominable offerings were ſtrictly forbidden, and the whole ritual of ſacrifice reſtored to its original purity, though not ſimplicity.

All Chriſtian churches, the Socinian, if it can be called a church, not excepted, have till very lately agreed in believing that the Jewiſh ſacrifices ſerved, amongſt other uſes, for types of the death of Chriſt and the Chriſtian worſhip, (ſee TYPE.) In this belief all ſober Chriſtians agree ſtill, whilſt many are of opinion that they were likewiſe fœderal rites, as they certainly were conſidered by the antient Romans.

Of the various kinds of Jewiſh ſacrifices, and the ſubordinate ends for which they were offered, a full account is given in the books of Moſes. When an Iſraelite offered a loaf or a cake, the prieſt broke it in two parts; and, ſetting aſide that half which he reſerved for himſelf, broke the other into crumbs, poured oil, wine, incenſe, and ſalt upon it, and ſpread the whole upon the fire of the altar. If theſe offerings were accompanied with the ſacrifice of an animal, they were thrown upon the victim, to be conſumed along with it. If the offerings were of the ears of new corn, they were parched at the fire, rubbed in the hand, and then offered to the prieſt in a veſſel, over which he poured oil, incenſe, wine, and ſalt, and then burnt it upon the altar, having firſt taken as much of it as of right belonged to himſelf.

The principal ſacrifices among the Hebrews conſiſted of bullocks, ſheep, and goats; but doves and turtles were accepted from thoſe who were not able to bring the other: theſe beaſts were to be perfect, and without blemiſh. The rites of ſacrificing were various; all of which are very minutely deſcribed in the books of Moſes.

The manner of ſacrificing among the Greeks and Romans was as follows. In the choice of the victim, they took care that it was without blemiſh or imperfection; its tail was not to be too ſmall at the end; the tongue not black, nor the ears cleft; and that the bull was one that had never been yoked. The victim being pitched upon, they gilt the forehead and horns, eſpecially if a bull, heifer, or cow. The head they alſo adorned with a garland of flowers, a woollen infula or holy fillet, whence hung two rows of chaplets with twiſted ribbands; and on the middle of the body a kind of ſtole, pretty large, hung down on each ſide: the leſſer victims were only adorned with garlands and bundles of flowers, together with white tufts or wreaths.

The victims thus prepared were brought before the altar; the leſſer being driven to the place, and the greater led by a halter; when, if they made any ſtruggle, or refuſed to go, the reſiſtance was taken for an ill omen, and the ſacrifice frequently ſet aſide. The victim thus brought was carefully examined, to ſee that there was no defect in it; then the prieſt, clad in his ſacerdotal habit, and accompanied with the ſacrificers and other attendants, and being waſhed and purified according to the ceremonies preſcribed, turned to the right hand, and went round the altar,

ſprinkling it with meal and holy water, and alſo beſprinkling thoſe who were preſent. Then the crier proclaimed with a loud voice, Who is here? To which the people replied, Many and good. The prieſt then, having exhorted the people to join with him, by ſaying Let us pray, confeſſed his own unworthineſs, acknowledging that he had been guilty of divers ſins; for which he begged pardon of the gods, hoping that they would be pleaſed to grant his requeſts, accept the oblations offered them, and ſend them all health and happineſs; and to this general form added petitions for ſuch particular favours as were then deſired. Prayers being ended, the prieſt took a cup of wine, and, having taſted it himſelf, cauſed his aſſiſtants to do the like; and then poured forth the remainder between the horns of the victim. Then the prieſt or the crier, or ſometimes the moſt honourable perſon in the company, killed the beaſt, by knocking it down or cutting its throat. If the ſacrifice was in honour of the celeſtial gods, the throat was turned up towards heaven; but if they ſacrificed to the heroes or infernal gods, the victim was killed with its throat towards the ground. If by accident the beaſt eſcaped the ſtroke, leaped up after it, or expired with pain and difficulty, it was thought to be unacceptable to the gods. The beaſt being killed, the prieſt inſpected its entrails, and made predictions from them. They then poured wine, together with frankincenſe, into the fire, to increaſe the flame, and then laid the ſacrifice on the altar; which in the primitive times was burnt whole to the gods, and thence called a *holocauſt*; but in after-times, only part of the victim was conſumed in the fire, and the remainder reſerved for the ſacrificers; the thighs, and ſometimes the entrails, being burnt to their honour, the company feaſted upon the reſt. During the ſacrifice, the prieſt, and the perſon who gave the ſacrifice, jointly prayed, laying their hand upon the altar. Sometimes they played upon muſical inſtruments in the time of the ſacrifice, and on ſome occaſions they danced round the altar ſinging ſacred hymns in honour of the god.

Human SACRIFICES, an abominable practice, about the origin of which different opinions have been formed.—The true account ſeems to be that which we have given in the preceding article. When men had gone ſo far as to indulge the fancy of bribing their gods by ſacrifice, it was natural for them to think of enhancing the value of ſo cheap an *atonement* by the coſt and rarity of the offering; and, oppreſſed with their malady, they never reſted till they had got to that which they conceived to be the moſt precious of all, a human ſacrifice. "It was cuſtomary (ſays Sanchoniathon), in antient times, in great and public calamities, before things became incurable, for princes and magiſtrates to offer up in ſacrifice to the avenging dæmons the deareſt of their offspring." Sanchoniathon wrote of Phœnicia, but the practice prevailed in every nation under heaven of which we have received any antient account. The Egyptians had it in the early part of their monarchy. The Cretans likewiſe had it, and retained it for a longer time. The nations of Arabia did the ſame. The people of Dumah, in particular, ſacrificed every year a child, and buried it underneath an altar, which they made uſe of inſtead of an idol; for they did not admit of images. The Perſians buried people alive. Ameſtris, the wife of Xerxes, entombed 12 perſons quick under ground for the good of her ſoul. It would be endleſs to enumerate every city, or every province, where theſe dire practices obtained. The Cyprians, the Rhodians, the Phoceans, the Ionians, thoſe of Chios, Leſbos, Tenedos, all had human ſacrifices. The natives of the Tauric Cherſoneſus offered up to Diana every ſtranger whom chance threw upon their coaſt. Hence aroſe that juſt expoſtulation in Euripides upon the inconſiſtency of the proceeding; wherein much good reaſoning is implied. Iphigenia wonders, as the goddeſs delighted in the blood of men, that every villain and murderer ſhould be privileged to eſcape, nay, driven from the threſhold of the temple; whereas, if an honeſt and virtuous man chanced to ſtray thither, he was only ſeized upon, and put to death. The Pelaſgi, in a time of ſcarcity, vowed the tenth of all that ſhould be born to them for a ſacrifice, in order to procure plenty. Ariſtomenes the Meſſenian ſlew 300 noble Lacedemonians, among whom was Theopompus the king of Sparta, at the altar of Jupiter at Ithome. Without doubt the Lacedemonians did not fail to make ample returns; for they were a ſevere and revengeful people, and offered the like victims to Mars. Their feſtival of the Diamaſtigoſis is well known; when the Spartan boys were whipped in the ſight of their parents with ſuch ſeverity before the altar of Diana Orthia, that they often expired under the torture. Phylarchus affirms, as he is quoted by Porphyry, that of old every Grecian ſtate made it a rule, before they marched towards an enemy, to ſolicit a bleſſing on their undertakings by human victims.

The Romans were accuſtomed to the like ſacrifices. They both devoted themſelves to the infernal gods, and conſtrained others to ſubmit to the ſame horrid doom. Hence we read in Titus Livius, that, in the conſulate of Æmilius Paulus and Terentius Varro, two Gauls, a man and a woman, and two in like manner of Greece, were buried alive at Rome in the ox-market, where was a place under ground, walled round, to receive them; which had before been made uſe of for ſuch cruel purpoſes. He ſays it was a ſacrifice not properly Roman, that is, not originally of Roman inſtitution; yet it was frequently practiſed there, and that too by public authority. Plutarch makes mention of a like inſtance a few years before, in the conſulſhip of Flaminius and Furius. There is reaſon to think, that all the principal captives who graced the triumphs of the Romans, were at the cloſe of that cruel pageantry put to death at the altar of Jupiter Capitolinus. Caius Marius offered up his own daughter for a victim to the Dii Averrunci, to procure ſucceſs in a battle againſt the Cimbri; as we are informed by Dorotheus, quoted by Clemens. It is likewiſe atteſted by Plutarch, who ſays that her name was *Calpurnia*. Marius was a man of a ſour and bloody diſpoſition; and had probably heard of ſuch ſacrifices being offered in the enemy's camp, among whom they were very common, or he might have beheld them exhibited at a diſtance; and therefore murdered what was neareſt, and ſhould have been deareſt to him, to counteract their fearful ſpells, and outwit them in their wicked machinery. Cicero, making mention of this cuſtom being common in Gaul, adds, that it prevailed among the people even at the time he was ſpeaking; from whence we may be led to infer, that it was then diſcontinued among the Romans. And we are told by Pliny, that it had then, and not very long, been diſcouraged. For there was a law enacted, when Lentulus and Craſſus were conſuls, ſo late as the 657th year of Rome, that there ſhould be no more human ſacrifices: for till that time thoſe horrid rites had been celebrated in broad day without any maſk or controul; which, had we not the beſt evidence for the fact, would appear ſcarce credible. And however they may have been diſcontinued for a time, we ſind that they were again renewed; though they became not ſo public, nor ſo general. For, not very long after this, it is reported of Auguſtus Cæſar, when Peruſia ſurrendered in the time of the ſecond triumvirate, that beſides multitudes executed in a military manner, he offered up, upon the Ides of March, 300 choſen perſons, both of the equeſtrian and ſenatorial order, at an altar dedicated to the manes of his uncle Julius. Even at Rome itſelf this cuſtom was revived: and Porphyry aſſures us, that in his time a man was every year ſacrificed at the ſhrine of Jupiter Latialis. Heliogabalus offered the like victims to the Syrian deity which he introduced among the Romans. The ſame is ſaid of Aurelian.

The Gauls and the Germans were ſo devoted to this ſhocking

custom, that no business of any moment was transacted among them without being prefaced with the blood of men. They were offered up to various gods; but particularly to Hesus, Taranis, and Thautates. These deities are mentioned by Lucan, where he enumerates the various nations who followed the fortunes of Cæsar.

The altars of these gods were far removed from the common resort of men; being generally situated in the depth of woods, that the gloom might add to the horror of the operation, and give a reverence to the place and proceeding. The persons devoted were led thither by the Druids, who presided at the solemnity, and performed the cruel offices of the sacrifice. Tacitus takes notice of the cruelty of the Hermunduri, in a war with the Catti, wherein they had greatly the advantage; at the close of which they made one general sacrifice of all that was taken in battle. The poor remains of the legions under Varus suffered in some degree the same fate. There were many places destined for this purpose all over Gaul and Germany; but especially in the mighty woods of Arduenna, and the great Hercynian forest; a wild that extended above 30 days journey in length. The places set apart for this solemnity were held in the utmost reverence, and only approached at particular seasons. Lucan mentions a grove of this sort near Massilia, which even the Roman soldiers were afraid to violate, though commanded by Cæsar. It was one of those set apart for the sacrifices of the country.

Claudian compliments Stilicho, that, among other advantages accruing to the Roman armies through his conduct, they could now venture into the awful forest of Hercynia, and follow the chace in those so much dreaded woods, and otherwise make use of them.

These practices prevailed among all the people of the north, of whatever denomination. The Massagetæ, the Scythians, the Getes, the Sarmatians, all the various nations upon the Baltic, particularly the Suevi and Scandinavians, held it as a fixed principle, that their happiness and security could not be obtained but at the expense of the lives of others. Their chief gods were Thor and Woden, whom they thought they could never sufficiently glut with blood. They had many very celebrated places of worship; especially in the island of Rugen, near the mouth of the Oder; and in Zeeland: some, too, very famous among the Semnones and Naharvalli. But the most reverenced of all, and the most frequented, was at Upsal; where there was every year a grand celebrity, which continued for nine days. During this term they sacrificed animals of all sorts: but the most acceptable victims, and the most numerous, were men. Of these sacrifices none were esteemed so auspicious and salutary as a sacrifice of the prince of the country. When the lot fell for the king to die, it was received with universal acclamations and every expression of joy; as it once happened in the time of a famine, when they cast lots, and it fell to king Domalder to be the people's victim: and he was accordingly put to death. Olaus Tretelger, another prince, was burnt alive to Woden. They did not spare their own children. Harald the son of Gunild, the first of that name, slew two of his children to obtain a storm of wind. "He did not let (says Verstegan) to sacrifice two of his sons unto his idols, to the end he might obtain of them such a tempest at sea, as should break and disperse the shipping of Harald king of Denmark." Saxo Grammaticus mentions a like fact. He calls the king Haquin; and speaks of the persons put to death as two very hopeful young princes. Another king slew nine sons to prolong his own life; in hopes, perhaps, that what they were abridged of would in great measure be added to himself. Such instances, however, occur not often: but the common victims were without end. Adam Bremensis, speaking of the awful grove at Upsal, where these horrid rites were celebrated, says, that there was not a single tree but what was reverenced, as if it were gifted with some portion of divinity: and all this because they were stained with gore and foul with human putrefaction. The same is observed by Scheiffer in his account of this place.

The manner in which the victims were slaughtered was diverse in different places. Some of the Gaulish nations chined them with a stroke of an ax. The Celtæ placed the man who was to be offered for a sacrifice upon a block, or an altar, with his breast upwards, and with a sword struck him forcibly across the sternum; then tumbling him to the ground, from his agonies and convulsions, as well as from the effusion of blood, they formed a judgment of future events. The Cimbri ripped open the bowels; and from them they pretended to divine. In Norway they beat men's brains out with an ox-yoke. The same operation was performed in Iceland, by dashing them against an altar of stone. In many places they transfixed them with arrows. After they were dead, they suspended them upon the trees, and left then to putrefy. One of the writers above quoted mentions that in his time 70 carcases of this sort were found in a wood of the Suevi. Dithmar of Mersburgh, an author of nearly the same age, speaks of a place called *Ledur* in Zeeland, where there were every year 99 persons sacrificed to the god Swantowite. During these bloody festivals a general joy prevailed, and banquets were most royally served. They fed, caroused, and gave a loose to indulgence, which at other times was not permitted. They imagined that there was something mysterious in the number nine: for which reason these feasts were in some places celebrated every ninth year, in others every ninth month; and continued for nine days. When all was ended, they washed the image of the deity in a pool; and then dismissed the assembly. Their servants were numerous, who attended during the term of their feasting, and partook of the banquet. At the close of all, they were smothered in the same pool, or otherwise made away with. On which Tacitus remarks, how great an awe this circumstance must necessarily infuse into those who were not admitted to these mysteries.

These accounts are handed down from a variety of authors in different ages; many of whom were natives of the countries which they describe, and to which they seem strongly attached. They would not therefore have brought so foul an imputation on the part of the world in favour of which they were each writing, nor could there be that concurrence of testimony, were not the history in general true.

The like custom prevailed to a great degree at Mexico, and even under the mild government of the Peruvians; and in most parts of America. In Africa it is still kept up, where, in the inland parts, they sacrifice some of the captives taken in war to their fetiches, in order to secure their favour. Snelgrave was in the king of Dahoome's camp after his inroad into the countries of Ardra and Whidaw; and says that he was a witness to the cruelty of this prince, whom he saw sacrifice multitudes to the deity of his nation.

The same abominable worship is likewise practised occasionally in the islands visited by Captain Cook, and other circumnavigators, in the South Sea. It seems indeed to have prevailed in every country at one period of the progress of civilization, and undoubtedly had the origin which we have assigned to it.

The sacrifices of which we have been treating, if we except some few instances, consisted of persons doomed by the chance of war, or assigned by lot, to be offered. But among the nations of Canaan, the victims were peculiarly chosen. Their own children, and whatever was nearest and dearest to them, were deemed the most worthy offering to their god. The Carthaginians, who were a colony from Tyre, carried with them the religion of thei mother-country, and instituted the same worship in the parts where they settled. It consisted in the adoration of several deities, but particularly of Kronus; to whom they offered human sacri-

fices, and especially the blood of children. If the parents were not at hand to make an immediate offer, the magistrates did not fail to make choice of what was most fair and promising, that the god might not be defrauded of his dues.. Upon a check being received in Sicily, and some other alarming circumstauces happening, Hamilcar without any hesitation laid hold of a boy, and offered him on the spot to Kronus; and at the same time drowned a number of priests, to appease the deity of the sea. The Carthaginians another time, upon a great defeat of their army by Agathocles, imputed their miscarriages to the anger of this god, whose services had been neglected. Touched with this, and seeing the enemy at their gates, they seized at once 300 children of the prime nobility, and offered them in public for a sacrifice. Three hundred more, being persons who were somehow obnoxious, yielded themselves voluntarily, and were put to death with the others. The neglect of which they accused themselves, consisted in sacrificing children purchased of parents among the poorer sort who reared them for that purpose, and not selecting the most promising, and the most honourable, as had been the custom of old. In short, there were particular children brought up for the altar, as sheep are fattened for the shambles; and they were brought and butchered in the same manner. But this indiscriminate way of proceeding was thought to have given offence. It is remarkable that the Egyptians looked out for the most specious and handsome person to be sacrificed. The Albanians pitched upon the best man of the community, and made him pay for the wickedness of the rest. The Carthaginians chose what they thought the most excellent, and at the same time the most dear to them: which made the lot fall heavy upon their children. This is taken notice of by Silius Italicus in his fourth book.

Kronus, to whom these sacrifices were exhibited, was an oriental deity, the god of light and fire; and therefore always worshipped with some reference to that element. See PHŒNICIA.

The Greeks, we find, called the deity to whom these offerings were made *Agraulos*; and feigned that she was a woman, and the daughter of Cecrops. But how came Cecrops to have any connection with Cyprus? Agraulos is a corruption and transposition of the original name, which should have been rendered *Uk El Aur* or *Uk El Aurus*; but has like many other oriental titles and names, been strangely sophisticated, and is here changed to Agraulos. It was in reality the god of light, who was always worshipped with fire. This deity was the Moloch of the Tyrians and Canaanites, and the Melech of the east; that is, the great and principal god, the god of light, of whom fire was esteemed a symbol; and at whose shrine, instead of viler victims, they offered the blood of men.

Such was the Kronus of the Greeks, and the Moloch of the Phœnicians: and nothing can appear more shocking than the sacrifices of the Tyrians and Carthaginians, which they performed to this idol. In all emergencies of state, and times of general calamity, they devoted what was most necessary and valuable to them for an offering to the gods, and particularly to Moloch. But besides these undetermined times of bloodshed, they had particular and prescribed seasons every year, when children were chosen out of the most noble and reputable families, as before mentioned. If a person had an only child, it was the more liable to be put to death, as being esteemed more acceptable to the deity, and more efficacious for the general good. Those who were sacrificed to Kronus were thrown into the arms of a molten idol, which stood in the midst of a large fire, and was red with heat. The arms of it were stretched out, with the hands turned upwards, as it were to receive them; yet sloping downwards, so that they dropt from thence into a glowing furnace below. To other gods they were otherwise slaughtered, and, as it is implied, by the very hands of their parents. What can be more horrid to the imagination, than to suppose a father leading the dearest of all his sons to such an infernal shrine? or a mother the most engaging and affectionate of her daughters, just rising to maturity, to be slaughtered at the altar of Ashtaroth or Baal? Justin describes this unnatural custom very pathetically: *Quippe homines, ut victimas, immolabant: et impuberes (quæ ætas hostium misericordiam provocat) aris admovebant; pacem sanguine eorum exposcentes, pro quorum vita Dii rogari maxime solent.* Such was their blind zeal, that this was continually practised; and so much of natural affection still left unextinguished, as to render the scene ten times more shocking from the tenderness which they seemed to express. They embraced their children with great fondness, and encouraged them in the gentlest terms, that they might not be appalled at the sight of the hellish process; begging of them to submit with cheerfulness to this fearful operation. If there was any appearance of a tear rising, or a cry unawares escaping, the mother smothered it with her kisses, that there might not be any show of backwardness or constraint, but the whole be a free-will offering. These cruel endearments over, they stabbed them to the heart, or otherwise opened the sluices of life; and with the blood warm, as it ran, besmeared the altar and the grim visage of the idol. These were the customs which the Israelites learned of the people of Canaan, and for which they are upbraided by the psalmist: "They did not destroy the nations, concerning whom the Lord commanded them; but were mingled among the heathen, and learned their works: yea, they sacrificed their sons and their daughters unto devils, and shed innocent blood, even the blood of their sons and of their daughters, whom they sacrificed unto the idols of Canaan; and the land was polluted with blood. Thus were they defiled with their own works, and went a whoring with their own inventions."

These cruel rites, practised in so many nations, made Plutarch debate with himself, "Whether it would not have been better for the Galatæ, or for the Scythians, to have had no tradition or conception of any superior beings, than to have formed to themselves notions of gods who delighted in the blood of men; of gods, who esteemed human victims the most acceptable and perfect sacrifice? Would it not (says he) have been more eligible for the Carthaginians to have had the atheist Critias, or Diagoras, their lawgiver, at the commencement of their polity, and to have been taught, that there was neither god nor dæmon, than to have sacrificed, in the manner they were wont, to the god which they adored? Wherein they acted, not as the person did whom Empedocles describes in some poetry, where he exposes this unnatural custom. The sire there with many idle vows offers up unwittingly his son for a sacrifice; but the youth was so changed in feature and figure, that his father did not know him. These people used, knowingly and wilfully, to go through this bloody work, and slaughter their own offspring. Even they who were childless would not be exempted from this cursed tribute; but purchased children, at a price, of the poorer sort, and put them to death with as little remorse as one would kill a lamb or a chicken. The mother, who sacrificed her child, stood by, without any seeming sense of what she was losing, and without uttering a groan. If a sigh did by chance escape, she lost all the honour which she proposed to herself in the offering, and the child was notwithstanding slain. All the time of this ceremony, while the children were murdering, there was a noise of clarions and tabors sounding before the idol, that the cries and shrieks of the victims might not be heard. "Tell me now (says Plutarch), if the monsters of old, the Typhons, and the giants, were to expel the gods, and to rule the world in their stead; could they require a service more horrid than these infernal rites and sacrifices?"

SACRILEGE, SACRILEGIUM, the crime of profaning sacred things, or things devoted to God; or of alienating to laymen, or common purposes, what was given to religious persons and pious uses.

SACRISTAN, a church officer, otherwise called SEXTON.

SACRISTY, in church-history, an apartment in a church

where the facred utenfils were kept, being the fame with our VESTRY.

SADDLE, is a feat upon a horfe's back, contrived for the conveniency of the rider.

A hunting faddle is compofed of two bows, two bands, fore-bolfters, pannels, and faddle-ftraps; and the great faddle has befides thefe parts, corks, hind-bolfters, and a trouffequin.

The pommel is common to both.

SADDUCEES, were a famous fect among the antient Jews, and confifted of perfons of great quality and opulence. Refpecting their origin there are various accounts and various opinions. Epiphanius, and after him many other writers, contend that they took their rife from Dofitheus a fectary of Samaria, and their name from the Hebrew word צדק *Juft* or *Juftice*, from the great juftice and equity which they fhowed in all their actions; a derivation which neither fuits the word *Sadducee* nor the general character of the fect. They are thought by fome too to have been Samaritans; but this is by no means probable, as they always attended the worfhip and facrifices at Jerufalem, and never at Gerizzim.

In the Jewifh Talmud we are told that the Sadducees derived their name from *Sadoc*, and that the fect arofe about 260 years before Chrift, in the time of Antigonus of Socho, prefident of the Sanhedrim at Jerufalem, and teacher of the law in the principal divinity fchool of that city. He had often in his lectures, it feems, taught his fcholars, that they ought not to ferve God as flaves do their mafters, from the hopes of a reward, but merely out of filial love for his own fake; from which Sadoc and Baithus inferred that there were no rewards at all after this life. They therefore feparated from their mafter, and taught that there was no refurrection nor future ftate. This new doctrine quickly fpread, and gave rife to the fect of Sadducees, which in many refpects refembled the EPICUREANS.

Dr. Prideaux think, that the Sadducees were at firft no more than what the Caraites are now; that is, they would not receive the traditions of the elders, but ftuck to the written word only; and the Pharifees being great promoters of thofe traditions, hence thefe two fects became directly oppofite to each other. See *Prideaux's Conn.* part. ii. b. 2 and 3. and fee alfo PHARISEES and CARAITES.

Afterwards the Sadducees imbibed other doctrines, which rendered them a fect truly impious; for they denied the refurrection of the dead, and the exiftence of angels, and of the fpirits or fouls of men departed (Mat. xxii. 23. Acts xxiii. 8.) They held, that there is no fpiritual being but God only; that, as to man, this world is his all. They did not deny but that we had reafonable fouls; but they maintained this foul was mortal; and, by a neceffary confequence, they denied the rewards and punifhments of another life. They pretended alfo, that what is faid of the exiftence of angels, and of a future refurrection, are nothing but illufions. St. Epiphanius, and after him St. Auftin, have advanced, than the Sadducees denied the Holy Ghoft. But neither Jofephus nor the evangelifts accufe them of any error like this. It has been alfo imputed to them, that they thought God corporeal, and that they received none of the prophecies.

It is pretty difficult to apprehend how they could deny the being of angels, and yet receive the books of Mofes, where fuch frequent mention is made of angels, and of their appearances. Grotius and M. Le Clerc obferve that it is very likely they looked upon angels, not as particular beings, fubfifting of themfelves, but as powers, emanations, or qualities, infeparable from the Deity, as the fun beams are infeparable from the fun. Or perhaps they held angels not to be fpiritual but mortal; juft as they thought that fubftance to be which animates us and thinks in us. The antients do not tell us how they folved this difficulty, that might be urged againft them from fo many paffages of the Pentateuch where mention is made of angels.

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As the Sadducees acknowledged neither punifhments nor recompenfes in another life, fo they were inexorable in their chaftifing of the wicked. They obferved the law themfelves, and caufed it to be obferved by others with the utmoft rigour. They admitted of none of the traditions, explications, or modifications, of the Pharifees; they kept only to the text of the law; and maintained, that only what was written was to be obferved.

The Sadducees are accufed of rejecting all the books of Scripture except thofe of Mofes; and to fupport this opinion, it is obferved that our Saviour makes ufe of no Scripture againft them, but paffages taken out of the Pentateuch. But Scaliger produces good proofs to vindicate them from this reproach. He obferves that they did not appear in Ifrael till after the number of the holy books was fixed; and that if they had been to choofe out of the canonical Scriptures, the Pentateuch was lefs favourable to them than any other book, fince it often makes mention of angels and their apparition. Befides, the Sadducees were prefent in the temple and at other religious affemblies, where the books of the prophets were read indifferently as well as thofe of Mofes. They were in the chief employs of the nation, many of them were even priefts. Would the Jews have fuffered in thefe employments perfons that rejected the greateft part of their Scriptures? Menaffe-ben-Ifrael fays exprefsly, that indeed they did not reject the prophets, but that they explained them in a fenfe very different from that of the other Jews.

Jofephus affures us that they denied deftiny or fate; alleging, that thefe were only founds void of fenfe, and that all the good or evil that happens to us is in confequence of the good or evil fide we have taken, by the free choice of our will. They faid alfo, that God was far removed from doing or knowing evil, and that man was the abfolute mafter of his own actions. This was roundly to deny a providence; and upon this footing I know not, fays F. Calmet, what could be the religion of the Sadducees, or what influence they could afcribe to God in things here below. However, it is certain they were not only tolerated among the Jews, but that they were admitted to the high priefthood itfelf. John Hircanus, high-prieft of that nation, feparated himfelf in a fignal manner from the fect of the Pharifees, and went over to that of Sadoc. It is faid alfo, he gave ftrict command to all the Jews, on pain of death, to receive the maxims of this fect. Ariftobulus and Alexander Jannæus, fon of Hircanus, continued to favour the Sadducees; and Maimonides affures us, that under the reign of Alexander Jannæus they had in poffeffion all the offices of the Sanhedrim, and that there only remained of the party of the Pharifees, Simon the fon of Secra. Caiaphas, who condemned Jefus Chrift to death, was a Sadducee (Acts v. 17. iv. 1.); as alfo Ananus the younger, who put to death St. James the brother of our Lord. At this day, the Jews hold as heretics that fmall number of Sadducees that are to be found among them. See upon this matter *Serrar. Triharef. Menaffe ben-Ifrael, de Refurrectione mortuorum*; *Bafnage's Hiftory of the Jews*, &c.; and *Calmet's Differtation upon the Sects of the Jews* before *the Commentary of St. Mark*.

The fect of the Sadducees was much reduced by the deftruction of Jerufalem, and by the difperfion of the Jews; but it revived afterwards. At the beginning of the third century it was fo formidable in Egypt, that Ammonim, Origen's mafter, when he faw them propagate their opinions in that country, thought himfelf obliged to write againft them, or rather againft the Jews, who tolerated the Sadducees, though they denied the fundamental points of their religion. The emperor Juftinian mentions the Sadducees in one of his novels, banifhes them out of all the places of his dominions, and condemns them to the fevereft punifhments, as people that maintained atheiftical and impious tenets; denying the refurrection and the laft judgment. Annus, or Ananus, a difciple of Juda, fon of Nachman, a famous rabbin of the 8th century, declared himfelf, as it is faid, in favour of the Sadducees

cees, and ſtrenuouſly protected them againſt their adverſaries. They had alſo a celebrated defender in the 12th century, in the perſon of Alpharag, a Spaniſh rabbin. This doctor wrote againſt the Phariſees, the declared enemies of the Sadducees; and maintained by his public writings, that the purity of Judaiſm was only to be found among the Sadducees; that the traditions avowed by the Phariſees were uſeleſs; and that the ceremonies, which they had multiplied without end, were an inſupportable yoke. The rabbi Abraham-ben-David Italleri replied to Alpharag, and ſupported the ſect of the Phariſees by two great arguments, that of their univerſality and that of their antiquity. He proved their antiquity by a continued ſucceſſion from Adam down to the year 1167: and their univerſality becauſe the Phariſees are ſpread all the world over, and are found in all the ſynagogues. There are ſtill Sadducees in Africa and in ſeveral other places. They deny the immortality of the ſoul, and the reſurrection of the body; but they are rarely found, at leaſt there are but few who declare themſelves for theſe opinions.

SADLER (John), was deſcended from an antient family, in Shropſhire; born in 1615; and educated at Cambridge, where he became eminent for his great knowledge in the oriental languages. He removed to Lincoln's-Inn, where he made no ſmall progreſs in the ſtudy of the law; and in 1644 was admitted one of the maſters in chancery, as alſo one of the two maſters of requeſts. In 1649 he was choſen town-clerk of London, and the ſame year publiſhed his *Rights of the Kingdom*. He was greatly eſteemed by Oliver Cromwell, by whoſe ſpecial warrant he was continued a maſter in chancery, when their number was reduced to ſix. By his intereſt it was that the Jews obtained the privilege of building for themſelves a ſynagogue in London. In 1658 he was made member of parliament for Yarmouth; and next year was appointed firſt commiſſioner under the great ſeal with Mr. Taylor, Mr. Whitelocke, and others, for the probate of wills. In 1660. he publiſhed his *Olbia*. Soon after the Reſtoration, he loſt all his employments. In the fire of London in 1666, he was a great ſufferer; which obliged him to retire to his ſeat of Warmwell in Dorſetſhire, where he lived in a private manner till 1674, when he died.

SADOC, a famous Jewiſh rabbi, and founder of the ſect of the Sadducees

SADOLET (James), a polite and learned cardinal of the Romiſh church, born at Modena in 1477. Leo X. made him and Peter Bembus his ſecretaries, an office for which they were both qualified; and Sadolet was ſoon after made biſhop of Carpentras, near Avignon: he was made a cardinal in 1536 by Paul III. and employed in ſeveral negotiations and embaſſies. He died in 1547, not without ſuſpicion of poiſon, for correſponding too familiarly with the Proteſtants, and for teſtifying too much regard for ſome of their doctors. His works, which are all in Latin, were collected in 1607 at Mentz, in one volume 8vo. All his cotemporaries ſpoke of him in the higheſt terms.

SAFE guard, a protection formerly granted to a ſtranger who feared violence from ſome of the king's ſubjects for ſeeking his right by courſe of law.

Safe-*Conduct*, is a ſecurity given by a prince under the great ſeal, to a ſtranger for his *ſafe-coming* into and paſſing out of the realm; the form whereof is in *Reg. Orig.* 25. There are letters of ſafe conduct which muſt be enrolled in chancery; and the perſons to whom granted muſt have them ready to ſhow; and touching which there are ſeveral ſtatutes. See Prerogative.

SAFFRON, in the materia medica, is formed of the ſtigmata of the crocus officinalis, (ſee Crocus) dried on a kiln, and preſſed together into cakes. Of this there are two kinds, the Engliſh and Spaniſh; of which the latter is by far the moſt eſteemed. Saffron is principally cultivated in Cambridgeſhire, in a circle of about ten miles diameter. The greateſt part of this tract is an open level country, with few incloſures; and the cuſtom there is, as in moſt other places, to crop two years, and let the land be fallow the third. Saffron is generally planted upon fallow-ground, and, all other things being alike, they prefer that which has borne barley the year before.

The ſaffron ground is ſeldom above three acres, or leſs than one; and in chooſing, the principal thing they have regard to is, that they be well expoſed, the ſoil not poor, nor a very ſtiff clay, but a temperate dry mould, ſuch as commonly lies upon chalk, and is of a hazel colour; though, if every thing elſe anſwers, the colour of the mould is pretty much neglected.

The ground being made choice of, about Lady-day or the beginning of April, it muſt be carefully ploughed, the furrows being drawn much cloſer together, and deeper if the ſoil will allow it, than is done for any kind of corn; and accordingly the charge is greater.

About five weeks after, during any time in the month of May, they lay between 20 and 30 loads of dung upon each acre; and having ſpread it with great care, they plough it in as before. The ſhorteſt rotten dung is the beſt; and the farmers who have the conveniency of making it, ſpare no pains to make it good, being ſure of a proportionable price for it. About midſummer they plough a third time, and between every 16 feet and a half they leave a broad furrow or trench, which ſerves both as a boundary to the ſeveral parcels, and for throwing the weeds into at the proper ſeaſon. The time of planting is commonly in the month of July. The only inſtrument uſed at this time is a ſmall narrow ſpade, commonly called a *ſpit-ſhovel*. The method is this: One man with his ſhovel raiſes about three or four inches of earth, and throws it before him about ſix or more inches. Two perſons, generally women, follow with roots, which they place in the furtheſt edge of the trench made by the digger, at about three inches from each other. As ſoon as the digger has gone once the breadth of the ridge, he begins again at the other ſide; and, digging as before, covers the roots laſt ſet, which makes room for another row of roots at the ſame diſtance from the firſt that they are from one another. The only dexterity neceſſary in digging is, to leave ſome part of the firſt ſtratum of earth untouched, to lie under the roots; and, in ſetting, to place the roots directly upon their bottom. The quantity of roots planted on an acre is generally about 16 quarters, or 128 buſhels. From the time of planting till the beginning of September, or ſometimes later, there is no more labour required; but at that time they begin to vegetate, and are ready to ſhow themſelves above ground, which may be known by digging up a few of the roots. The ground is then to be pared with a ſharp hoe, and the weeds raked into the furrows, otherwiſe they would hinder the growth of the ſaffron. In ſome time after, the flowers appear.

They are gathered before they are full blown, as well as after, and the proper time for it is early in the morning. The owners of the ſaffron-fields get together a ſufficient number of hands, who pull off the whole flowers, and throw them by handfuls into a baſket, and ſo continue till about 11 o'clock. Having then carried home the flowers, they immediately fall to picking out the ſtimata or chives, and together with a them pretty large proportion of the ſtylus itſelf, or ſtring to which they are attached: the reſt of the flower they throw away as uſeleſs. Next morning they return to the field without regarding whether the weather be wet or dry; and ſo on daily, even on Sundays, till the whole crop is gathered.—The next labour is to dry the chives on the kiln. The kiln is built upon a thick plank, that it may be moved from place to place. It is ſupported by four ſhort legs: the outſide conſiſts of eight pieces of wood of three

inches thick, in form of a quadrangular frame, about 12 inches ſquare at the bottom on the inſide, and 22 on the upper part; which laſt is likewiſe the perpendicular height of it. On the foreſide is left a hole of about eight inches ſquare, and four inches above the plank, through which the fire is put in; over all the reſt laths are laid pretty thick, cloſe to one another, and nailed to the frame already mentioned. They are then plaſtered over on both ſides, as are alſo the planks at bottom, very thick, to ſerve for a hearth. Over the mouth is laid a hair-cloth, fixed to the edges of the kiln, and likewiſe to two rollers or moveable pieces of wood, which are turned by wedges or ſcrews, in order to ſtretch the cloth. Inſtead of the hair-cloth, ſome people uſe a net-work or iron wire, by which the ſaffron is ſooner dried, and with leſs fuel; but the difficulty of preſerving it from burning makes the hair cloth preferred by the beſt judges. The kiln is placed in a light part of the houſe; and they begin with putting five or ſix ſheets of white paper on the hair-cloth, and upon theſe they lay out the wet ſaffron two or three inches thick. It is then covered with ſome other ſheets of paper, and over theſe they lay a coarſe blanket five or ſix times doubled, or inſtead of this, a canvas pillow filled with ſtraw; and after the fire has been lighted for ſome time, the whole is covered with a board having a conſiderable weight upon it. At firſt they apply a pretty ſtrong heat, to make the chives *ſweat* as they call it; and at this time a great deal of care is neceſſary to prevent burning. When it has been thus dried about an hour, they turn the cakes of ſaffron upſide down, putting on the coverings and weight as before. If no ſiniſter accident happens during theſe firſt two hours, the danger is thought to be over; and nothing more is requiſite than to keep up a very gentle fire for 24 hours, turning the cake every half hour. That fuel is beſt which yields the leaſt ſmoke; and for this reaſon charcoal is preferable to all others.

The quantity of ſaffron produced at a crop is uncertain. Sometimes five or ſix pounds of wet chives are got from one rood, ſometimes not above one or two; and ſometimes not ſo much as is ſufficient to defray the expenſe of gathering and drying. But it is always obſerved, that about five pounds of wet ſaffron go to make one pound of dry for the firſt three weeks of the crop, and ſix pounds during the laſt week. When the heads are planted very thick, two pounds of dry ſaffron may at a medium be allowed to an acre for the firſt crop, and 24 pounds for the two remaining ones, the third being conſiderably larger than the ſecond.

To obtain the ſecond and third crops, the labour of hoeing, gathering, picking, &c. already mentioned, muſt be repeated; and about midſummer, after the third crop is gathered, the roots muſt all be taken up and tranſplanted. For taking up the roots, ſometimes the plough is made uſe of, and ſometimes a forked hoe; and then the ground is harrowed once or twice over. During all the time of ploughing, harrowing, &c. 15 or more people will find work enough to follow and gather the heads as they are turned up. The roots are next to be carried to the houſe in ſacks, where they are cleaned and raſed. This labour conſiſts in cleaning the roots thoroughly from earth, decayed old pieces, involucra, or excreſcences; after which they become fit to be planted in new ground immediately, or they may be kept for ſome time without danger of ſpoiling. The quantity of roots taken up in proportion to thoſe planted is uncertain; but at a medium, 24 quarters of clean roots, fit to be planted, may be had from each acre.—There ſometimes happens a remarkable change in the roots of ſaffron and ſome other plants. As ſoon as they begin to ſhoot upwards, there are commonly two or three large tap-roots ſent forth from the ſide of the old one, which will run two or three inches deep into the ground. At the place where theſe bulbs firſt come out from, the old one will be formed ſometimes, though not always, and the tap-root then decays. The bulb increaſes in bigneſs, and at laſt fails quite off; which commonly happens in April. But many times theſe tap-roots never produce any bulbs, and remain barren for ever after. All ſuch roots therefore ſhould be thrown away in the making a new plantation. This degeneracy of the roots is a diſeaſe for which no cure is as yet known.

When ſaffron is offered to ſale, that kind ought to be choſen which has the broadeſt blades; this being the mark by which Engliſh ſaffron is diſtinguiſhed from the foreign. It ought to be of an orange or fiery-red colour, and to yield a dark yellow tincture. It ſhould be choſen freſh, not above a year old, in cloſe cakes, neither dry nor yet very moiſt, tough and firm in tearing, of the ſame colour within as without, and of a ſtrong, acrid, diffuſive ſmell. This drug has been reckoned a very elegant and uſeful aromatic.

Meadow-Saffron. See Colchicum.

SAGAN, in ſcripture-hiſtory, the ſuffragan or deputy of the Jewiſh high prieſt. According to ſome writers, he was only to officiate for him when he was rendered incapable of attending the ſervice through ſickneſs or legal uncleanneſs on the day of expiation; or, according to others, he was to aſſiſt the high-prieſt in the care of the affairs of the temple and the ſervice of the prieſts.

SAGAPENUM, in pharmacy, &c. a gum-reſin brought to us in two forms; the finer and purer is in looſe granules or ſingle drops; the coarſer kind is in maſſes compoſed of theſe drops of various ſizes, cemented together by a matter of the ſame kind. In either caſe, it is of a firm and compact ſubſtance, conſiderably heavy, and of a reddiſh colour on the outſide, browniſh within, and ſpotted in many places with ſmall yellowiſh or whitiſh ſpecks. Its ſmell is ſtrong and diſagreeable; its taſte acrid and unpleaſant.

It is brought to us from Perſia and the Eaſt Indies. The plant which produces it has never been deſcribed; but it is ſuppoſed to be, as Dioſcorides ſays, of the ferula kind, from the ſeeds and fragments of the ſtalks ſometimes met with in the body of it.

Sagapenum is a very great attenuant, aperient, and diſcutient. It is good in all diſorders of the breaſt that owe their origin to a tough phlegm. It has alſo been found to diſcuſs tumors in the nervous parts in a remarkable manner; and to give relief in habitual head-achs, where almoſt all things elſe have failed. Its doſe is from ten grains to two ſcruples; but it is now ſeldom given alone. It has been found, however, to do great things in aſthmas; in obſtructions of the viſcera, particularly the ſpleen; in nervous complaints; and even in epilepſies. It alſo promotes the menſes, and expels the ſecundines; and is an ingredient in the theriaca, mithridate, and many other of the ſhop compoſitions.

SAGE, in botany. See Salvia.

Sage (Alain Renè), an ingenious French romance-writer, was born at Ruys in Brittany in the year 1667. He had a fine flow of imagination, was a complete maſter of the French and Spaniſh languages, and wrote ſeveral admired romances in imitation of the Spaniſh authors. Theſe were, The Bachelor of Salamanca, 2 vols. 12mo; New Adventures of Don Quixote, 2 vols. 12mo; The Devil on Two Sticks, 2 vols. 12mo; and Gil Blas, 4 vols. 12mo. He produced alſo ſome comedies, and other pieces of pleaſantry; and died in 1747, in a little houſe near Paris, where he ſupported himſelf by writing.

SAGENE, a Ruſſian long meaſure, 500 of which make a verſt: the ſagene is equal to ſeven Engliſh feet.

SAGINA, in botany: A genus of the tetragynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 22d order, *Caryophyllei*. The calyx

is tetraphyllous; the petals four; the capſule is unilocular, quadrivalved, and polyſpermous.

SAGITTARIA, ARROW-HEAD: A genus of the polyandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the fifth order, *Tripetaloideæ*. The male calyx is triphyllous; the corolla tripetalous; the filaments generally about 14; the female calyx is triphyllous; the corolla tripetalous; many piſtils; and many naked ſeeds. There are four ſpecies, of which the moſt remarkable is the ſagittifolia, growing naturally in many parts of England. The root is compoſed of many ſtrong fibres, which ſtrike into the mud; the footſtalks of the leaves are in length proportionable to the depth of the water in which they grow; ſo they are ſometimes almoſt a yard long: they are thick and fungous; the leaves, which float upon the water, are ſhaped like the point of an arrow, the two ears at their baſe ſpreading wide aſunder, and are very ſharp-pointed. The flowers are produced upon long ſtalks which riſe above the leaves, ſtanding in whorls round them at the joints. They conſiſt of three broad white petals, with a cluſter of ſtamina in the middle, which have purple ſummits. There is always a bulb at the lower part of the root, growing in the ſolid earth beneath the mud. This bulb conſtitutes a conſiderable part of the food of the Chineſe; and upon that account they cultivate it. Horſes, goats, and ſwine, eat it; cows are not fond of it.

SAGITTARIUS, the name of one of the ſigns of the zodiac.

SAGO, a ſimple brought from the Eaſt Indies, of conſiderable uſe in diet as a reſtorative. It is produced from a ſpecies of palm-tree (CYCAS *circinalis* L.) growing ſpontaneouſly in the Eaſt Indies without any culture. The progreſs of its vegetation in the early ſtages is very ſlow. At firſt it is a mere ſhrub, thick ſet with thorns, which makes it difficult to come near it; but as ſoon as its ſtem is once formed, it riſes in a ſhort time to the height of 30 feet, is about ſix feet in circumference, and imperceptibly loſes its thorns. Its ligneous bark is about an inch in thickneſs, and covers a multitude of long fibres; which being interwoven one with another, envelop a maſs of a gummy kind of meal. As ſoon as this tree is ripe, a whitiſh duſt, which tranſpires through the pores of the leaves, and adheres to their extremities, proclaims its maturity. The Malais then cut them down near the root, divide them into ſeveral ſections, which they ſplit into quarters; they then ſcoop out the maſs of mealy ſubſtance, which is enveloped by and adheres to the fibres; they dilute it in pure water, and then paſs it through a ſtraining bag of fine cloth, in order to ſeparate it from the fibres. When this paſte has loſt part of its moiſture by evaporation, the Malais throw it into a kind of earthen veſſels, of different ſhapes, where they allow it to dry and harden. This paſte is wholeſome nouriſhing food, and preſerves for many years. The Indians eat it diluted with water, and ſometimes baked or boiled. Through a principle of humanity, they reſerve the fineſt part of this meal for the aged and infirm. A jelly is ſometimes made of it, which is white and of a delicious flavour.

SAGUM, in Roman antiquity, a military habit, open from top to bottom, and uſually faſtened on the right ſhoulder with a buckle or claſp. It was not different in ſhape from the *chlamys* of the Greeks and the *paludamentum* of the generals. The only difference between them was, that the paludamentum was made of a richer ſtuff, was generally of a purple colour, and both longer and fuller than the ſagum.

SAGUNTUM, an ancient town of Spain, now called *Morvedro*, where there are ſtill the ruins of a Roman amphitheatre to be ſeen. The new town is ſeated on a river called *Morvedro*, 15 miles to the north of Valencia, in E. lon. 0. 10. N. lat. 39. 38. It was taken by lord Peterborough in 1706.

SAICK, or SAIQUE, a Turkiſh veſſel, very common in the Levant for carrying merchandize.

SAIDE, the modern name of Sidon. See SIDON.

SAIL, in navigation, an aſſemblage of ſeveral breadths of canvas ſewed together by the liſts, and edged round with cord, faſtened to the yards of a ſhip, to make it drive before the wind. See SHIP. The edges of the cloths, or pieces, of which a ſail is compoſed, are generally ſewed together with a double ſeam; and the whole is ſkirted round at the edges with a cord, called the *bolt-rope*. Although the form of ſails is extremely different, they are all nevertheleſs triangular or quadrilateral figures; or, in other words, their ſurfaces are contained either between three or four ſides. The former of theſe are ſometimes ſpread by a yard, as lateen-ſails; and otherwiſe by a ſtay, as ſtay-ſails; or by a maſt, as ſhoulder of mutton ſails; in all which caſes the foremoſt leech or edge is attached to the ſaid yard, maſt, or ſtay, throughout its whole length. The latter, or thoſe which are four-ſided, are either extended by yards, as the principal ſails of a ſhip; or by yards and booms, as the ſtudding-ſails, drivers, ring-tails, and all thoſe ſails which are ſet occaſionally; or by gaffs and booms, as the main-ſails of ſloops and brigantines.

The principal ſails of a ſhip (Plate 4, fig. 2.) are the courſes or lower ſails *a*; the top ſails *b*, which are next in order above the courſes; and the top gallant ſails *c*, which are expanded above the top-ſails. The *courſes* are the main-ſail, fore-ſail, and mizen, main ſtay-ſail, fore ſtay-ſail, and mizen ſtay-ſail: but more particularly the three firſt. The main-ſtay ſail is rarely uſed except in ſmall veſſels. In all *quadrangular* ſails the upper edge is called the *head*; the ſides or ſkirts are called *leeches*; and the bottom or lower edge is termed the *foot*. If the head is parallel to the foot, the two lower corners are denominated *clues*, and the upper corners earings. In all *triangular* ſails, and in thoſe four-ſided ſails wherein the head is not parallel to the foot, the foremoſt corner at the foot is called the *tack*, and the after lower corner the *clue*; the foremoſt perpendicular or ſloping edge is called the *fore-leech*, and the hindmoſt the *after-leech*. The heads of all *four-ſided ſails*, and the fore-leeches of lateen-ſails, are attached to their reſpective yard or gaff by a number of ſmall cords called *ro-bands*; and the extremities are tied to the yard-arms, or to the peek of the gaff, by earings. The *ſtay ſails* are extended upon ſtays between the maſts, whereon they are drawn up or down occaſionally, as a curtain ſlides upon its rod, and their lower parts are ſtretched out by a tack and ſheet. The clues of a top-ſail are drawn out to the extremities of the lower yard, by two large ropes called the *top-ſail ſheets*; and the clues of the top-gallant ſails are in like manner extended upon the top-ſail yard arms, as exhibited by fig. 2. The *ſtudding-ſails* are ſet beyond the leeches or ſkirts of the main-ſail and fore-ſail, or of the top-ſails or top-gallant ſails of a ſhip. Their upper and lower edges are accordingly extended by poles run out beyond the extremities of the yards for this purpoſe. Thoſe ſails, however, are only ſet in favourable winds and moderate weather.

All ſails derive their name from the maſt, yard, or ſtay, upon which they are extended. Thus, the principal ſail extended upon the main-maſt is called the *main ſail*, *d*; the next above, which ſtands upon the main-top maſt, is termed the *main-top ſail*, *e*; and the higheſt, which is ſpread acroſs the main top-gallant maſt, is named the *main top-gallant ſail*, *f*.

In the ſame manner there is the fore-ſail, *g*; the fore-top-ſail, *h*; and the fore-top-gallant-ſail, *i*; the mizen, *k*; the mizen top-ſail, *l*; and mizen top-gallant ſail, *m*. Thus alſo there is the main-ſtay-ſail, *o*; main-top-maſt ſtay-ſail, *p*; and main top-gallant ſtay-ſail, *q*; with a middle ſtay-ſail which ſtands between the two laſt.

N. B. All theſe ſtay-ſails are between the main and fore maſts.

The ſtay-ſails between the main-maſt and mizen-maſt are the mizen ſtay-ſail, *r*; and the mizen top maſt ſtay-ſail, *s*; and ſometimes a mizen top-gallant ſtay ſail above the latter. The

ſtay-ſails between the foremaſt and the bowſprit are the fore ſtay-ſail, *t*; the fore top maſt ſtay ſail, *u*; and the jib, *x*. There are beſides two ſquare ſails extended by yards under the bowſprit, one of which is called the *ſprit-ſail*, *y*; and the other the *ſprit ſail top-ſail*, *z*. The ſtudding-ſails being extended upon the different yards of the main maſt and fore maſt, are likewiſe named according to their ſtations, the *lower*, *top maſt*, or *top-gallant ſtudding ſails*. The ropes by which the lower yards of a ſhip are hoiſted up to their proper height on the maſts, are called the *jears*. In all other ſails the ropes employed for this purpoſe are called *haliards*.

The principal ſails are then expanded by haliards, ſheets, and bowlines; except the courſes, which are always ſtretched out below by a tack and ſheet. They are drawn up together, or truſſed up, by bunt lines, clue-lines, *d d*; leech lines, *e e*; reef tackles, *f f*; ſlab line, *g*; and ſpiling-lines. As the bunt-lines and leech lines paſs on the other ſide of the ſail, they are expreſſed by the dotted lines in the figure.

The courſes, top-ſails, and top-gallant ſails, are wheeled about the maſt, ſo as to ſuit the various directions of the wind, by braces. The higher ſtudding ſails, and in general all the ſtay-ſails, are drawn down, ſo as to be furled, or taken in, by down-hauls.

Some experienced ſail-makers contend, that it would be of much advantage if many of the ſails of ſhips were made of equal magnitude; in which caſe, when neceſſity required it, they could be interchangeably uſed. For example, as the mizen top-ſail is now made nearly as large as the main-top gallant ſail, it would be eaſy to make the yards, maſts, and ſails, ſo as mutually to ſuit each other. The main and fore-top ſails differ about two feet at head and foot, and from one to three feet in depth. Theſe likewiſe could be eaſily made alike, and in ſome caſes they are ſo. The ſame may be ſaid of the main and fore top-gallant ſails, and of the mizen top-gallant ſail, and main fore royal. The main-ſail and fore-ſail might alſo, with reſpect to their head, be made alike; but as the former has a gore at the leech, and a larger gore at the foot for clearing it of the gallows, boats, &c. which the latter has not, there might be more difficulty in arranging them. The difficulty, however, appears not to be inſurmountable. Theſe alterations, it is thought, would be extremely uſeful in the event of loſing ſails by ſtreſs of weather. Fewer ſails would be thus neceſſary, leſs room would be required to ſtow them, and there would be leſs danger of confuſion in taking them out. But perhaps the utility of theſe alterations will be more felt in the merchant ſervice than in the navy, which latter has always a large ſtore of ſpare ſails, and ſufficient room to ſtow them in order. Thus, too, ſpare yards and maſts might be conſiderably reduced in number, and yet any caſual damages more eaſily repaired at ſea. Top-maſt ſtudding ſails are occaſionally ſubſtituted for awnings, and might, by a very little attention in planning the rigging of a ſhip, be ſo contrived as to anſwer both purpoſes. See Ship-building.

Sail is alſo a name applied to any veſſel beheld at a diſtance under ſail.

To ſet Sail, is to unfurl and expand the ſails upon their reſpective yards and ſtays, in order to begin the action of ſailing.

To make Sail, is to ſpread an additional quantity of ſail, ſo as to increaſe the ſhip's velocity.

To ſhorten Sail, is to reduce or take in part of the ſails, with an intention to diminiſh the ſhip's velocity.

To ſtrike Sail, is to lower it ſuddenly. This is particularly uſed in ſaluting or doing homage to a ſuperior force, or to one whom the law of nations acknowledges as ſuperior in certain regions. Thus all foreign veſſels ſtrike to a Britiſh man of war in the Britiſh ſeas.

SAILING, the movement by which a veſſel is wafted along the ſurface of the water, by the action of the wind upon her ſails.

When a ſhip changes her ſtate of reſt into that of motion, as in advancing out of a harbour, or from her ſtation at anchor, ſhe acquires her motion very gradually, as a body which arrives not at a certain velocity till after an infinite repetition of the action of its weight.

The firſt impreſſion of the wind greatly affects the velocity, becauſe the reſiſtance of the water might deſtroy it; ſince the velocity being but ſmall at firſt, the reſiſtance of the water which depends on it will be very feeble: but as the ſhip increaſes her motion, the force of the wind on the ſails will be diminiſhed; whereas, on the contrary, the reſiſtance of the water on the bow will accumulate in proportion to the velocity with which the veſſel advances. Thus the repetition of the degrees of force which the action of the ſails adds to the motion of the ſhip, is perpetually decreaſing; whilſt, on the contrary, the new degrees added to the effort of reſiſtance on the bow are always augmenting. The velocity is then accelerated in proportion as the quantity added is greater than that which is ſubſtracted: but when the two powers become equal; when the impreſſion of the wind on the ſails has loſt ſo much of its force, as only to act in proportion to the oppoſite impulſe of reſiſtance on the bow, the ſhip will then acquire no additional velocity, but continue to ſail with a conſtant uniform motion. The great weight of the ſhip may indeed prevent her from acquiring her greateſt velocity; but when ſhe has attained it, ſhe will advance by her own intrinſic motion, without gaining any new degree of velocity, or leſſening what ſhe has acquired. She moves then by her own proper force *in vacuo*, without being afterwards ſubject either to the effort of the wind on the ſails, or to the reſiſtance of the water on the bow. If at any time the impulſion of the water on the bow ſhould deſtroy any part of the velocity, the effort of the wind on the ſails will revive it, ſo that the motion will continue the ſame. It muſt, however, be obſerved, that this ſtate will only ſubſiſt when theſe two powers act upon each other in direct oppoſition; otherwiſe they will mutually deſtroy one another. The whole theory of working ſhips depends on this counter action, and the perfect equality which ſhould ſubſiſt between the effort of the wind and the impulſion of the water.

The effect of ſailing is produced by a judicious arrangement of the ſails to the direction of the wind. Accordingly the various modes of ſailing are derived from the different degrees and ſituations of the wind with regard to the courſe of the veſſel. See Seamanship.

To illuſtrate this obſervation by examples, the plan of a number of ſhips proceeding on various courſes is repreſented in plate 4. (under the title "*Sailing*") which exhibits the 32 points of the compaſs, of which C is the centre; the direction of the wind, which is northerly, being expreſſed by the arrow.

It has been obſerved in the article Close-*Hauled*, that a ſhip in that ſituation will ſail nearly within ſix points of the wind. Thus the ſhips B and *y* are cloſe-hauled; the former being on the larboard tack, ſteering E. N. E. and the latter on the ſtarboard-tack, ſailing W. N. W. with their yards *a b* braced obliquely, as ſuitable to that manner of ſailing. The line of battle on the larboard tack would accordingly be expreſſed by CB, and on the ſtarboard by C*y*.

When a ſhip is neither cloſe-hauled, nor ſteering afore the wind, ſhe is in general ſaid to be ſailing large. The relation of the wind to her courſe is preciſely determined by the number of points between the latter and the courſe cloſe-hauled. Thus the ſhips *c* and *x* have the wind one point large, the former ſteering E. *b* N. and the latter W. *b* N. The yards remain almoſt in the ſame poſition as in B and *y*; the bowlines and ſheets of the ſails being only a little ſlackened.

The ſhips *d* and *u* have the wind two points large, the one ſteering eaſt and the other weſt. In this manner of ſailing, however, the wind is more particularly ſaid to be upon the

beam, as being at right angles with the keel, and coinciding with the poſition of the ſhip's beams. The yards are now more acroſs the ſhip, the bowlines are caſt off, and the ſheets more relaxed; ſo that the effort of the wind being applied nearer to the line of the ſhip's courſe, her velocity is greatly augmented.

In *e* and *t* the ſhips have the wind three points large, or one point abaft the beam, the courſe of the former being E. *b* S. and that of the latter W. *b* S. The ſheets are ſtill more flowing, the angle which the yards make with the keel further diminiſhed, and the courſe accelerated in proportion.

The ſhips *f* and *ſ*, the firſt of which ſteers E. S. E. and the ſecond W. S. W. have the wind four points large, or two points abaft the beam. In *g* and *r* the wind is five points large, or three points abaft the beam, the former ſailing S. E. *b* E. and the latter S. W. *b* W. In both theſe ſituations the ſheets are ſtill further ſlackened, and the yards laid yet more athwart the ſhip's length, in proportion as the wind approaches the quarter.

The ſhips *b* and *q*, ſteering S. E. and S. W. have the wind ſix points large, or more properly on the quarter; which is conſidered as the moſt favourable manner of ſailing, becauſe all the ſails co-operate to increaſe the ſhip's velocity: whereas, when the wind is right aſt, as in the ſhip *m*, it is evident that the wind in its paſſage to the foremoſt ſails will be intercepted by thoſe which are further aft. When the wind is on the quarter, the fore-tack is brought to the cat-head; and the main-tack being caſt off, the weather-clue of the main-ſail is hoiſted up to the yard, in order to let the wind paſs freely to the fore-ſail; and the yards are diſpoſed ſo as to make an angle of about two points, or nearly 22°, with the keel.

The ſhips *i* and *p*, of which the former ſails S. E. *b* S. and the latter S. W. *b* S. are ſaid to have the wind three points on the larboard or ſtarboard quarter: and thoſe expreſſed by *k* and *o*, two points; as ſteering S. S. E. and S. S. W. in both which poſitions the yards make nearly an angle of 16°, or about a point and a half, with the ſhip's length.

When the wind is one point on the quarter, as in the ſhips *l* and *n*, whoſe courſes are S. *b* E. and S. *b* W. the ſituation of the yards and ſails is very little different from the laſt mentioned; the angle which they make with the keel being ſomewhat leſs than a point, and the ſtay-ſails being rendered of very little ſervice. The ſhip *m* ſails right afore the wind, or with the wind right aſt. In this poſition the yards are laid at right angles with the ſhip's length: the ſtay-ſails being entirely uſeleſs, are hauled down; and the main-ſail is drawn up in the brails, that the fore-ſail may operate; a meaſure which conſiderably facilitates the ſteerage, or effort of the helm. As the wind is then intercepted by the main-top-ſail and main top gallant ſail, in its paſſage to the fore-top-ſail and fore-top gallant ſail, theſe latter are by conſequence entirely becalmed; and might therefore be furled, to prevent their being fretted by flapping againſt the maſt, but that their effort contributes greatly to prevent the ſhip from broaching to, when ſhe deviates from her courſe to the right or left thereof.

Thus all the different methods of ſailing may be divided into four, viz. cloſe-hauled, large, quartering, and afore the wind; all which relate to the direction of the wind with regard to the ſhip's courſe, and the arrangement of the ſails.

SAILING alſo implies a particular mode of navigation, formed on the principles, and regulated by the laws of trigonometry. Hence we ſay, Plain Sailing, Mercator's, Middle-latitude, Parallel, and Great-circle Sailing. See the article NAVIGATION.

SAIL-MAKING, the art of making ſails. See SAIL and SHIP-BUILDING.

SAILOR, the ſame with MARINER and SEAMAN.

SAINT, means a perſon eminent for piety and virtue, and is generally applied by us to the apoſtles and other holy perſons mentioned in ſcripture. But the Romaniſts make its application much more extenſive. Under the word CANONIZATION we have already ſaid ſomething on their practice of creating ſaints. Our readers, however, will not, we truſt, be diſpleaſed with the following more enlarged account, which they themſelves give of the matter. The canonization of ſaints, then, they tell us, is the enrolment of any perſon in the *canon* or catalogue of thoſe who are called *ſaints*; or it is a judgment and ſentence of the church, by which it is declared, that a deceaſed perſon was eminent for ſanctity during his lifetime, and eſpecially towards the end of it; and that conſequently he muſt now be in glory with God, and deſerves to be honoured by the church on earth with that veneration which ſhe is wont to pay to the bleſſed in heaven.

The diſcipline with regard to this matter has varied. It would ſeem that in the firſt ages every biſhop in his own dioceſe was wont to declare what perſons were to be honoured as ſaints by his people. Hence St. Cyprian, about the middle of the third century, B. 3. *ep.* 6. requires that he be informed of thoſe who ſhould die in priſon for the faith, that ſo he might make mention of them in the holy ſacrifice with the martyrs, and might honour them afterwards on the anniverſary day of their happy death. This veneration continued ſometimes to be confined to one country; but ſometimes it extended to diſtant provinces, and even became univerſal all over the church. It was thus that St. Laurence, St. Ambroſe, St. Auguſtine, St. Baſil, and many others, appear to have been canonized by cuſtom and univerſal perſuaſion. In thoſe ages none were reckoned ſaints but the apoſtles, the martyrs, and very eminent confeſſors, whoſe ſanctity was notorious everywhere.

Afterwards it appears that canonizations were wont to be performed in provincial ſynods under the direction of the metropolitan. It was thus that St. Iſidore of Seville was canonized in the 7th century, by the 8th council of Toledo, 14 years after his death. This manner of canonization continued occaſionally down to the 12th century. The laſt inſtance of a ſaint canonized in that way, is that of St. Walter, abbot of Pontoiſe, who was declared a ſaint by the archbiſhop of Rouen in the year 1153.

In the 12th century, in order to prevent miſtakes in ſo delicate a matter, pope Alexander III. judged it proper to reſerve this declaration to the holy ſee of Rome excluſively; and decreed that no one ſhould for the future be honoured by the church as a ſaint without the expreſs approbation of the pope.

Since that time, the canonization of ſaints has been carried on in the form of a proceſs; and there is at Rome a congregation of cardinals, called the *congregation of holy rites*, who are aſſiſted by ſeveral divines under the name of *conſultors*, who examine ſuch matters, and prepare them for the deciſion of his holineſs. When therefore any potentate, province, city, or religious body, think fit, they apply to the pope for the canonization of any perſon.

The firſt juridical ſtep in this buſineſs muſt be taken by the biſhop in whoſe dioceſe the perſon for whom the application is made had lived and died, who by his own authority calls witneſſes to atteſt the opinion of the holineſs, the virtues, and miracles of the perſon in queſtion. When the deceaſed has reſided in different dioceſes, it may be neceſſary that different biſhops take ſuch depoſitions; the originals of which are preſerved in the archives of their reſpective churches, and authentic copies ſealed up are ſent to Rome by a ſpecial meſſenger, where they are depoſited with the congregation of rites, and where they muſt remain for the ſpace of ten years without being opened. They are then opened, and maturely examined by the congregation, and with their advice the pope allows the cauſe to go on or not as he thinks proper. The ſolicitors for the canonization are then

referred by his holineſs to the ſaid congregation, which, with his authority, gives a commiſſion to one or more biſhops, or other reſpectable perſons, to examine, on the ſpot and in the places where the perſon in queſtion has lived and died, into his character and whole behaviour. Theſe commiſſioners ſummon witneſſes, take depoſitions, and collect letters and other writings of the venerable man, and get all the intelligence they can concerning him, and the opinion generally entertained of him. The report of theſe commiſſioners is conſidered attentively and at length by the congregation, and every part of it diſcuſſed by the conſultors, when the congregation determines, whether or not they can permit the proceſs to go on. If it be allowed to proceed, a cardinal, who is called *ponent*, undertakes to be the principal agent in that affair. The firſt queſtion then that comes to be examined is, whether or not the perſon propoſed for canonization can be proved to have been in an eminent degree endued with the moral virtues of prudence, juſtice, fortitude, and temperance; and with the theological virtues of faith, hope, and charity? All this is canvaſſed with great deliberation; and there is a diſtinguiſhed eccleſiaſtic called the *promoter of the holy faith*, who is ſworn to make all reaſonable objections to the proofs that are adduced in favour of the canonization. If the deciſion be favourable, then the proofs of miracles done to ſhow the ſanctity of the perſon in queſtion are permitted to be brought forward; when two miracles muſt be verified to the ſatisfaction of the congregation, both as to the reality of the facts, and as to their having been truly above the power of nature. If the deciſion on this comes out likewiſe favourable, then the whole is laid before the pope and what divines he chooſes*. Public prayer and faſting are likewiſe preſcribed, in order to obtain light and direction from heaven. After all this long procedure, when the pope is reſolved to give his approbation, he iſſues a bull, firſt of *beatification*, by which the perſon is declared *bleſſed*, and afterwards another of *ſanctification*, by which the name of *ſaint* is given him. Theſe bulls are publiſhed in St. Peter's church with very great ſolemnity.

A perſon remarkable for holineſs of life, even before he is canonized, may be venerated as ſuch by thoſe who are perſuaded of his eminent virtue, and his prayers may be implored; but all this muſt reſt on private opinion. After his canonization, his name is inſerted in the Martyrology, or catalogue of ſaints, of which the reſpective portion is read every day in the choir at the divine office. A day is alſo appointed for a yearly commemoration of him. His name may be mentioned in the public church ſervice, and his interceſſion with God beſought. His relics may be enſhrined: he may be painted with rays of glory, and altars and churches may be dedicated to God in honour of him, and in thankſgiving to the divine Goodneſs for the bleſſings beſtowed on him in life, and for the glory to which he is raiſed in heaven.

The affair of a canonization is neceſſarily very expenſive, becauſe ſo many perſons muſt be employed about it; ſo many journeys muſt be made; ſo many writings for and againſt it muſt be drawn out. The expenſe altogether amounts to about 25,000 Roman crowns, or 6000l. ſterling. But it is generally contrived to canonize two or three at a time, by which means the particular expenſe of each is very much leſſened, the ſolemnity being common.

It often happens that the ſolicitors for a canonization are unſucceſsful. Thus the Jeſuits, even when their intereſt at Rome was greateſt, could not obtain the canonization of Bellarmine; and it is remarkable, that the objection is ſaid to have been, his having defended the indirect power of the pope over Chriſtian princes even in temporals.

Several authors have written on canonization, and particularly Proſper Lambertini, afterwards pope under the name of Benedict XIV. who had held the office of *promoter of the faith* for many years. He publiſhed on it a large work in ſeveral volumes, in folio, of which there is an abridgement in French. In this learned performance there is a full hiſtory of the canonization of ſaints in general, and of all the particular proceſſes of that kind that are on record: an account is given of the manner of proceeding in theſe extraordinary trials; and it is ſhown, that, beſides the aſſiſtance of Providence, which is implored and expected in what is ſo much connected with religion, all prudent human means are made uſe of, in order to avoid miſtakes, and to obtain all the evidence of which the matter is ſuſceptible, and which muſt appear more than ſufficient to every impartial judge. See Pope, Popery, &c.

Saint-*Foin*, in botany, a ſpecies of the hedyſarum. See Hedysarum, and Husbandry.

Saint *Januarius's Blood*. See Chemistry.

SAINTES, an antient and large, but not populous town of France, in the department of Lower Charente and late province of Saintonge, with a biſhop's ſee. There are ſeveral monuments of antiquity, of which the moſt famous are the amphitheatre, the aqueducts, and the triumphal arch on the bridge over the Charente. The caſtle, built on a rock, is deemed impregnable; and the cathedral has one of the largeſt ſteeples in France. It is ſeated on an eminence, 37 miles ſouth-eaſt of Rochelle, and 262 ſouth ſouth-weſt of Paris. W. lon. 0. 38. N. lat. 45. 54.

SAINTONGE, a late province of France, 62 miles long and 30 broad; bounded on the eaſt by Angoumois and Perigord, on the north by Poitou and Aunis, on the weſt by the Atlantic, and on the ſouth by Bordelois and Giron. The river Charente runs through the middle of it, and renders it one of the fineſt and moſt fertile provinces in France, abounding in all ſorts of corn and fruits; and the beſt ſalt in Europe is made here. It now forms, with the late province of Aunis, the department of Lower Charente.

The SAINTS, three leagues diſtant from Guadaloupe, are two very ſmall iſlands, which, with another yet ſmaller, form a triangle, and have a tolerable harbour. Thirty Frenchmen were ſent thither in 1648, but were ſoon driven away by an exceſſive drought, which dried up their only ſpring before they had time to make any reſervoirs. A ſecond attempt was made in 1652, and laſting plantations were eſtabliſhed, which now yield annually 50,000 weight of coffee, and 100,000 of cotton.

SAKRADAWENDRA is the name of one of the Ceyloneſe deities, who commands and governs all the reſt, and formerly anſwered the prayers of his worſhippers; but according to the fabulous account which is given of him, the golden chair, on which he ſat, and the foot of which was made of wax, that was ſoftened by their prayers and tears, and ſunk downward, ſo that he could take notice of their requeſts and relieve them, being diſpoſed of among the poor, they no longer derive any benefit from him, or pay him any reverence. See Budun.

SAL. See Salt.

Native Sal *Ammoniac*. This ſalt, according to Mongou, is met with in the form of an efflоreſcence on the ſurface of the earth, or adhering in powder to rocks. Sometimes, as in Perſia and the country of the Kalmucks, it is found as hard as ſtone. It is met with of different colours, as gray, black, green, and

* His holineſs generally appoints three conſiſtories in the firſt of which the cardinals, only aſſiſt, and give their opinion; in the ſecond, a preacher pronounces a ſpeech in praiſe of the candidate before a numerous audience; to the third, not only the cardinals, but all the biſhops who are at Rome, are invited, and all of them give their vote by word of mouth.

red, in the neighbourhood of volcanoes, in the caverns or grottoes of Puzzuoli, and in the mineral lakes of Tuſcany, as well as in ſome mountains of Tartary and Thibet. At Solfaterra, near Naples, it is found in the crevices, of a yellowiſh colour, like common ſal-ammoniac more than once ſublimed. See CHEMISTRY.

SALADIN, a famous ſultan of Egypt, equally renowned as a warrior and legiſlator. He ſupported himſelf by his valour, and the influence of his amiable character, againſt the united efforts of the chief Chriſtian potentates of Europe, who carried on the moſt unjuſt wars againſt him, under the falſe appellation of *Holy Wars*. See the articles EGYPT and CROISADE.

SALAMANCA, an antient, large, rich, and populous city of Spain, in the kingdom of Leon, ſituated on the river Tormes, about 75 miles weſt from Madrid. It is ſaid to have been founded by Teucer the ſon of Telamon, who called it *Salamis* or *Saltmantica*, in memory of the antient Salamis. Here is an univerſity, the greateſt in Spain, and perhaps inferior to none in the whole world, in reſpect at leaſt to its revenues, buildings, number of ſcholars, and maſters. Here are alſo many grand and magnificent palaces, ſquares, convents, churches, colleges, chapels, and hoſpitals. The biſhop of this country is ſuffragan to the archbiſhop of Compoſtella, and has a yearly revenue of 1000 ducats. A Roman way leads from hence to Merida and Seville, and there is an old Roman bridge over the river. Of the colleges in the univerſity, four are appropriated to young men of quality; and near it is an infirmary for poor ſick ſcholars. W. lon. 6. 10. N. lat. 41. 0.

SALAMANDER, in zoology. See BASILISCUS.

SALAMIS, an iſland of the Archipelago, ſituated in E. lon. 34. 0. N. lat. 37. 32.—It was famous in antiquity for a battle between the Greek and Perſian fleets.

The iſland of Salamis is now inhabited by a few Albanians, who till the ground. Their village is called *Ampelaki*, "the Vineyard," and is at a diſtance from the port, ſtanding more inland. In the church are marble fragments and ſome inſcriptions.

SALARY, a recompenſe or conſideration made to a perſon for his pains and induſtry in another man's buſineſs. The word is uſed in the ſtatute 23 Edw. III. cap. 1. *Salarium* at firſt ſignified the rents or profits of a ſalle, hall, or houſe (and in Gaſcoigne they now call the ſeats of the gentry *ſalas*, as we do *halls*); but afterwards it was taken for any wages, ſtipend, or annual allowance.

SALACIA, in botany; a genus of the trigynia order, belonging to the gynandria claſs of plants. The calyx is quinquefid; the corolla quinquepetalous; the antheræ ſitting on the top of the germ.

SALE, is the exchange of a commodity for money; barter, or permutation, is the exchange of one commodity for another. When the bargain is concluded, an obligation is contracted by the buyer to pay the value, and by the ſeller to deliver the commodity, at the time and place agreed on, or immediately, if no time be ſpecified.

In this, as well as other mercantile contracts, the ſafety of commerce requires the utmoſt good faith and veracity. Therefore, although, by the laws of England, a ſale above the value of 10l. be not binding, unleſs earneſt be paid, or the bargain confirmed by writing, a merchant would loſe all credit who refuſed to perform his agreement, although theſe legal requiſites were omitted.

When a ſpecific thing is ſold, the property, even before delivery, is in ſome reſpect veſted in the buyer; and if the thing periſhes, the buyer muſt bear the loſs. For example, if a horſe dies before delivery, he muſt pay the value: but if the bargain only determines the quantity and quality of the goods, without ſpecifying the identical articles, and the ſeller's warehouſe, with all his goods, be burned, he is entitled to no payment He muſt alſo bear the loſs if the thing periſh through his fault; or when a particular time and place of delivery is agreed on, if it periſh before it be tendered, in terms of the bargain.

If a perſon purchaſe goods at a ſhop without agreeing for the price, he is liable for the ordinary market-price at the time of purchaſe. If the buyer proves inſolvent before delivery, the ſeller is not bound to deliver the goods without payment or ſecurity. If the importation, or uſe of the commodities ſold, be prohibited by law, or if the buyer knows that they were ſmuggled, no action lies for delivery.

The property of goods is generally preſumed, in favour of commerce, to belong to the poſſeſſor, and cannot be challenged in the hands of an onerous purchaſer. But to this there are ſome exceptions. By the Scots law, ſtolen goods may in all caſes be reclaimed by the proprietor, and alſo by the Engliſh law, unleſs they were bought *bona fide* in open market; that is, in the accuſtomed public places, on ſtated days in the country, or in a ſhop in London; and horſes may be reclaimed, unleſs the ſale be regularly entered by the book-keeper of the market. In all caſes, if the goods be evicted by the lawful proprietor, the ſeller is liable to the purchaſer for the value.

Actions for payment of ſhop-accounts, as well as other debts not conſtituted by writing, are limited in England to ſix years. The teſtimony of one witneſs is admitted; and the ſeller's books, although the perſon that kept them be dead, are good evidence for one year. In Scotland, merchants books may be proved within three years of the date of the laſt article, by one witneſs, and the creditor's books and oath in ſupplement. After three years, they can only be proved by the oath or writ of the debtor. A merchant's books are in all caſes good evidence againſt him.

SALEP, in the materia medica, the dried root of a ſpecies of orchis. See ORCHIS.

Several methods of preparing ſalep have been propoſed and practiſed. Geoffroy has delivered a very judicious proceſs for this purpoſe in the *Hiſtoire de l'Academie Royale des Sciences*, 1740; and Retmus, in the Swediſh Tranſactions 1764, has improved Geoffroy's method. But Mr. Moult of Rochdale has lately favoured the public with a new manner of curing the orchis root; by which ſalep is prepared, at leaſt equal, if not ſuperior, to any brought from the Levant. The new root is to be waſhed in water; and the fine brown ſkin which covers it is to be ſeparated by means of a ſmall bruſh, or by dipping the root in hot water, and rubbing it with a coarſe linen cloth. When a ſufficient number of roots have been thus cleaned, they are to be ſpread on a tin plate, and placed in an oven heated to the uſual degree, where they are to remain ſix or ten minutes, in which time they will have loſt their milky whiteneſs, and acquired a tranſparency like horn, without any diminution of bulk. Being arrived at this ſtate, they are to be removed, in order to dry and harden in the air, which will require ſeveral days to effect; or by uſing a very gentle heat, they may be finiſhed in a few hours.

Salep thus prepared, may be afforded in thoſe parts of England where labour bears a high value, at about eight-pence or ten-pence per pound: and it might be ſold ſtill cheaper, if the orchis were to be cured without ſeparating from it the brown ſkin which covers it; a troubleſome part of the proceſs, and which does not contribute to render the root either more palatable or ſalutary. Whereas the foreign ſalep is now ſold at five or ſix ſhillings per pound.

Salep is ſaid to contain the greateſt quantity of vegetable nouriſhment in the ſmalleſt bulk. Hence a very judicious writer, to prevent the dreadful calamity of famine at ſea, has lately

proposed that the powder of it should constitute part of the provisions of every ship's company. This powder and portable soup, dissolved in boiling water, form a rich thick jelly, capable of supporting life for a considerable length of time. An ounce of each of these articles, with two quarts of boiling water, will be sufficient subsistence for a man a day; and, as being a mixture of animal and vegetable food, must prove more nourishing than double the quantity of rice-cake, made by boiling rice in water; which last, however, sailors are often obliged solely to subsist upon for several months; especially in voyages to Guinea, when the bread and flour are exhausted, and the beef and pork, having been salted in hot countries, are become unfit for use.

"But as a wholesome nourishment (says Dr. Percival), rice is much inferior to salep. I digested several alimentary mixtures prepared of mutton and water, beat up with bread, sea-biscuit, salep, rice-flower, sago powder, potatoe, old cheese, &c. in a heat equal to that of the human body. In 48 hours they had all acquired a vinous smell, and were in brisk fermentation, except the mixture with rice, which did not emit many air-bubbles, and was but little changed. The third day several of the mixtures were sweet, and continued to ferment; others had lost their intestine motion, and were sour; but the one which contained the rice was become putrid. From this experiment it appears, that rice as an aliment is slow of fermentation, and a very weak corrector of putrefaction. It is therefore an improper diet for hospital-patients; but more particularly for sailors in long voyages; because it is incapable of preventing, and will not contribute much to check the progress of that fatal disease, the sea scurvy. Under certain circumstances, rice seems disposed of itself, without mixture, to become putrid; for by long keeping it sometimes acquires an offensive fœtor. Nor can it be considered as a very nutritive kind of food, on account of its difficult solubility in the stomach. Experience confirms the truth of this conclusion; for it is observed by the planters in the West Indies, that the negroes grow thin, and are less able to work, whilst they subsist upon rice.

"Salep has the singular property of concealing the taste of salt water; a circumstance of the highest importance at sea, when there is a scarcity of fresh water. I dissolved a dram and a half of common salt in a pint of the mucilage of salep, so liquid as to be potable, and the same quantity in a pint of spring water. The salep was by no means disagreeable to the taste, but the water was rendered extremely unpalatable. This experiment suggested to me the trial of the orchis root as a corrector of acidity, a property which would render it a very useful diet for children. But the solution of it, when mixed with vinegar, seemed only to dilute like an equal proportion of water, and not to cover its sharpness. Salep, however, appears by my experiments to retard the acetous fermentation of milk: and consequently would be a good lithing for milk-pottage, especially in large towns, where the cattle being fed upon sour draff must yield acescent milk.

"Salep in a certain proportion, which I have not yet been able to ascertain, would be a very useful and profitable addition to bread. I directed one ounce of the powder to be dissolved in a quart of water, and the mucilage to be mixed with a sufficient quantity of flour, salt, and yeast. The flour amounted to two pounds, the yeast to two ounces, and the salt to 80 grains. The loaf when baked was remarkably well fermented, and weighed three pounds two ounces. Another loaf, made with the same quantity of flour, &c. weighed two pounds and 12 ounces; from which it appears that the salep, though used in so small a proportion, increased the gravity of the loaf six ounces, by absorbing and retaining more water than the flour alone was capable of. Half a pound of flour and an ounce of salep were mixed together, and the water added according to the usual method of preparing bread. The loaf when baked weighed 13 ounces and a half; and would probably have been heavier if the salep had been previously dissolved in about a pint of water. But it should be remarked, that the quantity of flour used in this trial was not sufficient to conceal the peculiar taste of the salep.

"The restorative, mucilaginous, and demulcent qualities of the orchis root render it of considerable use in various diseases. In the sea-scurvy it powerfully obtunds the acrimony of the fluids, and at the same time is easily assimilated into a mild and nutritious chyle. In diarrhœas and the dysentery it is highly serviceable, by sheathing the internal coat of the intestines, by abating irritation, and gently correcting putrefaction. In the symptomatic fever, which arises from the absorption of pus from ulcers in the lungs, from wounds, or from amputation, salep used plentifully is an admirable demulcent, and well adapted to resist the dissolution of the crasis of the blood, which is so evident in these cases. And by the same mucilaginous quality, it is equally efficacious in the strangury and dysury; especially in the latter, when arising from a venereal cause, because the discharge of urine is then attended with the most exquisite pain, from the ulceration about the neck of the bladder and through the course of the urethra. I have found it also an useful aliment for patients who labour under the stone or gravel." The antient chemists appear to have entertained a very high opinion of the orchis root, as appears from the *Secreta Secretorum* of Raymund Lully, a work dated 1565.

SALERNO, an antient and considerable town of Italy, in the kingdom of Naples, and capital of the Hither Principato, with an archbishop's see, a castle, harbour, and an university chiefly for medicine. It is seated at the bottom of a bay of the same name. E. lon. 14. 43. N. lat. 40. 45.

SALET, in war, a light covering or armour for the head, antiently worn by the light-horse, only different from the casque in that it had no crest, and was little more than a bare cap.

SALIANT, in fortification, denotes projecting. There are two kinds of angles, the one saliant, which have their point outwards; the other re-entering, which have their points inwards.

SALIANT, SALIENT, or SAILANT, in heraldry, is applied to a lion, or other beast, when its fore-legs are raised in a leaping posture.

SALIC, or SALIQUE LAW, (*Lex Salica*), an antient and fundamental law of the kingdom of France, usually supposed to have been made by Pharamond, or at least by Clovis; in virtue whereof males only are to inherit. Some, as Postellus, would have it to have been called *Salic*, q. d. *Gallic*, because peculiar to the Gauls. Fer Montanus insists, it was because Pharamond was at first called *Salicus*. Others will have it to be so named, as having been made for the salic lands. These were noble fiefs which their first kings used to bestow on the sallians, that is, the great lords of their salle or court, without any other tenure than military service; and for this reason, such fiefs were not to descend to women, as being by nature unfit for such a tenure. Some, again, derive the origin of this word from the Salians, a tribe of Franks that settled in Gaul in the reign of Julian, who is said to have given them lands on condition of their personal service in war. He even passed the conditions into a law, which the new conquerors acquiesced in, and called it *salic*, from the name of their former countrymen.

SALICORNIA, JOINTED GLASS-WORT, or *Salt-wort*. A genus of the monogynia order, belonging to the monandria class of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The calyx is ventricose, or a little swelling out and entire; there are no petals, and but one seed. There are four species, of which the most remarkable are, 1. The

fruticofa, with obtufe points, grows plentifully in moft of the falt marfhes which are overflowed by the tides in many parts of England. It is an annual plant, with thick, fucculent, jointed ftalks, which trail upon the ground. The flowers are produced at the ends of the joints toward the extremity of the branches, which are fmall, and fcarce difcernible by the naked eye. 2. The perennis, with a fhrubby branching ftalk, grows naturally in Sheppey ifland. This hath a fhrubby branching ftalk about fix inches long; the points of the articulations are acute; the ftalks branch from the bottom, and form a kind of pyramid. They are perennial, and produce their flowers in the fame manner as the former. The inhabitants near the fea-coafts where thefe plants grow, cut them up toward the latter end of fummer, when they are fully grown; and after having dried them in the fun, they burn them for their afhes, which are ufed in making of glafs and foap. Thefe herbs are by the country people called *kelp*, and promifcuoufly gathered for ufe. See the article GLASS-WORT.

SALII, in Roman antiquity, priefts of Mars, whereof there were 12, inftituted by Numa, wearing painted, parti-coloured garments, and high bonnets; with a fteel cuiraffe on the breaft. They were called *falii*, from *faltare* "to dance;" becaufe, after affifting at facrifices, they went dancing about the ftreets, with bucklers in their left-hand, and a rod in their right, ftriking mufically with their rods on one another's bucklers, and finging hymns in honour of the gods.

SALINO, one of the Lipari iflands, fituated between Sicily and Italy, confifts of two mountains both in a high ftate of cultivation. The one lying more towards the north than the other is rather the higheft of the two, and is called *del Capo*, "the head." The other is called *della Foffa felice*, or "the happy valley." One third of the extent of thefe hills from the bottom to the fummit is one continued orchard, confifting of vines, olive, fig, plum, apricot, and a vaft diverfity of other trees. The white roofs of the houfes, which are every where interfperfed amid this diverfity of verdure and foliage, contribute to variegate the profpect in a very agreeable manner. The back part of almoft all the houfes is fhaded by an arbour of vines, fupported by pillars of brick, with crofs poles to fuftain the branches and foliage of the vines. Thofe arbours fhelter the houfes from the rays of the fun, the heat of which is quite fcorching in thefe fouthern regions. The vines are extremely fruitful; the poles bending under the weight of the grapes.

The fcenes in this ifland are more interefting to the lover of natural hiftory than to the antiquarian. See RETICULUM. On the fouth fide of the ifland, however, there are ftill to be feen fome fine ruins of an antient bath, a Roman work. They confift of a wall 10 or 11 fathoms in extent, and terminating in an arch of no great height, of which only a fmall part now remains. The building feems to have been reduced to its prefent ftate rather by the ravages of men than the injuries of time. Almoft all the houfes in the ifland are built of materials which have belonged to antient monuments. The antients had, in all probability, baths of frefh as well as of falt water in this ifland; for, whenever the prefent inhabitants have occafion for a fpring of frefh water, they have only to dig a pit on the fhore, and pure fweet water flows in great abundance.

There were formerly mines of alum here, from which the inhabitants drew a very confiderable yearly revenue. But whether they are exhaufted, or whatever circumftance may have caufed them to be given up, they are now no longer known. The ifland abounds in a variety of fruits.

On the eaft fide it is very populous. There are two places which are both called *Lingua*, "the tongue," and which contain a good number of inhabitants; the one is near Salino, the other is diftinguifhed by the name of *St. Marina*: there are befides thefe two other villages. All thefe places together may contain about 4000 inhabitants: the circumference of the ifland may be about 14 miles.

SALISBURY, or NEW SARUM, a new city in Wiltfhire, of which it is the capital, with a market on Tuefday and Saturday, and a bifhop's fee. It is fituate in a chalky foil, almoft furrounded by the Avon and its contributory rivers, and is rendered particularly clean by a fmall ftream flowing through every ftreet. It has a fine cathedral, crowned by a fpire, the lofticft in the kingdom. The town-hall is a handfome building, and ftands in a fpacious market-place. Salifbury is governed by a mayor, fends two members to parliament, and has a manufacture of flannels and linfeys, and another of hard-ware and cutlery. It is 21 miles N. E. of Southampton, and 83 W. by S. of London. lon. 1. W. 42. N. lat. 51. 3.

SALISBURY *Plain*, the extenfive downs in Wiltfhire which are thus denominated, forms in fummer one of the moft delightful parts of Great Britain for extent and beauty. It extends 28 miles weft of Weymouth, and 25 eaft to Winchefter; and in fome places is near 40 miles in breadth. That part about Salifbury is a chalky down, and is famous for feeding numerous flocks of fheep. Confiderable portions of this tract are now enclofing, the advantages of which are fo great, that we hope the whole will undergo fo beneficial an alteration.

SALIVA, is that fluid by which the mouth and tongue are continually moiftened in their natural ftate; and is fupplied by glands which form it, that are called *falivary glands*. This humour is thin and pellucid, incapable of being concreted by the fire, almoft without tafte and fmell. By chewing, it is expreffed from the glands which feparate it from the blood, and is intimately mixed with our food, the digeftion of which it greatly promotes. In hungry perfons it is acrid, and copioufly difcharged; and in thofe who have fafted long it is highly acrid, penetrating, and refolvent. A too copious evacuation of it produces thirft, lofs of appetite, bad digeftion, and an atrophy.

SALIVATION, in medicine, a promoting of the flux of faliva, by means of medicines, moftly by mercury. The chief ufe of falivation is in difeafes belonging to the glands and membrana adipofa, and principally in the cure of the venereal difeafe; though it is fometimes alfo ufed in epidemic difeafes, cutaneous difeafes, &c. whofe crifes tend that way.

SALIX, the WILLOW, in botany: A genus of the diandria order, belonging to the diœcia clafs of plants; and in the natural method ranking under the 50th. order, *Amentaceæ*. The amentum of the male is fcaly; there is no corolla; but a nectariferous glandule at the bafe of the flower. The female amentum is fcaly; there is no corolla; the ftyle bifid; the capfule unilocular and bivalved; the feeds pappous. The willow trees have been frequently the theme of poetical defcription, both in antient and modern times. In Virgil, Horace, and in Ovid, we have many exquifite allufions to them and their feveral properties; and for a melancholy lover or a contemplative poet, imagination cannot paint a fitter retreat than the banks of a beautiful river, and the fhade of a drooping willow. There are 31 fpecies; of which the moft remarkable are, 1. The *caprea*, or common fallow tree, grows to but a moderate height, having fmooth, dark-green, brittle branches; oval, waved, rough leaves, indented at top, and woolly underneath. It grows abundantly in this country, but more frequently in dry than moift fituations: it is of a brittle nature, fo is unfit for the bafket-makers; but will ferve for poles, ftakes, and to lop for fire-wood; and its timber is good for many purpofes. 2. The *alba*, white, or filver-leaved willow, grows to a great height and confiderable bulk, having fmooth, pale-green fhoots; long, fpear-fhaped, acuminated, fawed, filvery-white leaves, being downy on both fides, with glands below the ferratures. This is the common white willow, which grows abundantly about towns and villages, and by the fides of rivers and brooks, &c. 3. The *vitellina*, yellow

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or golden willow, grows but to a moderate height; having yellow, very pliant, shoots; oval, acute, ferrated, very smooth leaves, with the ferratures cartilaginous, and with callous punctures on the footstalks. 4. The *purpurea*, purple or red willow, grows to a large height, having long, reddish, very pliable shoots, and long, spear-shaped, serrated, smooth leaves, the lower ones being opposite. 5. The *viminalis*, or osier-willow, grows but a moderate height, having slender rod-like branches; very long, pliant, greenish shoots; and very long, narrow, spear-shaped, acute, almost entire leaves, hoary, and silky underneath. 6. The *pentandria*, pentandrous, broad-leaved, sweet-scented willow, grows to some considerable stature, having brownish-green branches; oblong, broad, serrated, smooth, sweet-scented leaves, shining above; and pentandrous flowers. 7. The *triandria*, or triandrous willow, grows to a large stature, having numerous, erect, grayish-green branches, and pliant shoots; oblong, acute-pointed, serrated, smooth, shining green leaves, eared at the base; and triandrous flowers. 8. The *fragilis*, fragile or crack willow, rises to a middling stature, with brownish, very fragile, or brittle branches, long, oval-lanceolate, sawed, smooth leaves of a shining-green on both sides, having dentated glandular foot-stalks. This sort in particular being exceedingly fragile, so that it easily cracks and breaks, is unfit for culture in osier-grounds. 9. The *Babylonica*, Babylonian pendulous salix, commonly called *weeping willow*, grows to a largish size, having numerous, long, slender, pendulous branches, hanging down loosely all round in a curious manner, and long, narrow, spear-shaped, serrated, smooth leaves. This curious willow is a native of the east, and is retained in our hardy plantations for ornament, and exhibits a most agreeable variety; particularly when disposed singly by the verges of any piece of water, or in spacious openings of grass-ground.

All the species of salix are of the tree kind, very hardy, remarkably fast growers, and several of them attaining a considerable stature when permitted to run up to standards. They are mostly of the aquatic tribe, being generally the most abundant and of most prosperous growth in watery situations: they however will grow freely almost any where, in any common soil and exposure; but grow considerably the fastest and strongest in low moist land, particularly in marshy situations, by the verges of rivers, brooks, and other waters; likewise along the sides of watery ditches, &c. which places often lying waste, may be employed to good advantage, in plantations of willows, for different purposes.

SALLEE, an antient and considerable town of Africa in the kingdom of Fez, with a harbour and several ports. The harbour of Sallee is one of the best in the country; and yet, on account of a bar that lies across it, ships of the smallest draught are forced to unload and take out their guns before they can get into it. There are docks to build ships; but they are hardly ever used, for want of skill and materials. It is a large place, divided into the Old and New Towns, by the river Guero. It has long been famous for its rovers and pirates, which make prizes of all Christian ships that come in their way, except there is a treaty to the contrary. The town of Sallee in its present state, though large, presents nothing worthy the observation of the traveller, except a battery of 24 pieces of cannon fronting the sea, and a redoubt at the entrance of the river, which is about a quarter of a mile broad, and penetrates several miles into the interior country. W. lon. 6. 30. N. lat. 34. 0.

SALLET, or SALLAD, a dish of eatable herbs, ordinarily accompanying roast meat; composed chiefly of crude, fresh herbage, seasoned with salt, oil, and vinegar. Menage derives the word from the Latin *salata*; of *sal*, "salt;" others from *salcedo*; Du-Cange from *salgama*, which is used in Ausonius and Columella in the same sense. Some add mustard, hard eggs, and sugar; others, pepper, and other spices, with orange-peel, saffron, &c. The principal sallet herbs, and those which ordinarily make the basis of our English sallets, are lettuce, celery, endive cresses, radish, and rape: along with which, by way of furniture, or additionals, are used purslane, spinach, sorrel, tarragon, burnet, corn-sallet, and chervil. The gardeners call some plants *small herbs* in sallets; these should always be cut while in the seed leaf: as cresses, mustard, radish, turnep, spinach, and lettuce; all which are raised from seeds sown in drills, or lines, from the middle of February to the end of March, under glasses or frames; and thence to the middle of May, upon natural beds, warmly exposed; and during the summer heats in more shady places; and afterwards in September, as in March, &c.; and lastly, in the rigour of the winter, in hot-beds. If they chance to be frozen in very frosty weather, putting them in spring water two hours before they be used recovers them.

SALLO (DENIS DE), a French writer, famous for being the projector of literary journals, was born at Paris in 1626. He studied the law, and was admitted a counsellor in the parliament of Paris in 1652. It was in 1664 he schemed the plan of the *Journals des Sçavans*; and the year following began to publish it under the name of Sieur de Heronville, which was that of his valet de chambre. But he played the critic so severely, that authors, surprised at the novelty of such attacks, retorted so powerfully, that M. de Sallo, unable to weather the storm, after he had published his third Journal, declined the undertaking, and turned it over to the abbé Gallois; who, without presuming to criticise, contented himself merely with giving titles, and making extracts. Such was the origin of literary journals, which afterwards sprang up in other countries under different titles; and the success of them, under judicious management, is a clear proof of their utility. M. de Sallo died in 1669.

SALLUSTIUS (CAIUS CRISPUS), a celebrated Roman historian, was born at Amiternum, a city of Italy, in the year of Rome 669, and before Christ 85. His education was liberal, and he made the best use of it. His Roman History in six books, from the death of Sylla to the conspiracy of Catiline, the great work from which he chiefly derived his glory among the antients, is unfortunately lost excepting a few fragments; but his two detached pieces of History which happily remain entire, are sufficient to justify the great encomiums he has received as a writer.—He has had the singular honour to be twice translated by a royal hand: first by our Elizabeth, according to Camden; and secondly, by the present Infant of Spain, whose version of this elegant historian, lately printed in folio, is one of the most beautiful books that any country has produced since the invention of printing. No man has inveighed more sharply against the vices of his age than this historian; yet no man had less pretensions to virtue than he. His youth was spent in a most lewd and profligate manner; and his patrimony almost squandered away when he had scarcely taken possession of it. Marcus Varro, a writer of undoubted credit, relates, in a fragment preserved by Aulus Gellius, that Sallust was actually caught in bed with Fausta the daughter of Sylla, by Milo her husband; who scourged him very severely, and did not suffer him to depart till he had redeemed his liberty with a considerable sum. A. U. C. 694, he was made questor, and in 702 tribune of the people; in neither of which places is he allowed to have acquitted himself at all to his honour. By virtue of his questorship, he obtained an admission into the senate; but was expelled thence by the censors in 704, on account of his immoral and debauched way of life. In the year 705 Cæsar restored him to the dignity of a senator; and, to introduce him into the house with a better grace, made him questor a second time. In the administration of this office he behaved himself very scandalously; exposed every thing to sale that he could find a purchaser for; and, if we may believe the author of the invective, thought nothing wrong which he had a mind to do;

Nihil non venale habuerit, cujus aliquis emptor fuit, nihil non æquum et verum duxit, quod ipſi facere collibuiſſet. In the year 707, when the African war was at an end, he was made prætor for his ſervices to Cæſar, and ſent to Numidia. Here he acted the ſame part as Verres had done in Sicily; outrageouſly plundered the province; and returned with ſuch immenſe riches to Rome, that he purchaſed a moſt magnificent building upon mount Quirinal, with thoſe gardens which to this day retain the name of *Saluſtian gardens*, beſides his country houſe at Tivoli. How he ſpent the remaining part of his life, we have no account from antient writers. Euſebius tells us, that he married Terentia, the divorced wife of Cicero; and that he died at the age of 50, in the year 710, which was about four years before the battle of Actium. Of the many things which he wrote, beſide his Hiſtories of the Catilinarian and Jugurthine wars, we have ſome orations or ſpeeches, printed with his fragments.

SALLY-PORTS, in fortification, or *Poſtern-Gates*, as they are ſometimes called, are thoſe under-ground paſſages which lead from the inner works to the outward ones; ſuch as from the higher flank to the lower, or to the tenailles, or the communication from the middle of the curtain to the ravelin. When they are made for men to go through only, they are made with ſteps at the entrance and going out. They are about 6 feet wide and 8½ feet high. There is alſo a gutter or ſhore made under the ſally-ports, which are in the middle of the curtains, for the water which runs down the ſtreets to paſs into the ditch; but this can only be done when they are wet ditches. When ſally-ports ſerve to carry guns through them for the out-works, inſtead of making them with ſteps, they muſt have a gradual ſlope, and be 8 feet wide.

SALMASIUS (CLAUDIUS), a French writer of uncommon abilities and immenſe erudition, deſcended from an antient and noble family, and born at or near Semur in 1596. His mother, who was a Proteſtant, infuſed her notions of religion into him, and he at length converted his father: he ſettled at Leyden; and in 1650 paid a viſit to Chriſtina queen of Sweden, who is reported to have ſhown him extraordinary marks of regard. Upon the violent death of Charles I. of England, he was prevailed on by the royal family, then in exile, to write a defence of that king; which was anſwered by our famous Milton in 1651, in a work entitled *Defenſio pro Populo Anglicano contra Claudii Salmaſii Defenſionem Regiam.* This book was read over all Europe; and conveyed ſuch a proof of the writer's abilities, that he was reſpected even by thoſe who hated his principles. Salmaſius died in 1653; and ſome did not ſcruple to ſay, that Milton killed him by the acuteneſs of his reply. His works are numerous, and of various kinds; but the greateſt monuments of his learning are, his *Notæ in Hiſtoriæ Auguſtæ Scriptores*, and his *Exercitationes Plinianæ in Solinum.*

SALMO, the SALMON; a genus of the order of abdominales. The head is ſmooth, and furniſhed with teeth and a tongue; the rays of the gills are from four to ten; the back-fin is fat behind; and the belly-fins have many rays. There are 29 ſpecies; of which the moſt remarkable are,

1. The *ſalar*, or common ſalmon, is a northern fiſh, being unknown in the Mediterranean ſea and other warm climates: it is found in France in ſome of the rivers that empty themſelves into the ocean, and north as far as Greenland; they are alſo very common in Newfoundland, and the northern parts of North America. Salmons are taken in the rivers of Kamtſchatka; but whether they are of the ſame ſpecies with the European kind, is not very certain. They are in ſeveral countries a great article of commerce, being cured different ways, by ſalting, pickling, and drying: there are ſtationary fiſheries in Iceland, Norway, and the Baltic; but we believe nowhere greater than thoſe at Colraine in Ireland; and in Great Britain at Berwick, and in ſome of the rivers of Scotland. In the Hiſtory of Cumberland, we are told that "they depoſit their ſpawn even on the upper ſide of Pooley bridge, but always in the ſtream of Eamont. At thoſe times it is not an eaſy matter to drive them away by throwing ſtones at them. They will take a bait of roe, or ſmall fiſh, while upon the rudd, or laying their ſpawn. We have never heard of a ſalmon or ſalmon-ſmelt being ſeen in the lake. They go up the river Derwent in September, through the lake of Baſſenthwaite, up the river which runs through Keſwick into the vale of St. John, where they depoſit their ſpawn in the ſmall ſtreams and feeders of the lake. The young ſalmon are called *ſalmon ſmelts*, and go down to the ſea with the firſt floods in May."

The ſalmon was known to the Romans, but not to the Greeks. Pliny ſpeaks of it as a fiſh found in the rivers of Aquitaine: Auſonius enumerates it among thoſe of the Moſel. The ſalmon is a fiſh that lives both in the ſalt and freſh waters; quitting the ſea at certain ſeaſons for the ſake of depoſiting its ſpawn, in ſecurity, in the gravelly beds of rivers remote from their mouths. There are ſcarce any difficulties but what they will overcome, in order to arrive at places fit for their purpoſe: they will aſcend rivers hundreds of miles, force themſelves againſt the moſt rapid ſtreams, and ſpring with amazing agility over cataracts of ſeveral feet in height. Salmon are frequently taken in the Rhine as high up as Baſil; they gain the ſources of the Lapland rivers in ſpite of their torrent-like currents, and ſurpaſs the perpendicular falls of Leixlip, Kennerth, and Pont Aberglaſtyn. It may here be proper to contradict the vulgar error, of their taking their tail in their mouth when they attempt to leap; ſuch as Mr. Pennant ſaw ſprung up quite ſtraight, and with a ſtrong tremulous motion.

The ſalmon is a fiſh ſo generally known, that a very brief deſcription will ſerve. The largeſt we ever heard of weighed 74 pounds. The colour of the back and ſides is gray, ſometimes ſpotted with black, ſometimes plain: the covers of the gills are ſubject to the ſame variety; the belly ſilvery; the noſe ſharp-pointed; the end of the under jaw in the males often turns up in the form of a hook; ſometimes this curvature is very conſiderable: it is ſaid that they loſe this hook when they return to the ſea. The teeth are lodged in the jaws and on the tongue, and are ſlender, but very ſharp; the tail is a little forked.

2. The *trutta*, or ſea-trout, migrates like the true ſalmon up ſeveral of our rivers; ſpawns, and returns to the ſea. That deſcribed by Mr. Pennant was taken in the Tweed below Berwick, June 1769. The ſhape was more thick than the common trout; the weight three pounds two ounces. The irides ſilver; the head thick, ſmooth, and duſky, with a gloſs of blue and green; the back of the ſame colour, which grows fainter towards the ſide line. The back is plain, but the ſides, as far as the lateral line, are marked with large diſtinct irregularly-ſhaped ſpots of black: the lateral line ſtraight; the ſides beneath the line, and the belly, are white. Tail broad, and even at the end. The dorſal fin had 12 rays; the pectoral 14; the ventral 9; the anal 10. The fleſh when boiled is of a pale red, but well-flavoured.

3. The *fario*, or trout; the colours of which vary greatly in different waters, and in different ſeaſons. Trouts differ alſo in ſize. One taken in Llynallet, Denbighſhire, which is famous for an excellent kind, meaſured 17 inches, its depth three and three quarters, its weight one pound ten ounces; the head thick; the noſe rather ſharp; the upper jaw a little longer than the lower; both jaws, as well as the head, were of a pale brown, blotched with black; the teeth ſharp and ſtrong, diſpoſed in the jaws, roof of the mouth, and tongue. The back was duſky; the ſides tinged with a purpliſh bloom, marked with deep purple ſpots, mixed with black above and below the ſide-line, which was ſtraight; the belly white. The firſt dorſal

fin was ſpotted; the ſpurious fin brown, tipped with red; the pectoral, ventral, and anal fins, of a pale brown; the edges of the anal fin white; the tail very little forked when extended.—The ſtomachs of the common trouts are uncommonly thick and muſcular. They feed on the ſhell fiſh of lakes and rivers, as well as on ſmall fiſh. They likewiſe take into their ſtomachs gravel or ſmall ſtones, to aſſiſt in comminuting the teſtaceous parts of their food. The trouts of certain lakes in Ireland, ſuch as thoſe of the province of Galway and ſome others, are remarkable for the great thickneſs of their ſtomachs, which, from ſome ſlight reſemblance to the organs of digeſtion in birds, have been called *gizzards;* the Iriſh name the ſpecies that has them *gillaroo trouts*. Theſe ſtomachs are ſometimes ſerved up to table under the former appellation. Trouts are moſt voracious fiſh, and afford excellent diverſion to the angler. The paſſion for the ſport of angling is ſo great in the neighbourhood of London, that the liberty of fiſhing in ſome of the ſtreams in the adjacent counties is purchaſed at the rate of 10l. *per annum*. Theſe fiſh ſhift their quarters to ſpawn; and, like ſalmon, make up towards the heads of rivers to depoſit their roes. The under jaw of the trout is ſubject, at certain times, to the ſame curvature as that of the ſalmon.

"It is caught (ſay the editors of the Hiſtory of Cumberland) in very great plenty at all ſeaſons of the year; one weighing a pound and a half is an uſual ſize, though ſome are caught of 4lb. weight. Five or ſix ounces is a common weight; the largeſt are commonly the beſt for the table, when they cut of a deep ſalmon colour. In the winter months great quantities are potted along with the charr, and ſent to London, &c.—The angler, on a favourable day, here enjoys his diverſion in higher perfection than in moſt places. A trout occaſionally ſtrays out of the Eamont into the lake, and *vice verſa*, out of the lake into the river. They are eaſily diſtinguiſhed by their ſpots; and it is obſerved, that a fiſh taken from its uſual place is not in ſo good a condition as one of equal length taken on its own ground; hence it is probable, that they do not emigrate, except when diſeaſed or ſpawning. Geld fiſh (thoſe without ſpawn) are the firmeſt and beſt. They have been taken out of a ſolid piece of ice, in which they were frozen, as it were in a caſe, perfectly uninjured, after an impriſonment of ſeveral hours."

4. The ſpecies called from its colour the *white*, migrates out of the ſea into the river Eſk in Cumberland, from July to September. When dreſſed, their fleſh is red, and moſt delicious eating. They have, on their firſt appearance from the ſalt water, the *lernæa ſalmonea*, or ſalmon louſe, adhering to them. They have both milt and ſpawn; but no fry has as yet been obſerved. This is the fiſh called by the Scots *phinocs*. They never exceed a foot in length. The upper jaw is a little longer than the lower; in the firſt are two rows of teeth, in the laſt one: on the tongue are ſix teeth. The back is ſtraight: the whole body of an elegant form: the lateral line is ſtraight; colour, between that and the top of the back, duſky and ſilvery intermixed; beneath the line, of an exquiſite whiteneſs; firſt dorſal fin ſpotted with black: tail black, and much forked.

5. The *ſamlet* is the leaſt of the trout kind; is frequent in the Wye, in the upper part of the Severn, and the rivers that run into it, in the north of England, and in Wales. It is by ſeveral imagined to be the fry of the ſalmon; but Mr. Pennant diſſents from that opinion. See his *Brit. Zool.* III. 303.

This ſpecies has a general reſemblance to the trout, therefore muſt be deſcribed comparatively. 1*ſt*, The head is proportionably narrower, and the mouth leſs than that of the trout. 2*dly*, Their body is deeper. 3*dly*, They ſeldom exceed ſix or ſeven inches in length; at moſt, eight and a half. 4*thly*, The pectoral fins have generally but one large black ſpot, though ſometimes a ſingle ſmall one attends it; whereas the pectoral fins of the trout are more numerouſly marked. 5*thly*, The ſpurious or fat fin on the back is never tipped with red; nor is the edge of the anal fin white. 6*thly*, The ſpots on the body are fewer, and not ſo bright: it is alſo marked from the back to the ſides with ſix or ſeven large blueiſh bars; but this is not a certain character, as the ſame is ſometimes found in young trouts. 7*thly*, The tail of the ſamlet is much more forked than that of the trout. Theſe fiſh are very frequent in the rivers of Scotland, where they are called *pars*. They are alſo common in the Wye, where they are known by the name of *ſkirlings*, or *laſprings*.

6. The *alpinus*, or red charr (*umblæ minor*, or caſe charr of Pennant), is an inhabitant of the lakes of the north, and of thoſe of the mountainous parts of Europe. It affects clear and pure waters, and is very rarely known to wander into running ſtreams, except into ſuch whoſe bottom is ſimilar to the neighbouring lake. It is found in vaſt abundance in the cold lakes on the ſummits of the Lapland Alps, and is almoſt the only fiſh that is met with in any plenty in thoſe regions; where it would be wonderful how they ſubſiſted, had not Providence ſupplied them with innumerable larvæ of the gnat kind: theſe are food to the fiſh, who in their turn are a ſupport to the migratory Laplanders, in their ſummer voyages to the diſtant lake. In ſuch excurſions thoſe vacant people find a luxurious and ready repaſt in theſe fiſh, which they dreſs and eat without the addition of ſauces; for exerciſe and temperance render uſeleſs the inventions of epicuriſm. There are but few lakes in our iſland that produce this fiſh; and even thoſe not in any abundance. It is found in Ullſwater and Windermere in Weſtmoreland; in Llyn Quellyn, near the foot of Snowdon; and, before the diſcovery of the coppermines, in thoſe of Llynberris; but the mineral ſtreams have entirely deſtroyed the fiſh in the laſt lakes. In Scotland it is found in Loch Inch, and other neighbouring lakes, and is ſaid to go into the Spey to ſpawn.

"The largeſt and moſt beautiful we ever received (ſays Mr. Pennant) were taken in Windermere, and were communicated by the Rev. Mr. Fariſh of Carliſle, with an account of their natural hiſtory. He ſent five ſpecimens; two under the name of the *caſe charr*, male and female; another he called the *geld charr*, i. e. a charr which had not ſpawned the preceding ſeaſon, and on that account is reckoned to be in the greateſt perfection. The two others were inſcribed, the *red charr*, the *ſilver* or *gild charr*, the *carpio lacus benaci*, Raii *Syn. Piſc.* 66, which laſt are in Weſtmoreland diſtinguiſhed by the epithet *red*, by reaſon of the fleſh aſſuming a higher colour than the other when dreſſed.

"The umbla minor, or caſe charr, ſpawns about Michaelmas, and chiefly in the river Brathy, which uniting with another called the *Rowthay*, about a quarter of a mile above the lake, they both fall into it together. The Brathy has a black rocky bottom; the bottom of the Rowthay is a bright ſand, and into this the charr are never obſerved to enter. Some of them, however, ſpawn in the lake; but always in ſuch parts of it which are ſtony, and reſemble the channel of the Brathy. They are ſuppoſed to be in the higheſt perfection about May, and continue ſo all the ſummer; yet are rarely caught after April. When they are ſpawning in the river they will take a bait, but at no other time; being commonly taken, as well as the other ſpecies, in what they call *breaſt-neſts*, which are in length about 24 fathoms, and about five where broadeſt.—The ſeaſon which the other ſpecies ſpawn in is from the beginning of January to the end of March. They are never known to aſcend the rivers, but always in thoſe parts of the lake which are ſpringy, where the bottom is ſmooth and ſandy, and the water warmeſt. The fiſhermen judge of this warmth, by obſerving that the water ſeldom freezes in the places where they ſpawn except in intenſe froſts, and then the ice is thinner than in other parts of the lake. They are taken in greateſt plenty from the end of September to the end of November; at other times they are hardly to be met with. This

ſpecies is much more eſteemed for the table than the other, and is very delicate when potted. The length of the red charr to the diviſion in its tail was 12 inches; its biggeſt circumference almoſt 7. The firſt dorſal fin was five inches and three quarters from the tip of its noſe, and conſiſted of 12 branched rays, the firſt of which was ſhort, the fifth the longeſt; the fat fin was very ſmall. Each of the five fiſh had double noſtrils, and ſmall teeth in the jaws, roof of the mouth, and on the tongue.—The jaws of the caſe-charr are perfectly even; on the contrary, thoſe of the red charr were unequal, the upper jaw being the broadeſt, and the teeth hung over the lower, as might be perceived on paſſing the finger over them,—The geld or barren charr was rather more ſlender than the others, as being without ſpawn. The back was of a gloſſy duſky blue; the ſides ſilvery, mixed with blue, ſpotted with pale red; the ſides of the belly were of a pale red, the bottom white. The tails of each bifurcated."

7. The *thymallus*, or grayling, haunts clear and rapid ſtreams, and particularly thoſe that flow through mountainous countries. It is found in the rivers of Derbyſhire; in ſome of thoſe of the north; in the Tame near Ludlow; in the Lug, and other ſtreams near Leominſter; and in the river near Chriſtchurch, Hampſhire. It is alſo very common in Lapland: the inhabitants make uſe of the guts of this fiſh inſtead of rennet, to make the cheeſe which they get from the milk of the rein-deer. It is a voracious fiſh, rifes freely to the fly, and will very eagerly take a bait. It is a very ſwift ſwimmer, and diſappears like the tranſient paſſage of a ſhadow, from whence we believe it derived the name of *umbra*.

Effugienſque oculos celeri levis umbra *natatu*. Auſon.
The *umbra* ſwift eſcapes the quickeſt eye.

Thymalus and *thymus* are names beſtowed on it on account of the imaginary ſcent, compared by ſome to that of thyme; but we never could perceive any particular ſmell. It is a fiſh of an elegant form: leſs deep than that of a trout; the largeſt we ever heard of was taken near Ludlow, which was about half a yard long, and weighed four pounds ſix ounces; but this was a very rare inſtance. The irides are ſilvery, tinged with yellow: the teeth very minute, ſeated in the jaws and the roof of the mouth, but none on the tongue: the head is duſky; the covers of the gills of a gloſſy green: the back and ſides of a fine ſilvery gray; but when the fiſh is juſt taken, varied ſlightly with blue and gold: the ſide-line is ſtraight: the ſcales are large, and the lower edges duſky, forming ſtraight rows from head to tail: the tail is much forked.

8. The *eperlanus*, or ſmelt, inhabits the ſeas of the northern parts of Europe, and probably never is found as far ſouth as the Mediterranean: the Seine is one of the French rivers which receive it; but whether it is found ſouth of that, we have not at preſent authority to ſay. If we can depend on the obſervations of navigators, who generally have too much to think of to attend to the minutiæ of natural hiſtory, theſe fiſh are taken in the Straits of Magellan, and of a moſt ſurpriſing ſize, ſome meaſuring 20 inches in length and 8 in circumference. They inhabit the ſeas that waſh theſe iſlands the whole year, and never go very remote from ſhore, except when they aſcend the rivers. It is remarked in certain rivers, that they appear a long time before they ſpawn, being taken in great abundance in November, December, and January, in the Thames and Dee, but in others not till February; and in March and April they ſpawn; after which they all return to the ſalt water, and are not ſeen in the rivers till the next ſeaſon. It has been obſerved that they never come into the Merſey as long as there is any ſnow-water in the river. Theſe fiſh vary greatly in ſize; but the largeſt we ever heard of was 13 inches long, and weighed half a pound. They have a very particular ſcent, from whence is derived one of their Engliſh names, *ſmelt*, i. e. ſmell it. That of *ſparling*, which is uſed in Wales and the north of England, is taken from the French *ſperlan*. There is a wonderful diſagreement in the opinion of people in reſpect to the ſcent of this fiſh: ſome aſſert it flavours of the violet; the Germans, for a very different reaſon, diſtinguiſh it by the elegant title of *ſtinckfiſch*.—Smelts are often ſold in the ſtreets of London ſplit and dried. They are called *dried ſparlings*; and are recommended as a reliſh to a glaſs of wine in the morning. It is a fiſh of a very beautiful form and colour; the head is tranſparent, and the ſkin in general ſo thin, that with a good microſcope the blood may be obſerved to circulate. The irides are ſilvery; the pupil of a full black; the under jaw is the longeſt: in the front of the upper jaw are four large teeth; thoſe in the ſides of both are ſmall; in the roof of the mouth are two rows of teeth; on the tongue two others of large teeth. The ſcales are ſmall, and readily drop off: the tail conſiſts of 19 rays, and is forked. The colour of the back is whitiſh, with a caſt of green, beneath which it is varied with blue, and then ſucceeds a beautiful gloſs of a ſilvery hue.

9. The *lavaretus*, or gwiniad, is an inhabitant of ſeveral of the lakes of the Alpine parts of Europe. It is found in thoſe of Switzerland, Savoy, and Italy; of Norway, Sweden, Lapland, and Scotland; in thoſe of Ireland, and of Cumberland; and in Wales, in that of Llyntegid, near Bala, in Merionethſhire. It is the ſame with the ferra of the lake of Geneva; the ſchelly of Hulſe-water; the pollen of Lough Neagh; and the vangis and juvengis of Loch Mabon. In Scotland there is a tradition that it was firſt introduced there by their beauteous but unfortunate queen, Mary Stuart; and as in her time the Scotch court was much Frenchified, it ſeems likely that the name was derived from the French *vendoiſe*, a "dace;" to which a ſlight obſerver might be tempted to compare it from the whiteneſs of its ſcales. The Britiſh name *gwiniad*, or *whiting*, was beſtowed upon it for the ſame reaſon. It is a gregarious fiſh, and approaches the ſhores in vaſt ſhoals in ſpring and in ſummer; which proves in many places a bleſſed relief to the poor of inland countries, in the ſame degree as the annual return of the herring is to thoſe who inhabit the coaſts. Between 7000 and 8000 have been taken at one draught. The gwiniad is a fiſh of an inſipid taſte, and muſt be eaten ſoon, for it will not keep long; thoſe that chooſe to preſerve them do it with ſalt. They die very ſoon after they are taken. Their ſpawning ſeaſon in Llyntegid is in December. The largeſt gwiniad we ever heard of weighed between three and four pounds: the head is ſmall, ſmooth, and of a duſky hue; the eyes very large; the pupil of a deep blue: the noſe blunt at the end; the jaws of equal length: the mouth ſmall and toothleſs: the branchioſtegous rays nine: the covers of the gills ſilvery, powdered with black. The back is a little arched, and ſlightly carinated: the colour, as far as the lateral line, is gloſſed with deep blue and purple; but towards the lines aſſumes a ſilvery caſt, tinged with gold; beneath which thoſe colours entirely prevail. The tail is very much forked: the ſcales are large, and adhere cloſe to the body.

SALMON, in ichthyology. See SALMO.

SALMON-*Fiſhery*. See *Salmon* FISHERY.

SALON, or SALOON, in architecture, a lofty, ſpacious ſort of hall, vaulted at top, and uſually comprehending two ſtories, with two range of windows. The ſalon is a grand room in the middle of a building, or at the head of a gallery, &c. Its faces, or ſides, are all to have a ſymmetry with each other; and as it uſually takes up the height of two ſtories, its ceiling, Daviler obſerves, ſhould be with a moderate ſweep. The ſalon is a ſtate room much uſed in the palaces in Italy; and from thence the mode came to us. Ambaſſadors, and other great viſitors, are uſually received in the ſalon. It is ſometimes built ſquare, ſometimes round or oval, ſometimes octagonal, as at Marly, and ſometimes in other forms.

SALONA, a ſea port town of Dalmatia, ſeated on a bay of the gulph of Venice. It was formerly a very conſiderable place,

and its ruins ſhow that it was 10 miles in circumference. It is 18 miles north of Spalatro, and ſubject to Venice. It is now a wretched village, preſerving few diſtinguiſhable remains of its antient ſplendour. Doubtleſs, the two laſt ages have deſtroyed all that had eſcaped the barbarity of the northern nations that demoliſhed it. In a valuable MS. relation of Dalmatia, written by the ſenator Giambattiſta Giuſtiniani, about the middle of the 16th century, there is a hint of what exiſted at that time. "The nobility, grandeur, and magnificence of the city of Salona may be imagined from the vaults and arches of the wonderful theatre, which are ſeen at this day; from the vaſt ſtones of the fineſt marble, which lie ſcattered on and buried in the fields; from the beautiful column of three pieces of marble, which is ſtill ſtanding in the place where they ſay the arſenal was, towards the ſea-ſhore; and from the many arches of ſurpriſing beauty, ſupported by very high marble columns; the height of the arches is a ſtone-throw, and above them there was an aqueduct, which reached from Salona to Spalatro. There are to be ſeen many ruins and veſtiges of large palaces, and many antient epitaphs may be read on fine marble ſtones; but the earth, which is increaſed, has buried the moſt antient ſtones and the moſt valuable things." E. lon. 17. 29. N. lat. 44. 10.

SALONICHI, formerly called *Theſſalonica*, a ſea-port town of Turkey in Europe, and capital of Macedonia, with an archbiſhop's ſee. It is antient, large, populous, and rich, being about 10 miles in circumference. It is a place of great trade, carried on principally by the Greek Chriſtians and Jews, the former of which have 30 churches, and the latter as many ſynagogues; the Turks alſo have a few moſques. It is ſurrounded with walls, flanked with towers, and defended on the land-ſide by a citadel, and near the harbour with three forts. It was taken from the Venetians by the Turks in 1431. The principal merchandize is ſilk. It is ſeated at the bottom of a gulph of the ſame name, partly on the top, and partly on the ſide of a hill, near the river Vardar. E. lon. 23. 13. N. lat. 40. 41.

SALSES, a ſtrong caſtle of France, in the department of the Eaſtern Pyrenees, and late province of Rouſillon. It is ſeated on a lake of the ſame name, among mountains, 10 miles N. of Perpignam. E. lon. 3. 0. N. lat. 42. 53.

SALSETTE, an iſland of the Eaſt Indies, adjacent to Bombay, from which it is in one place divided only by a narrow paſs fordable at low water. It is about 26 miles long, and eight or nine broad. The ſoil is rich, and by proper cultivation capable of producing any thing that will grow in tropical climates. It is every where well-watered, and when in the poſſeſſion of the Portugueſe furniſhed ſuch quantities of rice, that it was called the *Granary of Goa*. It abounds alſo in all kinds of proviſions, and has great plenty of game, both of the four-footed and feathered kind. It has pretty high mountains; and there is a tradition that the whole was thrown up from the bottom of the ſea: in confirmation of which it is ſaid, that on the top of the higheſt hill there was found, ſome years ago a ſtone anchor, ſuch as was antiently uſed by the inhabitants of that country. Here we meet with the ruins of a place called *Canara*, where there are excavations of rocks, ſuppoſed to be contemporary with thoſe of ELEPHANTA. They are much more numerous, but not comparable to the former either in bigneſs or workmanſhip.

The iſland of Salſette lately formed part of the Portugueſe dominions in India. It ought to have been ceded to the Engliſh along with Bombay, as part of the dower of Catharine of Liſbon, eſpouſed to Charles II. The fulfilment of this article, however, being evaded, the iſland remained in poſſeſſion of the Portugueſe; and notwithſtanding the little care they took of it, the revenue of it was valued at 60,000l. Such was the negligence of the Portugueſe government, that they took no care to fortify it againſt the attacks of the Mahrattas, from whoſe dominions Salſette was only ſeparated by a very narrow paſs fordable at low water. Here they had only a miſerable redoubt of no conſequence, till, on the appearance of an approaching war with the Mahrattas, they began to build another, which indeed would have anſwered the purpoſe of protecting the iſland, provided the Mahrattas had allowed them to finiſh it. This, however, was not their intention. They allowed them indeed to go quietly on with their works, till they ſaw them almoſt completed, when they came and took poſſeſſion of them. The Mahrattas thus became dangerous neighbours to the Engliſh at Bombay, until it was ceded to the latter by the treaty concluded with theſe people in 1780. E. lon. 72. 15. N. lat. 19. 0.

SALSOLA, GLASS-WORT. See GLASS-WORT.

SALT, one of the great diviſions of natural bodies, but which has never yet been accurately defined. The characteriſtic marks of ſalt have uſually been reckoned, its power of affecting the organs of taſte, and being ſoluble in water. But this will not diſtinguiſh ſalt from quicklime, which alſo affects the ſenſe of taſte, and diſſolves in water; yet quicklime has been univerſally reckoned an earth, and not a ſalt. The only diſtinguiſhing property of ſalts, therefore, is their cryſtallization in water: however, this does not belong to all ſalts; for the nitrous and marine acids, though allowed on all hands to be ſalts, are yet incapable of cryſtallization, at leaſt by any method hitherto known. Several of the imperfect neutral ſalts alſo, ſuch as combinations of the nitrous, muriatic, and vegetable acids with ſome kinds of earths, cryſtallize with very great difficulty. However, by the addition of ſpirit of wine, or ſome other ſubſtances which abſorb part of the water, keeping the liquor in a warm place, &c. all of them may be reduced to cryſtals of one kind or other. Salt, therefore, may be defined a ſubſtance affecting the organs of taſte, ſoluble in water, and capable of cryſtallization, either by itſelf or in conjunction with ſome other body; and, univerſally, every ſalt capable of being reduced into a ſolid form is alſo capable of cryſtallization *per ſe*. Thus the claſs of ſaline bodies will be ſufficiently diſtinguiſhed from all others: for quicklime, though ſoluble in water, cannot be cryſtallized without addition either of fixed air or ſome other acid; yet it is moſt commonly found in a ſolid ſtate. The precious ſtones, baſaltes, &c. though ſuppoſed to be formed by cryſtallization, are nevertheleſs diſtinguiſhed from ſalts by their inſipidity, and inſolubility in water.

But acids and alkalis, and combinations of both, when in a concrete form, are ſalts, and of the pureſt ſort. Hence we conclude, that the bodies to which the name of *ſalts* more properly belongs are the concretion of thoſe ſubſtances; which are accordingly called *acid ſalts*, *alkaline ſalts*, and *neutral ſalts*. Theſe laſt are combinations of acid and alkaline ſalts, in ſuch proportion as to render the compounds neither ſour nor akaline to the taſte. This proportionate combination is called *ſaturation*: thus the common kitchen ſalt is a neutral ſalt, compoſed of marine acid and mineral alkali combined together to the point of ſaturation. The appellation of *neutral ſalts* is alſo extended to denote all thoſe combinations of acids, and any other ſubſtance with which they can unite, ſo as to loſe, wholly or in great meaſure, their acid properties.

But although this general definition of ſalts is commonly received, yet there are many writers, eſpecially mineralogiſts, who confine the denomination of *ſalts* in the manner we firſt mentioned, viz. to thoſe ſubſtances only which, beſides the general properties of ſalts, have the power of cryſtallizing, that is, of arranging their particles ſo as to form regularly-ſhaped bodies, called *cryſtals*, when the water ſuperfluous to their concrete exiſtence has been evaporated.

The antient chemiſts aſſerted that ſalt was one of the component principles of metals, and indeed of every thing elſe: a doctrine which was attempted to be revived by the late Dr.

Price of Guildford, who thought it probable that the basis of all imperfect metals is saline, because Mr. Scheele had lately extracted a real acid from arsenic, which, by the addition of a proper quantity of phlogiston, becomes a semimetal. But here the argument will hold only with regard to the semimetals, all of which are volatile in the fire, and therefore may possibly have a volatile basis, such as all acids are in some degree: but some of the imperfect metals, as tin and copper, may be reduced to a calx equally refractory with quicklime itself; and even zinc, though volatile in close vessels, is yet capable of being reduced to an exceedingly refractory calx called *flowers of zinc*; and it is to be observed, that the regulus of arsenic, even in its most perfect metalline form, cannot be calcined like other metals. The common opinion, that metals have an earthy rather than a saline basis, seems to be well founded.

The origin of salts is very much, or rather totally unknown. Some eminent chemists, particularly Stahl, have supposed that the number of substances truly and essentially saline is very small; nay, that there is but one saline principle in nature. This principle they suppose to be the vitriolic acid, as being the most simple and indestructible of them all. Stahl delivers his opinion on this subject in the following words: "That he considers the vitriolic acid as the only substance essentially saline; as the only saline principle which, by uniting more or less intimately with other substances that are not saline, is capable of forming an innumerable multitude of other saline matters, which nature and art show us; and, secondly, that this saline principle is a secondary principle, composed only by the intimate union of two primary principles, water and earth.

In support of this theory Mr. Macquer argues in the following manner: "Every true chemist will easily discover that this grand idea is capable of comprehending by its generality, and of connecting together, all the phenomena exhibited by saline substances. But we must at the same time acknowledge, that when we examine the proof upon which it is founded, although it has a great appearance of truth by its consistency with the principles of chemistry, and with many phenomena, yet it is not supported by a sufficient number of facts and experiments to ascertain its truth. We might here examine what degree of probability ought to be granted to this theory of salts; but this could not be properly accomplished, without entering into long details, and penetrating into the depths of chemistry. We are therefore obliged to relate only what is most essential to be known concerning this grand hypothesis. We may perceive at once, that the former of these propositions, upon which is founded the theory which we mentioned, cannot be demonstrated, unless it be previously proved that every saline matter, excepting pure vitriolic acid, is nothing but this same acid differently modified, the primary properties of which are more or less altered or disguised by the union contracted with other substances. But we confess that chemists are not capable of proving decisively this opinion; which, however, will appear very probable from the following reflections:

"First, Of all saline matters known, none is so strong, so unalterable, so eminently possessed of saline properties, as vitriolic acid."

The vitriolic acid, when combined with other substances, forms vitriolic salts, which vary both in specific names and properties, according to the various substances with which the acid is combined. Thus, the vitriolic acid combined with mineral alkali forms the salt called *Glauber's salt*, or *sal mirabile*. When it is combined with calcareous earths, it forms vitriolic salts with bases of calcareous earth, which are commonly called *selenites*. When combined with argillaceous earths, it forms alum. When combined with metals, it forms vitriolic salts with metallic bases, to which the general name *vitriols* is given; and in commerce are commonly called *copperas*. The vitriols principally used are, 1. The martial vitriol; called also *English vitriol*, *green vitriol*, or *green copperas*, which is a combination of vitriolic acid with iron. 2. The vitriol of copper, called also *blue vitriol*, *Cyprian vitriol*, or *blue copperas*; which is a combination of vitriolic acid and copper. 3. The vitriol of zinc, called also *white copperas*, and *Goslar vitriol*, which is a combination of the same acid with a semimetal called *zinc*. It is a property peculiar to the vitriolic acid, that all the combinations of it with those substances with which it can form neutral salts are susceptible of crystallization.

"Secondly, Amongst the other saline substances, those which appear most active and most simple, as nitrous and marine acids, are at the same time those whose properties most resemble the properties of vitriolic acid."

The nitrous acid, combined with all the substances with which it can mix, forms saline substances, in general called *nitrous salts*; specifying each particular salt by the name of the substance united to the acid. Thus, nitrous acid with fixed vegetable alkali forms a saline substance called *nitre* or *saltpetre*. With mineral alkali, forms cubic or quadrangular nitre. When mixed with metallic substances, forms metallic nitres, which are specified *nitre of gold*; *nitre of silver*, or *lunar nitre*; *lunar crystals*, and *crystals of silver*; *nitrous crystals of mercury*; *nitre of copper*, &c.

"Thirdly, We may give to vitriolic acid many of the characteristic properties of nitrous acid, by combining it in a certain manner with the inflammable principle, as we see in the volatile sulphureous acid; and even, according to an experiment of Mr. Piech, related in a memoir concerning the origin of nitre, which gained the prize of the academy of Berlin, vitriolic acid, mixed with vegetable and animal matters susceptible of fermentation, is really transformed into a nitrous acid by the putrefaction of these matters.

"Fourthly, The marine acid, although its principles are less known than those of the nitrous acid, may be approximated to the character of vitriolic and nitrous acids by certain methods. This acid, after it has been treated with tin and other metallic matters, is capable of forming either, with spirit of wine, as vitriolic acid does, which it cannot do in its natural state; and when iron is dissolved in it, it seems to be approximated to the nature of nitrous acid. Reciprocally, the approximation of vitriolic acid to the character of marine acid seems not impossible. Having once distilled very pure vitriolic acid upon a considerable quantity of white arsenic, I was struck with a strong smell like that of marine acid, which was not either that of arsenic or of vitriolic acid; for this has no smell when it is pure."

The marine acid combined with various matters forms marine salts, or simply salts, specified by the names of their particular bases. The sea-salt, or kitchen salt, and sal gem, are combinations of marine acid and mineral alkali. When this acid is combined with volatile alkali, it forms sal ammoniac. With metals it forms metallic salts, called *salt of gold*, *salt of copper*, &c. according to the various metals combined with the acid. The salt of silver is also called *luna cornea*; the salt of lead is often called *plumbum corneum*; and the salts of antimony, and of arsenic, are known by the names of *butter of antimony*, and *butter of arsenic*.

"Fifthly, Oily vegetable acids become so much stronger, and more similar to vitriolic acid, as they are more perfectly deprived of their oily principle, by combining them with alkali, earths, or metals; and afterwards by separating them from these substances by distillation, and especially by frequently repeating these operations. They might perhaps be reduced to a pure vitriolic acid, by continuing sufficiently this method; and reciprocally, vitriolic and nitrous acids, weakened by water, and treated with much oily matters, or still better with spirit of wine,

acquire the character of vegetable acids. We may ſee a remarkable inſtance of this in Mr. Pott's diſſertation *De acido nitri vinoſo*.

"Sixthly, The properties of fixed alkalis ſeem to be very different from thoſe of acids in general, and conſequently of vitriolic acid. Yet if we conſider that a large quantity of earth enters their compoſition; that much of it may be ſeparated by repeated ſolutions and calcinations; and alſo that, by depriving theſe ſaline ſubſtances of their earthy principles, they become leſs fixed, more deliqueſcent, and, in a word, more ſimilar to vitriolic acid in this reſpect;—we ſhall not think it improbable, that fixed alkalis owe their ſaline properties to a ſaline principle, of the nature of vitriolic acid, but much diſguiſed by the quantity of earth, and probably of inflammable principle, to which it is united in theſe combinations. The properties of volatile alkalis, and the transformation of fixed alkali, or of its materials, into volatile alkali in putrefaction, and in ſeveral diſtillations, ſeem to ſhow ſufficiently that they are matters eſſentially ſaline, as fixed alkalis are, and that their volatility which diſtinguiſhes them proceeds from their containing a leſs quantity of earth, but more attenuated, and a portion of very ſubtile and volatile oil, which enters their compoſition. [For ſome other particulars relating to the tranſmutation of ſalts, ſee CHEMISTRY.]

"Beſides theſe principal facts, there are many others, too numerous to be even ſlightly mentioned here; they may be found ſcattered in the works of chemiſts, particularly of Stahl. But perſons who would collect and compare all the experiments relating to this ſubject, ought to know, that many of them are not ſufficiently aſcertained; and that perhaps a greater number of them have not been ſufficiently proſecuted, and are, properly ſpeaking, only begun. We muſt even acknowledge, that many of thoſe experiments which we have mentioned have not been ſufficiently proſecuted.

"The ſecond fundamental propoſition of the theory of ſalts, namely, 'That the vitriolic acid is compounded of only the aqueous and earthy principles,' is, like the firſt, ſupported by many facts which give it a degree of probability, but which do not amount to a complete demonſtration. This propoſition may be ſupported by the following conſiderations:

"Firſt, Experience conſtantly ſhows that the properties of compound bodies are always the reſult of thoſe of the component parts of theſe bodies, or rather they are the properties of theſe component bodies modified by one another.

"Thus, if a body be compoſed of two principles, one of which is fixed and the other volatile, it will have a leſs degree of fixity than the former, and a leſs volatility than the latter. If it be compoſed of two principles, one of which is ſpecifically heavier than the other, its ſpecific gravity will be greater than that of one of them, and leſs than that of the other. The ſame obſervation is applicable to all the other eſſential properties, excepting thoſe which deſtroy each other; as, for inſtance, the tendency to combination, or the diſſolving power; for theſe latter properties are weakened ſo much more in the compounds as their principles are more ſtrongly united, and in more juſt proportion.

"We obſerve, nevertheleſs, that the properties of compound bodies are not always exactly intermediate betwixt the properties of the component bodies; for, to produce this mean, the quantities of each of the component parts muſt be equal, which is the caſe in few or no compounds.

"Beſides, ſome particular circumſtances in the manner in which the principles unite with one another, contribute more or leſs to alter the reſult of the combined properties: for inſtance, experience ſhows that when ſeveral bodies, particularly metals, are united together, the ſpecific gravities of which are well known, the allay formed by ſuch union has not the preciſe ſpecific gravity which ought to reſult from the proportion of the allayed ſubſtances; but that in ſome allays it is greater, and in others leſs. But we are certain, on the other ſide, that theſe differences are too inconſiderable to prevent our diſtinguiſhing the properties of the principles in the compounds which they form, eſpecially when they have very different properties.

"Theſe things being premiſed, when we examine well the properties of vitriolic acid, we ſhall eaſily find that they partake of the properties of the aqueous and of the earthy principles.

"Firſt, When this acid is as pure as we can have it, it is, like the pureſt water and the pureſt vitrifiable earths, free from colour or ſmell, and perfectly tranſparent.

"Secondly, Although we cannot deprive the vitriolic acid of all the water ſuperabundant to its ſaline eſſence, and therefore its preciſe ſpecific gravity has not been determined, we know that, when it is well concentrated, it is more than twice as heavy as pure water, and much leſs heavy than any earthy ſubſtance.

"Thirdly, This acid is much leſs fixed than any pure earth, ſince, however well it may be concentrated, it may always be entirely diſtilled; for which purpoſe, a much ſtronger degree of heat is requiſite than for the diſtillation of pure water.

"Fourthly, We do not know the degree of ſolidity of vitriolic acid, or the adheſion of aggregation which its integrant parts have one to another, becauſe for this purpoſe the vitriolic acid ought to be deprived of all ſuperabundant water: but if we judge of it, by the ſolid conſiſtence of this acid when highly concentrated, as we ſee from the vitriolic acid called *glacial*, the integrant parts of this acid ſeem ſuſceptible of a much ſtronger adheſion than thoſe of pure water; but much leſs than thoſe of earth, as we ſee from the inſtance of hard ſtones.

"Fifthly, The union which this acid contracts with water and with earths, ſhows that theſe ſubſtances enter into its compoſition; for we know that, in general, compounds are diſpoſed to unite ſuperabundantly with the principles which compoſe them. All theſe properties of vitriolic acid, which ſo ſenſibly partake, and much more than any other acid, of the properties of earth and of water, are ſufficient to induce us to believe that it is compoſed of theſe two principles; but it has one very eminent property, that is common with it to neither water nor pure earth, which is, its violent and corroſive taſte. This property is ſufficient to raiſe doubts, if we could not explain it from principles, which ſeem certain and general, relating to the combination of bodies.

"We obſerve then, concerning the property now in queſtion, that is, of taſte in general, that it can only be conſidered as an irritation made upon the organs of taſte by ſapid bodies; and if we reflect attentively upon it, we ſhall be convinced, that no ſubſtance that is not impreſſed by ſome impulſe can irritate or agitate our ſenſible organs, but by a peculiar force of its integrant parts, or by their tendency to combination; that is, by their diſſolving power. According to this notion, the taſte of bodies, or the impreſſion made upon our ſenſible organs by their tendency to combination, or by their diſſolving power, are the ſame property; and we ſee accordingly, that every ſolvent has a taſte, which is ſo much more ſtrong as its diſſolving power is greater; that thoſe whoſe taſte is ſo violent that it amounts to acrimony, corroſion, and cauſticity, when applied to any other of the ſenſible parts of our body beſides the organs of taſte, excite in them itching and pain.

"This being premiſed, the queſtion is, How earth, in which we perceive no taſte nor diſſolving power, and water, which has but a very weak diſſolving power, and little or no taſte, ſhould form by their combination a ſubſtance, ſuch as the vitriolic acid is, powerfully corroſive and ſolvent?

"To conceive this, let us conſider, firſt, that every part of matter has a power by which it combines, or tends to combine,

with other parts of matter. Secondly, that this force, the effects of which are perceptible, in chemical operations, only among the very small molecules, or the integrant and constituent parts of bodies, seems proportionable to the density or specific gravity of these parts. Thirdly, that this same force is limited in every integrant molecule of matter: that if we consider this force as not satisfied, and consequently as a simple tendency to combination, it is the greatest possible in an integrant molecule of matter perfectly insulated, or attached to nothing; and is the smallest possible, or none, when it is satisfied by its intimate combination with other parts capable of exhausting all its action: its tendency being then changed into adhesion.

"Hence we may infer, that the integrant parts of the earthy principle have essentially, and like all the other parts of matter, a force of tendency to union, or of cohesion in union, according to their condition; that, as this earthy principle has a much more considerable density or specific gravity than all other simple bodies that we know, we may probably presume that its primary integrant molecules have a more considerable force of tendency to union, in the same proportion, than the integrant parts of other principles; that consequently, when they cohere together, and form an aggregate, their aggregation must also be stronger and firmer than that of any other body. Accordingly, we see that the purest earthy substances, whose parts are united and form masses, such as, for instance, the stones called *vitrifiable*, are the hardest bodies in nature. We are no less certain, that as the tendency of the parts of matter to unite is so much less evident as it is more exhausted and satisfied in the aggregation, the parts of the earthy principle being capable of exhausting mutually all their tendency to union, we may thence infer, that every sensible mass of pure earthy matter must appear deprived of any dissolving power; of taste; in a word, of tendency to union from the firmness of its aggregation. But we may also infer, that when these primary integrant parts of the earthy principle are not united together in aggregation, then, resuming all the activity and tendency to union which are essential to them, they must be the strongest and most powerful of all solvents.

"These being premised, if we suppose again, with Stahl and the best chemists, that, in the combination of the saline principle or of vitriolic acid, the parts of the earthy principle are united, not with each other, as in the earthy aggregation, but with the primary parts of the aqueous principle, each to each, we may then easily conceive that the primary integrant parts of the water, having essentially much less tendency to combination than those of earth, the tendency of these latter to union will not be exhausted, but satisfied only partly, by their combination with the former; and that consequently a compound must result, the integrant parts of which will have a strong dissolving power, as vitriolic acid is.

"We may see from hence how much mistaken chemists are, who, considering earth only in its aggregation, or rather not attending to this state, and not distinguishing it from that state in which the parts of this same earth are so separated from each other by the interposition of another body, that they cannot touch or cohere together, have considered the earthy principle as a substance without force or action, and have very improperly called that a *passive principle*, which of all others is the strongest, most active, and most powerful.

"However this general theory of salts may conform with the most important phenomena of chemistry, we must acknowledge, that it can only be proposed as a systematical opinion, till it be evidently demonstrated by the decisive means employed in chemical demonstrations, namely, by decomposition and recomposition: thus, if we could reduce vitriolic acid to earth and water, and make that acid by combining together these two principles, this theory would cease to be a system, and would become a demonstrated truth. But we must confess, that this theory is less supported by experiment than by argument, from the many difficulties that are inevitable in such inquiries. For on one side we know that the simpler bodies are, the more difficult is their decomposition; and on the other side, the stronger the aggregation is, the greater is the difficulty of making it enter into a new combination. Thus, as vitriolic acid is very simple, since it is a compound of the first order, it ought strongly to resist decomposition; and as the aggregation of pure earth is the firmest that we know, it cannot easily be made to enter as a principle into a new combination with water to form a saline matter. The following are the principal experiments which have been made relative to the subject:

"First, We seem to be certain, from many proofs, that all saline substances, comprehending those that contain vitriolic acid, as vitriolated tartar, Glauber's salt, and other vitriolated salts which are sufficiently fixed to support a perfect drying, or rather calcination, being alternately dissolved, dried, and calcined a number of times, are more and more diminished in quantity, and that earth and water are separated from them each operation. But alkaline salts appear to be still more susceptible than any other saline matter of this kind of decomposition.

"Secondly, When nitre is burnt in close vessels, so that we may retain not only all that remains fixed after this burning, but also what exhales in vapours, as in the experiment of the clyssus of nitre, we have a proof which seems decisive, that the mineral acid of this salt, which is not very far from the simplicity of vitriolic acid, is totally decomposed, and reduced into earth and water. For, if we examine the fixed residuum in the retort, we find that it is only the alkali that was contained in the nitre, charged with a superabundant earth, which is separable from it by solution and filtration. And if the liquor in the receiver, formed by the vapours condensed there, be examined, which ought to be nitrous acid, if this acid had not been destroyed; we find, that, so far from being acid, it is only pure water, sometimes even charged with a little fixed alkali, which had been raised by the force of the detonation. Thus nitrous acid is made to disappear in this experiment, and in its place we find only earth and water.

"Thirdly, The phenomena of limestone, which by calcination and extinction in water acquires saline properties that it had not before its attenuation by fire and its combination with water; and also the experiment of Beccher, who asserts, that if a vitrifiable stone be alternately made red-hot and extinguished in water a number of times, it may be so attenuated that it shall be like a saline gelatinous matter; these, I say, show that saline matters are actually formed by the intimate combination of the very attenuated parts of earth with those of water. We find in the writings of Beccher and Stahl, and particularly in the *Specimen Beccherianum* of the latter author, many other observations and experiments tending to prove the same proposition; but we must confess, that none of the experiments we have mentioned, excepting that of the decomposition of nitrous acid by burning, are absolutely decisive; principally because they have not been sufficiently repeated or prosecuted, nor carefully enough examined in all their circumstances."

On this theory it is obvious to remark, that our author has omitted to mention the most active part of the composition of salts, namely elementary fire. Of this both acids and alkalis undoubtedly contain a great quantity in a very active state, as is evident from their performing the effects of fire when applied to certain substances; nay, from their actually bursting into flame when mixed with some kinds of oils. For an explanation of the reason of which, see HEAT, and the various detached articles relative to that subject. Whatever doubts we may have of the power of mere water combined with mere earth to affect

the organs of taste, we can have none that the element of fire is capable of so doing; and from the very tasting of these substances, we may be assured, that whatever gives that peculiar sensation to the tongue which we call *acid* or *alkaline*, gives also the other properties of the salt, whatever they may be. In alkalis, no doubt, the greatest part of the composition is earth; but, from what has been said on QUICKLIME, it appears that mere earth, by the artificial action of fire alone, acquires all the properties of salt, that of crystallizing *per se* excepted: it seems probable therefore, that, in the more perfect operations of nature, the same materials are used; only the proportions are such, that the substance is more soluble, and its causticity greater, than even quicklime itself. With regard to acids, the earthy parts seem to be fewer; and in all probability the most considerable ingredient in their composition is water: but in what manner this element is united to that of fire so as to produce the peculiar phenomena of acids, cannot be explained.

The acid of tartar (the purest part of which, or that saline substance which first crystallizes by evaporation in the vessels in which it is purified, is called *cream of tartar)*, and also all other concrete vegetable acids analogous to it, when mixed with various other substances, form compounds, generally called *tartareous salts*, or *soluble tartars*, because they are dissolved by water more easily than the acid of tartar itself. Acetous salts, that is, all salts containing the acid of vinegar, are also combined with various bases, and form saline substances of different names; the principal of which are, the acetous salt of copper, called *crystals of Venus, or of verdigris*, by the chemists, and *distilled* or *crystallized verdigris* in commerce; the acetous salt of lead, commonly called *salt* or *sugar of lead*; and the acetous mercurial salts. Sugar is an essential vegetable salt, of a pleasant sweet taste, containing a vegetable acid combined with earth and oil.

Potash is a fixed vegetable alkali, extracted from the ashes of wood. Concrete volatile alkalis are generally called *volatile salts*; although this name is sometimes also given to the volatile salt of amber, which is not an alkaline but an acid salt. Borax is a neutral saline matter, whose origin, whether animal or vegetable, is as yet unknown, its components being not sufficiently examined. It is soluble in water, and very nearly as crystallizable as alum. When borax is exposed to the fire, it first bubbles and foams very much, but afterwards it melts into a clear glass. When acids are combined with the alkaline part of borax, a substance of a singular nature is separated from it, commonly called *sedative salt*. Although this substance acts as an acid in borax, by saturating its alkali, yet it has no acid taste, nor doth it turn the tincture of heliotropium to a red, as other acids do. It is the property of borax to facilitate considerably the fusion of metals, of earths, and other minerals. Some species of stones and earths cannot be vitrified at all, except they are mixed with borax. For this property borax is commonly used as a flux (that is, a substance which facilitates the fusion of other bodies) in various manufactories; but especially in soldering metals, and in assaying ores. Phosphoric salts are combinations of alkaline, earthy, and metallic substances with the acid obtained from the phosphorus of urine. Besides the above-mentioned salts, there are several others to be met with in the writings of the chemical and medical authors; but, as they are of little consequence, we shall omit any account of them.

Some new neutral salts have been formed by the oxygenated muriatic acid.—This was first taken notice of by M. Berthollet, and the discovery is illustrated by Dr. Dollfuss, in Crell's Annals for the year 1788, vol. i. p. 319.

In consequence of what is there related, we ought to reckon, in addition to the two salts discovered by M. Berthollet, another salt, to which, according to the new French nomenclature, might be given the name *murias oxygenatus magnesiæ liquidus*, because we cannot obtain it in a concrete form. The oxygenated muriatic acid appears to enter into a very different, or at least into a much more intimate combination with the metals; a subject which greatly merits the attention of the chemist. The probability of this proposition is strengthened by the theory of M. Berthollet; according to which the mercury in corrosive muriat of mercury (corrosive sublimate) is combined with the oxygenated muriatic acid, so as not to be separated from it without great difficulty.

Common SALT, or *Sea Salt*, the name of that salt extracted from the waters of the ocean, which is used in great quantities for preserving provisions, &c. It is a perfect neutral salt, composed of marine or muriatic acid, saturated with mineral alkali. It has a saline but agreeable flavour. It requires about four times its weight of cold water to be dissolved, and nearly the same quantity of boiling water, according to Macquer. But according to Kirwan, it only requires 2,5 its weight of water to be dissolved in the temperature of sixty degrees of Fahrenheit. This salt always contains some part formed with a calcareous base; and, in order to have it pure, it must be dissolved in distilled water: then a solution of mineral alkali is to be poured in it until no white precipitation appears; then, by filtrating and evaporating the solution, a pure common salt is produced. Its figure is perfectly cubic, and those hollow pyramids, or *tremies* as the French call them, as well as the parallelopipeds formed sometimes in its crystallization, consist all of a quantity of small cubes disposed in those forms. Its decrepitation on the fire, which has been reckoned by some as a characteristic of this salt, although the vitriolated tartar, nitrous lead, and other salts, have the same property, is owing chiefly to the water, and perhaps also to the air of its crystallization.

Its specific gravity is 2,120 according to Kirwan. The acid of tartar precipitates nothing from it. One hundred parts of common salt contain thirty-three of real acid, fifty of mineral alkali, and seventeen of water. It is commonly found in salt water and salt springs, in the proportion of even thirty-six *per cent.* It is found also in coals, and in beds of gypsum. This salt is unalterable by fire, though it fuses, and becomes more opake: nevertheless a violent fire, with the free access of air, causes it to evaporate in white flowers, which stick to the neighbouring bodies. It is only decomposed, as Macquer affirms, by the vitriolic and nitrous acid; and also by the boracic or sedative salt. But although nitre is decomposed very easily by arsenic, this neutral marine salt is nowise decomposed by the same. According to Mongez, the fixed vegetable alkali, when caustic, decomposes also this marine salt. It preserves from corruption almost all sorts of animal food much better for use than any other salt, as it preserves them without destroying their taste and qualities; but when applied in too small a quantity, it then forwards their corruption.

Of this most useful commodity there are ample stores on land as well as in the ocean. There are few countries which do not afford vast quantities of rock or fossil salt. Mines * of it have long been discovered and wrought in England, Spain, Italy, Germany, Hungary, Póland, and other countries of Europe. In several parts of the world, there are huge mountains which wholly consist of fossil salt. Of this kind are two mountains in Russia, nigh Astracan; several in the kingdoms of Tunis and Algiers, in Africa; and several also in Asia; and the whole island of Ormus in the Persian gulf almost entirely consists of

* Amongst the salt mines of chief note are those of Northwich in Cheshire, Altemonte in Calabria, Hall in Tyrol, Cardona in Catalonia: also those stupendous mines at Wilieczka in Poland, and Soowar in Upper Hungary; of which see accounts in Phil. Transf. Nos. 61 and 413.

foſſil ſalt. The new world is likewiſe ſtored with treaſures of this uſeful mineral, as well as with all other kinds of ſubterranean productions. Moreover, the ſea affords ſuch vaſt plenty of common ſalt, that all mankind might thence be ſupplied with quantities ſufficient for their occaſions. There are alſo innumerable ſprings, ponds, lakes, and rivers, impregnated with common ſalt, from which the inhabitants of many countries are plentifully ſupplied therewith. In ſome countries which are remote from the ſea, and have little commerce, and which are not bleſſed with mines of ſalt or ſalt-waters, the neceſſities of the inhabitants have forced them to invent a method of extracting their common ſalt from the aſhes of vegetables. The muriatic ſalt of vegetables was deſcribed by Dr. Grew under the title of *lixiviated marine ſalt*. Leeuwenhoek obtained cubical cryſtals of this ſalt from a lixivium of ſoda or kelp, and alſo from a ſolution of the lixivial ſalt of carduus benedictus; of which he hath given figures in a letter to the Royal Society, publiſhed in No. 173 of their Tranſactions. Dr. Dagner, in *Act. Acad. N. C.* vol. v. obſ. 150. takes notice of great quantities of it which he found mixed in pot aſhes. And the ingenious Dr. Fothergill extracted plenty of it from the aſhes of fern. See *Medical Eſſays*, vol. v. article 13.

The muriatic ſalt which the excellent Mr. Boyle extracted from ſandiver, and ſuppoſed to be produced from the materials uſed in making glaſs, was doubtleſs ſeparated from the kelp made uſe of in that proceſs. Kunckel alſo informs us, that he took an alkaline ſalt, and, after calcining it with a moderate fire, diſſolved it in pure water, and, placing the ſolution in a cool cellar, obtained from it many cryſtals of a neutral ſalt. He ſuppoſes, that the alkaline ſalt was by the proceſs converted into this neutral ſalt. But it is more reaſonable to believe, that the alkaline ſalt which he applied was not pure, but mixed with the muriatic ſalt of vegetables, which by this proceſs was only ſeparated from it.

It is doubtleſs chiefly this muriatic ſalt which, in ſome of the inland parts of Aſia, they extract from the aſhes of duck-weed and of Adam's fig-tree, and uſe for their common ſalt.

That they are able in thoſe countries to make common ſalt to profit from vegetables, ought not to be wondered at, ſince in Dehli and Agra, capitals of Indoſtan, ſalt is ſo ſcarce as uſually to be ſold for half-a-crown a pound. We may therefore give ſome credit to Marco Polo, when he informs us, that in the inner parts of the ſame quarter of the world, in the province of Caindu, lying weſt of Tebeth, the natives uſed ſalt inſtead of money, it being firſt made up in cakes, and ſealed with the ſtamp of their prince; and that they made great profit of this money by exchanging it with the neighbouring nations for gold and muſk. We are alſo told by Ludolfus, in his *Hiſtoria Æthiopica*, that in the country of the Abyſſines there are mountains of ſalt, the which when dug out is ſoft, but ſoon grows hard; and that this ſalt ſerves them inſtead of money to buy all things. The ſame is confirmed by Ramuſio.

Mr. Boyle diſcovered common ſalt in human blood and urine. "I have obſerved it (ſays Mr. Brownrigg), not only in human urine, but alſo in that of dogs, horſes, and black cattle. It may eaſily be diſcovered in theſe, and many other liquids impregnated with it, by certain very regular and beautiful ſtarry figures which appear in their ſurfaces after congelation. Theſe figures I firſt obſerved in the great froſt in the year 1739. The dung of ſuch animals as feed upon graſs or grain, doth alſo contain plenty of common ſalt."

Naturaliſts, obſerving the great variety of forms under which this ſalt appears, have thought fit to rank the ſeveral kinds of it under certain general claſſes; diſtinguiſhing it, moſt uſually, into rock or foſſil ſalt, ſea-ſalt, and brine or fountain ſalt. To which claſſes others might be added, of thoſe muriatic ſalts which are found in vegetable and animal ſubſtances. Theſe ſeveral kinds of common ſalt often differ from each other in their outward form and appearance, or in ſuch accidental properties as they derive from the heterogeneous ſubſtances with which they are mixed. But when perfectly pure they have all the ſame qualities; ſo that chemiſts, by the exacteſt inquiries, have not been able to diſcover any eſſential difference between them; for which reaſon we ſhall diſtinguiſh common ſalt after a different manner, into the three following kinds, *viz.* into rock or native ſalt, bay ſalt, and white ſalt.

By *rock ſalt*, or *native ſalt*, is underſtood all ſalt dug out of the earth, which hath not undergone any artificial preparation. Under the title of *bay ſalt* may be ranked all kinds of common ſalt extracted from the water wherein it is diſſolved, by means of the ſun's heat, and the operation of the air; whether the water from which it is extracted be ſea-water, or natural brine drawn from wells and ſprings, or ſalt water ſtagnating in ponds and lakes. Under the title of *white ſalt*, or *boiled ſalt*, may be included all kinds of common ſalt extracted by coction from the water wherein it is diſſolved; whether this water be ſea-water, or the ſalt water of wells, fountains, lakes, or rivers; or water of any ſort impregnated with rock-ſalt, or other kinds of common ſalt.

The firſt of theſe kinds of ſalt is in ſeveral countries found ſo pure, that it ſerves for moſt domeſtic uſes, without any previous preparation (triture excepted); for of all natural ſalts rock-ſalt is the moſt abundantly furniſhed by nature in various parts of the world, being found in large maſſes, occupying great tracts of land. It is generally formed in ſtrata under the ſurface of the earth, as in Hungary, Moſcovy, Siberia, Poland, Calabria, Egypt, Ethiopia, and the Eaſt Indies. "In England (ſays Magellan) the ſalt mines at Northwich are in a high ground, and contain it in layers or ſtrata of various colours, of which the yellow and brown are the moſt plentiful, as I have obſerved on the ſpot, which I viſited in June 1782, in company with my worthy and learned friend Mr. Volta, profeſſor of natural philoſophy in the univerſity of Pavia, and well known by his great abilities, and many diſcoveries in that branch of knowledge. The mine into which we deſcended was excavated in the form of a vaſt dome or vault under ground, ſupported by various columns of the ſalt, that were purpoſely left to ſupport the incumbent weight. And the workmen having lighted a number of candles all round its circumference, it furniſhed us with the moſt agreeable and ſurpriſing ſight, whilſt we were deſcending in the large tub, which ſerves to bring up the lumps that are broken from the mine, &c. See the deſcription of the famous ſalt-mines of Wilieczka in Poland, by Mr. Berniard, in the *Journal de Phyſique*, vol. xvi. for 1780, page 459, in which the miraculous tales concerning thoſe ſubterraneous habitations, villages, and towns, are reduced to their proper magnitude and eſtimate." But the Engliſh foſſil ſalt is unfit for the uſes of the kitchen, until by ſolution and coction it is freed from ſeveral impurites, and reduced into white ſalt. The Britiſh white ſalt alſo is not ſo proper as ſeveral kinds of bay ſalt for curing fiſh and ſuch fleſh-meats as are intended for ſea proviſions, or for exportation into hot countries. So that for theſe purpoſes we are obliged, either wholly or in part, to uſe bay ſalt, which we purchaſe in France, Spain, and other foreign countries.

However, it does not appear that there is any other thing requiſite in the formation of bay ſalt than to evaporate the ſea-water with an exceedingly gentle heat; and it is even very probable, that our common ſea ſalt by a ſecond ſolution and cryſtallization might attain the requiſite degree of purity. Without entering into any particular detail of the proceſſes uſed for the preparation of bay ſalt in different parts of the world, we ſhall content ourſelves with giving a brief account of the beſt methods of preparing common ſalt.

At ſome convenient place near the ſea-ſhore is erected the ſaltern. This is a long low building, conſiſting of two parts; one of which is called the *fore-houſe*, and the other the *pan-houſe*

or *boil'ng-houſe.* The fore-houſe ſerves to receive the fuel, and cover the workmen; and in the boiling-houſe are placed the furnace, and pan in which the ſalt is made. Sometimes they have two pans, one at each end of the ſaltern; and the part appropriated for the fuel and workmen is in the middle.

The furnace opens into the fore-houſe by two mouths, beneath each of which is a mouth to the aſh-pits. To the mouths of the furnace doors are fitted; and over them a wall is carried up to the roof, which divides the fore-houſe from the boiling-houſe, and prevents the duſt of the coal and the aſhes and ſmoke of the furnace from falling into the ſalt pan. The fore-houſe communicates with the boiling houſe by a door, placed in the wall which divides them.

The body of the furnace conſiſts of two chambers, divided from each other by a brick partition called the *mid-feather;* which from a broad baſe terminates in a narrow edge nigh the top of the furnace, and, by means of ſhort pillars of caſt iron erected upon it, ſupports the bottom of the ſalt-pan; it alſo fills up a conſiderable part of the furnace, which otherwiſe would be too large, and would conſume more coals than, by the help of this contrivance, are required. To each chamber of the furnace is fitted a grate, through which the aſhes fall into the aſh pits. The grates are made of long bars of iron, ſupported underneath by ſtrong croſs bars of the ſame metal. They are not continued to the furtheſt part of the furnace, it being unneceſſary to throw in the fuel ſo far: for the flame is driven from the fire on the grate to the furtheſt part of the furnace; and from thence paſſes, together with the ſmoke, through two flues into the chimney; and thus the bottom of the ſalt-pan is everywhere equally heated.

The ſalt-pans are made of an oblong form, flat at the bottom, with the ſides erected at right angles; the length of ſome of theſe pans is 15 feet, in breadth 12 feet, and the depth 16 inches; but at different works they are of different dimenſions. They are commonly made of plates of iron, joined together with nails, and the joints are filled with a ſtrong cement. Within the pan five or ſix ſtrong beams of iron are fixed to its oppoſite ſides, at equal diſtances, parallel to each other and to the bottom of the pan, from which they are diſtant about eight inches. From theſe beams hang down ſtrong iron hooks, which are linked to other hooks or claſps of iron firmly nailed to the bottom of the pan; and thus the bottom of the pan is ſupported, and prevented from bending down or changing its figure. The plates moſt commonly uſed are of malleable iron, about four feet and a half long, a foot broad, and the third of an inch in thickneſs. The Scots prefer ſmaller plates, 14 or 15 inches ſquare. Several make the ſides of the pan, where they are not expoſed to the fire, of lead; thoſe parts when made of iron being found to conſume faſt in ruſt from the ſteam of the pan. Some have uſed plates of caſt iron, five or ſix feet ſquare, and an inch in thickneſs; but they are very ſubject to break when unequally heated, and ſhaken (as they frequently are) by the violent boiling of the liquor. The cement moſt commonly uſed to fill the joints is plaſter made of lime.

The pan, thus formed, is placed over the furnace, being ſupported at the four corners by brick work; but along the middle, and at the ſides and ends, by round pillars of caſt iron called *taplins,* which are placed at three feet diſtance from each other, being about eight inches high, and at the top, where ſmalleſt, four inches in diameter. By means of theſe pillars the heat of the fire penetrates equally to all parts of the bottom of the pan, its four corners only excepted. Care is alſo taken to prevent the ſmoke of the furnace from paſſing into the boiling-houſe, by bricks and ſtrong cement, which are cloſely applied to every ſide of the ſalt-pan. In ſome places, as at Blyth in Northumberland, beſides the common ſalt-pans here deſcribed, they have a preparing-pan placed between two ſalt-pans, in the middle part of the building, which in other works is the fore-houſe. The ſea-water being received into this preparing-pan, is there heated and in part evaporated by the flame and heat conveyed under it through flues from the two furnaces of the ſalt-pans. And the hot water, as occaſion requires, is conveyed through troughs from the preparing-pan into the ſalt-pans. Various other contrivances have been invented to leſſen the expenſe of fuel, and ſeveral patents have been obtained for that purpoſe; but the ſalt-boilers have found their old methods the moſt convenient.

Between the ſides of the pan and walls of the boiling-houſe, there runs a walk five or ſix feet broad, where the workmen ſtand when they draw the ſalt, or have any other buſineſs in the boiling-houſe. The ſame walk is continued at the end of the pan, next to the chimney; but the pan is placed cloſe to the wall at the end adjoining to the fore-houſe.

The roof of the boiling-houſe is covered with boards faſtened on with nails of wood, iron nails quickly mouldering into ruſt. In the roof are ſeveral openings, to convey off the watery vapours; and on each ſide of it a window or two, which the workmen open when they look into the pan whilſt it is boiling.

Not far diſtant from the ſaltern, on the ſea-ſhore, between full ſea and low-water marks, they alſo make a little pond in the rocks, or with ſtones on the ſand, which they call their *ſump.* From this pond they lay a pipe, through which, when the tide is in, the ſea water runs into a well adjoining to the ſaltern; and from this well they pump it into troughs, by which it is conveyed into their ſhip or ciſtern, where it is ſtored up until they have occaſion to uſe it.

The ciſtern is built cloſe to the ſaltern, and may be placed moſt conveniently between the two boiling-houſes, on the back ſide of the fore-houſe; it is made either of wood, or brick and clay; it ſometimes wants a cover, but ought to be covered with a ſhed, that the ſalt-water contained therein may not be weakened by rains, nor mixed with ſoot and other impurities. It ſhould be placed ſo high, that the water may conveniently run out of it, through a trough, into the ſalt pans.

Beſides the buildings already mentioned, ſeveral others are required; as ſtore-houſes for the ſalt, ciſterns for the bittern, an office for his majeſty's ſalt-officers, and a dwelling-houſe for the ſalt-boilers.

All things being thus prepared, and the ſea-water having ſtood in the ciſtern till the mud and ſand are ſettled to the bottom, it is drawn off into the ſalt-pan. And at the four corners of the ſalt-pan, where the flame does not touch its bottom, are placed four ſmall lead pans called *ſcratch-pans,* which, for a ſalt-pan of the ſize above mentioned, are uſually about a foot and a half long, a foot broad, and three inches deep; and have a bow or circular handle of iron, by which they may be drawn out with a hook, when the liquor in the pan is boiling.

The ſalt-pan being filled with ſea-water, a ſtrong fire of pitcoal is lighted in the furnace; and then, for a pan which contains about 1400 gallons, the ſalt-boiler takes the whites of three eggs, and incorporates them well with two or three gallons of ſea-water, which he pours into the ſalt-pan while the water contained therein is only lukewarm; and immediately ſtirs it about with a rake, that the whites of eggs may every where be equally mixed with the ſalt-water.

Inſtead of whites of eggs, at many ſalterns, as at moſt of thoſe nigh Newcaſtle, they uſe blood from the butchers, either of ſheep or black cattle, to clarify the ſea-water: and at many of the Scots ſalterns they do not give themſelves the trouble of clarifying it.

As the water grows hot, the whites of eggs ſeparate from it a black frothy ſcum, which ariſes to the ſurface of the water,

and covers it all over. As ſoon as the pan begins to boil, this ſcum is all riſen, and it is then time to ſkim it off.

The moſt convenient inſtruments for this purpoſe are ſkimmers of thin aſh boards, ſix or eight inches broad, and ſo long that they may reach above half way over the ſalt-pan. Theſe ſkimmers have handles fitted to them; and the ſalt-boiler and his aſſiſtant, each holding one of them on the oppoſite ſides of the pan, apply them ſo to each other that they overlap in the middle, and, beginning at one end of the pan, carry them gently forward together, along the ſurface of the boiling liquor, to the other end; and thus, without breaking the ſcum, collect it all to one end of the pan, from whence they eaſily take it out.

After the water is ſkimmed, it appears perfectly clear and tranſparent; and they continue boiling it briſkly, till ſo much of the freſh or aqueous part is evaporated, that what remains in the pan is a ſtrong brine almoſt fully ſaturated with ſalt, ſo that ſmall ſaline cryſtals begin to form on its ſurface; which operation, in a pan filled 16 inches deep with water, is uſually performed in five hours.

The pan is then filled up a ſecond time with clear ſea-water drawn from the ciſtern; and about the time when it is half filled, the ſcratch-pans are taken out, and, being emptied of the ſcratch found in them, are again placed in the corners of the ſalt-pan. The ſcratch taken out of theſe pans is a fine white calcareous earth found in the form of powder, which ſeparates from the ſea-water during its coction, before the ſalt begins to form into grains. This ſubtile powder is violently agitated by the boiling liquor, until it is driven to the corners of the pan, where the motion of the liquor being more gentle, it ſubſides into the ſcratch-pans placed there to receive it, and in them it remains undiſturbed, and thus the greateſt part of it is ſeparated from the brine.

After the pan hath again been filled up with ſea-water, three whites of eggs are mixed with the liquor, by which it is clarified a ſecond time, in the manner before deſcribed; and it is afterwards boiled down to a ſtrong brine as at firſt; which ſecond boiling may take up about four hours.

The pan is then filled up a third time with clear ſea-water; and after that, a fourth time; the liquor being each time clarified and boiled down to a ſtrong brine, as before related; the ſcratch-pans being taken out and emptied every time that the pan is filled up.

Then, at the fourth boiling, as ſoon as the cryſtals begin to form on the ſurface of the brine, they ſlacken the fire, and only ſuffer the brine to ſimmer, or boil very gently. In this heat they conſtantly endeavour to keep it all the time that the ſalt corns or granulates, which may be nine or ten hours. The ſalt is ſaid to granulate, when its minute cryſtals cohere together into little maſſes or grains, which ſink down in the brine and lie at the bottom of the ſalt-pan.

When moſt of the liquor is evaporated, and the ſalt thus lies in the pan almoſt dry on its ſurface, it is then time to draw it out. This part of the proceſs is performed by raking the ſalt to one ſide of the pan into a long heap, where it drains awhile from the brine, and is then filled out into barrows or other proper veſſels, and carried into the ſtore-houſe, and delivered into the cuſtody of his majeſty's officers. And in this manner the whole proceſs is performed in 24 hours; the ſalt being uſually drawn every morning.

In the ſtore houſe the ſalt is put hot into drabs, which are partitions like ſtalls for horſes, lined on three ſides and at the bottom with boards, and having a ſliding-board on the fore-ſide to put in or draw out as occaſion requires. The bottoms are made ſhelving, being higheſt at the back-ſide, and gradually inclining forwards; by which means the ſaline liquor, which remains mixed with the ſalt, eaſily drains from it; and the ſalt, in three or four days, becomes ſufficiently dry; and is then taken out of the drabs, and laid up in large heaps, where it is ready for ſale.

The ſaline liquor which drains from the ſalt is not a pure brine of common ſalt, but hath a ſharp and bitter taſte, and is therefore called *bittern*; this liquor, at ſome works, they ſave for particular uſes, at others throw away. A conſiderable quantity of this bittern is left at the bottom of the pan after the proceſs is finiſhed; which, as it contains much ſalt, they ſuffer to remain in the pan, when it is filled up with ſea-water. But at each proceſs this liquor becomes more ſharp and bitter, and alſo increaſes in quantity: ſo that, after the third or fourth proceſs is finiſhed, they are obliged to take it out of the pan; otherwiſe it mixes in ſuch quantities with the ſalt, as to give it a bitter taſte, and diſpoſes it to grow ſoft and run in the open air, and renders it unfit for domeſtic uſes.

After each proceſs there alſo adheres to the bottom and ſides of the pan a white ſtony cruſt, of the ſame calcareous ſubſtance with that before collected from the boiling liquor. This the operators call *ſtone ſcratch*, diſtinguiſhing the other found in the lead-pans by the name of *powder ſcratch*. Once in eight or ten days they ſeparate the ſtone-ſcratch from their pans with iron picks, and in ſeveral places find it a quarter of an inch in thickneſs. If this ſtony cruſt is ſuffered to adhere to the pan much longer, it grows ſo thick that the pan is burnt by the fire, and quickly wears away.

In M. de Pagés's Travels round the World, we find the following important fact. "I had been anxious (ſays that author) to aſcertain by compariſon, whether ſea-water contains ſalt in greater quantity under the torrid than under the other zones; and my experiments on this ſubject ſerved to ſhow, contrary to what I expected, that ſea-water is impregnated with ſalt in leſs quantity within than without the tropics." Theſe experiments were made on a hundred pounds of ſea-water, taken at the depth of ten fathoms, and weighed in water-ſcales. M. de Pagés has given a table of theſe experiments, from which it appears that 100lb. of ſea-water in 4′° 12″ S. lat. gave $4\frac{1}{2}$lb. of ſalt, and in 1° 16″ only $3\frac{1}{2}$lb.; and that in 74 N. lat. it gave $4\frac{3}{4}$lb. and in 4° 22′ only $3\frac{1}{2}$lb. theſe being the higheſt and loweſt latitudes in which the experiments were made, and alſo the greateſt and leaſt quantities of ſalt.

Duty on SALT, is a diſtinct branch of his majeſty's extraordinary revenue, and conſiſts in an exciſe of 3s. 4d. per buſhel impoſed upon all ſalt, by ſeveral ſtatutes of king William and other ſubſequent reigns. This is not generally called an exciſe, becauſe under the management of different commiſſioners: but the commiſſioners of the ſalt-duties have, by ſtatute 1 Ann, c. 21. the ſame powers, and muſt obſerve the ſame regulations, as thoſe of other exciſes. This tax had uſually been only temporary, but by ſtatute 26 Geo. II. c. 3. was made perpetual.

Triple SALTS, a kind of ſalts formed by the union of three ingredients; the common neutrals being compoſed only of two. They are but lately diſcovered; and it is chiefly to the induſtry of Mr. Bergman that we owe the knowledge we have of them. Sometimes we meet even with ſalts of four ingredients; in which caſe we call the reſulting compounds *quadruple* ſalts. The moſt remarkable of theſe complicated ſubſtances are the following.

1. *Aphronitrum*, or mineral alkali, combined with a ſmall quantity of calcareous earth. The three ingredients here are fixed air, pure alkali, and calcareous earth. "This ſalt (ſays Cronſtedt) is ſo ſtrongly united with the calcareous earth, that the latter enters with it into the very cryſtals of the ſalt; though, by repeated ſolutions, the earth is by degrees ſeparated from it, and falls to the bottom after every ſolution." Cartheuſe aſſerts,

that, on throwing into its ſolution in water a fixed mineral alkali, the calcareous earth was precipitated; and, on the contrary, by adding oil of vitriol, nitrous acid was expelled, and a Glauber's ſalt produced; "from which (ſays M. Magellan) it is evident, that the aphronitrum is a triple ſalt ariſing from the combination of the nitrous acid with calcareous earth and mineral fixed alkali." Wallerius mentions three ſpecies of this ſalt; *viz.* one which contains only a mixture of calcareous earth with fixed mineral alkali. This, he ſays, is the aphronitrum of the antients; but he thinks that it ought to be rather called *aphronatron*, as they beſtowed the name of *natron* upon the mineral alkali. The ſecond ſpecies is that deſcribed by Cronſtedt under the title of *calcareous nitre*. The third is that deſcribed by Hoffman under the title of *aphronitrum janenſe*, into whoſe compoſition the vitriolic acid enters. It is a kind of Glauber's ſalt, and is frequently confounded with it.

The aphronitrum of Cronſtedt is deſcribed by him as appearing on old walls and below vaults, or in places where it cannot be waſhed away by the rain. When it contains any conſiderable quantity of calcareous earth, it ſhoots into rhomboidal cryſtals, a figure frequently affected by the calcareous earth when it ſhoots into cryſtals: but when the aphronitrum is purer, it forms priſmatic cryſtals. From theſe circumſtances, M. Magellan thinks that the aphronitrum is not only a triple but a multiple ſalt; as theſe pieces of old mortar, covered with this white froſt, on antient walls, are the very ſame from which the ſaltpetre-makers extract the mother water of nitre; after mixing with it the vegetable aſhes to furniſh the alkali.

2. Common ſalt with magneſia, or mineral alkali, contaminated by muriatic magneſia. This is a compound of common ſalt with magneſia, and is very deliqueſcent, owing to the compound of magneſia and ſpirit of ſalt; for neither mineral alkali nor pure ſea-ſalt is at all deliqueſcent in the air.

3. Vitriolated magneſia with vitriol of iron, or Epſom ſalt contaminated with copperas. This, according to M. Monet, is found in ſome mineral waters.

4. Native alum contaminated with copperas. This is ſometimes found in the aluminous ſchiſtus, and effloreſces in a feathery form, and is perhaps the plumoſe alum of the antients.

5. Native alum contaminated with ſulphur. Dr. Withering informs us, that this ſalt is met with about Wedneſbury and Belſton, two places in Staffordſhire, where the coal-pits are on fire. It ſublimes to the ſurface, whence it may be collected in conſiderable quantity during dry or froſty weather. Our author, however, does not certainly affirm that this is a true chemical union, but the parts, he ſays, cannot be diſtinguiſhed by the eye. It is kept in a deliqueſcent ſtate by an acceſs of vitriolic acid.

6. Native alum contaminated by vitriolated cobalt. This is found in ſome of the mines of Herregrund and Idria, where it ſhoots into long and ſlender filaments. M. Magellan ſuppoſes that this may be the *trichites* of the Greeks. On diſſolving it in water, the preſence of the vitriolic acid is diſcovered by adding a ſolution of terra ponderoſa in muriatic acid; the phlogiſticated alkali throws down a precipitate of cobalt, which forms a blue glaſs with cobalt or microcoſmic ſalt.

7. Vitriol of copper with iron, the *vitriolum ferreo-cupreum cyaneum* of Linnæus. It is alſo called *vitriol of Hungary*, becauſe found in plenty in that country. Its colour is that of blue mixed with green; but ſometimes the one ſhade prevails, and ſometimes the other.

8. Vitriol of copper, iron, and zinc, is prepared in Sweden from the water pumped out of the copper mines at Dalarne. The copper does not precipitate from a ſolution of this ſalt by rubbing it on iron, as is the caſe with the common blue vitriol. Large cryſtals of this ſalt are often found in the water of the copper mines from whence it is prepared.

9. Vitriol of copper and zinc. This is a quadruple ſalt, ſtyled by Linnæus *vitriolum ferreo-zinceo-cupreum cyaneum*. Its colour is blue inclining to green; and it does not precipitate the copper by rubbing on iron, as the common blue vitriol does. It is called the blue vitriol of Goſlar. Mongez makes a ſeparate article of a compound ſalt mentioned by Wallerius, conſiſting alſo of a vitriolated copper with zinc, but whoſe cryſtals are of a fine red colour, found lately in the mines of Fahlun in Sweden. He adds, that the pale-blue colour of the former ſalt ſhows the predominancy of the copper, by which it is neceſſarily diſtinguiſhed from the latter, where the vitriol is overſaturated. M. Magellan, however, is of opinion that the red colour is owing to a proper quantity of iron in a dephlogiſticated ſtate, which has been overlooked in that compound. To this kind alſo Wallerius refers the yellowiſh vitriol found in Hungary.

10. Vitriol of iron and zinc; the green vitriol from Goſlar in the Hartz; the *vitriolum zinceo-ferreum viride* of Linnæus. It is of a pale-green colour.

SALT-*Mines*. See SALT.

Rock-SALT. See SALT.

SALT-*Water*, or *Sea-water (Diſtillation of)*. See SEA-*Water*.

Neutral SALTS. See CHEMISTRY.

SALT-*Springs*. Of theſe there are great numbers in different parts of the world, which undoubtedly have their origin from ſome of the large collections of foſſil ſalt mentioned under the article *Common* SALT. See that article, and likewiſe SPRING.

SALTIER, one of the honourable ordinaries.—See HERALDRY. This, ſays G. Leigh, in his Accedence of Arms, p. 70. was antiently made of the height of a man, and driven full of pins, the uſe of which was to ſcale walls, &c. Upton ſays it was an inſtrument to catch wild beaſts, whence he derives this word from *ſaltus*, i. e. "a foreſt." The French call this ordinary *ſautoir*, from *ſauter* "to leap;" becauſe it may have been uſed by ſoldiers to leap over walls of towns, which in former times were but low; but ſome modern authors think it is borne in imitation of St. Andrew's croſs.

SALTING MEAT FOR THE USE OF THE NAVY. The following is the method recommended by the late admiral Sir Charles Knowles:—When the ox is killed, let it be ſkinned and cut up into pieces fit for uſe as quick as poſſible, and ſalted while the meat is hot. For which purpoſe we muſt have a ſufficient quantity of ſaltpetre and bay-ſalt pounded together and made hot in an oven, of each equal parts; with this ſprinkle the meat at the rate of about two ounces to the pound; then lay the pieces on ſhelving boards to drain for 24 hours; which done, turn them, and repeat the ſame operation, and let them lie for 24 hours longer. By this time the ſalt will be all melted, and have penetrated the meat, and the pieces be drained off; each piece muſt then be wiped dry with clean coarſe cloths. A ſufficient quantity of common ſalt muſt then be made hot likewiſe in an oven, and mixed when taken out with about one-third of brown ſugar: then, the caſks being ready, rub each piece well with this mixture, and pack them well down, allowing about half a pound of the ſalt and ſugar to each pound of meat, and it will keep good ſeveral years.

It is beſt to proportion the caſks to the quantity uſed at one time, as the leſs it is expoſed to the air the better. The ſame proceſs does for pork, only a larger quantity of ſalt and leſs ſugar muſt be uſed; but the preſervation of both depends equally upon the meat being hot when firſt ſalted.

One pound of beef requires two ounces of ſaltpetre and two ounces of bay-ſalt, becauſe it is to be ſprinkled twice; an ounce of each to a pound of beef both times. The ſaltpetre requiſite for 100lb. of beef is $12\frac{1}{2}$lb. which at 12d. per lb. is 12s. 6d.; and the ſame quantity of bay-ſalt (for 100lb. of beef), at three

half-pence per lb. is 1s. 6d.; of brown ſugar and common ſalt mixed together half a pound is required, the former in the proportion of one-third, the latter of two-thirds, to a pound of beef. The brown ſugar at 8d. per pound. A hundred pounds of beef will take 250 ounces of it, which coſts 10s. 5d. The quantity of common ſalt requiſite for 100lb. of beef is 533 ounces, which at 2d. per lb. amounts to 5s. 6d. The expenſe therefore will ſtand thus:

Saltpetre, 12¾lb. for 100lb. of beef, is	£. 0	12	6
Bay-ſalt, 12½lb. for do. is	0	1	6
Brown ſugar, 250 oz. for do. is	0	10	5
Beef, 100lb. at 6d. per pound, is	2	10	0
Three caſks for it at 1s. 6d. each,	0	4	6
Labour, and heating the oven twice,	0	4	6
Common ſalt, 533 oz. for do. is	0	5	6
	£. 4	8	5

Theſe articles are taken high; and if beef coſts 6d. per pound, meat cured thus will coſt leſs than 1s. per pound; and therefore comes much cheaper than live ſtock in long ſea voyages.

SALTPETRE, or NITRE. See CHEMISTRY.

SALTZBURG, an archbiſhopric of Germany, in the circle of Bavaria, 70 miles long and 60 broad; bounded on the north by Bavaria, on the eaſt by Auſtria, on the ſouth by Carinthia and the Tirol, and on the weſt by the Tirol and Bavaria. It is a mountainous country, but pretty fertile, and contains mines of copper, ſilver, and iron.

SALTZBURG, an antient and populous city of Germany, capital of an archbiſhopric of the ſame name. It is well built, and defended by a caſtle on a mountain. The archbiſhop, who is a ſovereign prince, has two noble palaces; one for ſummer, and the other for winter; the latter contains 163 apartments, all richly furniſhed, without reckoning the halls and galleries. The univerſity depends on the Benedictine monks. The cathedral is very fine, and contains five organs. Near Saltzburg are ſome very productive ſalt-works. It is ſeated on both ſides the river Saltz, 45 miles ſouth by weſt of Paſſaw, and 155 weſt by ſouth of Vienna. E. lon. 13. 5. N. lat. 47. 37.

SALVADORA, in botany: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The calyx is quadrifid; there is no corolla; the berry is monoſpermous; and the ſeed covered with an antlus or looſe coat.

SALVAGE-MONEY, a reward allowed by the civil and ſtatute law for the ſaving of ſhips or goods from the danger of the ſea, pirates, or enemies.—Where any ſhip is in danger of being ſtranded, or driven on ſhore, juſtices of the peace are to command the conſtables to aſſemble as many perſons as are neceſſary to preſerve it; and, on its being preſerved by their means, the perſons aſſiſting therein ſhall, in 30 days after, be paid a reaſonable reward for their ſalvage; otherwiſe the ſhip or goods ſhall remain in the cuſtody of the officers of the cuſtoms as a ſecurity for the ſame.

SALVATION, means the ſafety or preſervation of any thing which is or has been in danger, and is generally uſed in a religious ſenſe, when it means preſervation from eternal death, or reception to the happineſs of heaven, which is now offered to all men by the Chriſtian religion upon certain conditions. The Hebrews but rarely make uſe of concrete terms as they are called, but often of abſtracted. Thus, inſtead of ſaying that God ſaves them and protects them, they ſay that God is their ſalvation. Thus the word of ſalvation, the joy of ſalvation, the rock of ſalvation, the ſhield of ſalvation, the horn of ſalvation, &c. is as much as to ſay, The word that declares deliverance; the joy that attends the eſcaping a great danger; a rock where any one takes refuge, and where he may be in ſafety from his enemy; a buckler, that ſecures him from the arm of the enemy; a horn or ray of light, of happineſs and ſalvation, &c. See THEOLOGY, &c.

SALVATOR ROSA. See ROSA.

SALVE REGINA, among the Romaniſts, the name of a Latin prayer, addreſſed to the Virgin, and ſung after complines, as alſo upon the point of executing a criminal. Durandus ſays, it was compoſed by Peter biſhop of Compoſtella. The cuſtom of ſinging the *ſalve regina* at the cloſe of the office was begun by order of St. Dominic, and firſt in the congregation of Dominicans at Bologna, about 1237. Gregory IX. firſt appointed it to be general. St. Bernard added the concluſion, *O dulcis! O pia*, &c.

SALVIA, SAGE: A genus of the monogynia order, belonging to the digynia claſs of plants; and in the natural method ranking under the 42d order, *Verticillatæ*. The corolla is unequal; and the filaments placed croſswiſe on a pedicle. The moſt remarkable ſpecies are, 1. The *officinalis*, or common large ſage, which is cultivated in gardens, of which there are the following varieties: 1. The common green ſage. 2. The wormwood ſage. 3. The green ſage with a variegated leaf. 4. The red ſage. 5. The red ſage with a variegated leaf. Theſe are accidental variations, and therefore are not enumerated as ſpecies. The common ſage grows naturally in the ſouthern parts of Europe, but is here cultivated in gardens for uſe; but that variety with red or blackiſh leaves is the moſt common in the Britiſh gardens; and the wormwood ſage is in greater plenty here than the common green-leaved ſage, which is but in few gardens. 2. The *tomentoſa*, generally titled *balſamic ſage* by the gardeners. The ſtalks of this do not grow ſo upright as thoſe of the common ſage; they are very hairy, and divide into ſeveral branches, which are garniſhed with broad heart-ſhaped woolly leaves ſtanding upon long foot-ſtalks; they are ſawed on their edges, and their upper ſurfaces are rough: the leaves, which are upon the flower-ſtalks, are oblong and oval, ſtanding upon ſhorter foot-ſtalks, and are very ſlightly ſawed on their edges; they grow in whorled ſpikes toward the top of the branches; the whorls are pretty far diſtant, but few flowers in each; they are of a pale blue, about the ſize of thoſe of the common ſort. This ſage is preferred to all the others for making tea. 3. The *auriculata*, common ſage of virtue, which is alſo well known in the gardens and markets. The leaves of this are narrower than thoſe of the common ſort; they are hoary, and ſome of them are indented on their edges towards the baſe, which indentures have the appearance of ears. The ſpikes of flowers are longer than thoſe of the two former ſorts, and the whorls are generally naked, having no leaves between them. The flowers are ſmaller, and of a deeper blue than thoſe of common red ſage. 4. The *pomifera*, with ſpear-ſhaped oval entire leaves, grows naturally in Crete. This hath a ſhrubby ſtalk, which riſes four or five feet high, dividing into ſeveral branches. The flowers grow in ſpikes at the end of the branches; they are of a pale blue colour, and have obtuſe empalements. The branches of this ſage have often punctures made in them by inſects, at which places grow large protuberances as big as apples, in the ſame manner as the galls upon an oak, and the rough balls on the brier. All the ſorts of ſage may be propagated by ſeeds, if they can be procured; but, as ſome of them do not perfect their ſeeds in this country, and moſt of the ſorts, but eſpecially the common kinds for uſe, are eaſily propagated by ſlips, it is not worth while to raiſe them from ſeeds.

SALVIANUS, an antient father of the Chriſtian church, who flouriſhed in the 5th century, and was well ſkilled in the ſciences. It is ſaid he lived in continence with his wife Palladia, as if ſhe had been his ſiſter; and that he was ſo afflicted at the wickedneſs of that age, that he was called the *Jeremiah of the*

fifth century. He acquired ſuch reputation for his piety and learning, that he was named the *maſter of the biſhops*. He wrote a Treatiſe on Providence; another on Avárice; and ſome epiſtles, of which Baluze has given an excellent edition. That of Conrad Ritterſhuſius, in 2 vols. octavo, is alſo eſteemed.

SALUTATION, the act of ſaluting, greeting, or paying reſpect and reverence to any one. When men (writes the compiler of *L'Eſprit des Uſages et des Coutumes*) ſalute each other in an amicable manner, it ſignifies little whether they move a particular part of the body, or practiſe a particular ceremony. In theſe actions there muſt exiſt different cuſtoms. Every nation imagines it employs the moſt reaſonable ones; but all are equally ſimple, and none are to be treated as ridiculous. This infinite number of ceremonies may be reduced to two kinds; to reverences or ſalutations; and to the touch of ſome part of the human body. To bend and proſtrate one's ſelf to expreſs ſentiments of reſpect, appears to be a natural motion; for terrified perſons throw themſelves on the earth when they adore inviſible beings. The affectionate touch of the perſon they ſalute is an expreſſion of tenderneſs. As nations decline from their antient ſimplicity, much farce and grimace are introduced. Superſtition, the manners of a people, and their ſituation, influence the modes of ſalutation: as may be obſerved from the inſtances we collect.

Modes of ſalutation have ſometimes very different characters, and it is no unintereſting ſpeculation to examine their ſhades. Many diſplay a refinement of delicacy, while others are remarkable for their ſimplicity, or for their ſenſibility. In general, however, they are frequently the ſame in the infancy of nations, and in more poliſhed ſocieties. Reſpect, humility, fear, and eſteem, are expreſſed much in a ſimilar manner; for theſe are the natural conſequences of the organization of the body. Theſe demonſtrations become, in time, only empty civilities, which ſignify nothing. We ſhall notice what they were originally, without reflecting on what they are.

The firſt nations have no peculiar modes of ſalutation; they know no reverences, or other compliments, or they deſpiſe and diſdain them. The Greenlanders laugh when they ſee an European uncover his head and bend his body before him whom he calls his ſuperior. The iſlanders near the Philippines take the hand or foot of him they ſalute, and with it they gently rub their face. The Laplanders apply their noſe ſtrongly againſt that of the perſon they ſalute. Dampier ſays, that at New Guinea they are ſatisfied in placing on their heads the leaves of trees, which have ever paſſed for ſymbols of friendſhip and peace. This is at leaſt a pictureſque ſalute.

Other ſalutations are very incommodious and painful; it requires great practice to enable a man to be polite in an iſland ſituated in the Straits of the Sound. Houtman tells us, they ſaluted him in this odd way: "They raiſed his left foot, which they paſſed gently over the right leg, and from thence over his face." The inhabitants of the Philippines bend their body very low, in placing their hands on their cheeks, and raiſing at the ſame time one foot in the air, with their knee bent. An Ethiopian takes the robe of another, and ties it about his own waiſt, ſo that he leaves his friend half naked. This cuſtom of undreſſing on theſe occaſions takes other forms; ſometimes men place themſelves naked before the perſon whom they ſalute; it is to ſhow their humility, and that they are unworthy of appearing in his preſence. This was practiſed before Sir Joſeph Banks, when he received the viſit of two female Otaheiteans. Their innocent ſimplicity, no doubt, did not appear immodeſt in the eyes of the *virtuoſo*. Sometimes they only undreſs partially. The Japaneſe only take off a ſlipper; the people of Arracan, their ſandals in the ſtreet, and their ſtockings in the houſe.

In the progreſs of time, it appears ſervile to uncover one's ſelf. The grandees of Spain claim the right of appearing covered before the king, to ſhow that they are not ſo much ſubjected to him as the reſt of the nation; and (this writer obſerves) we may remark, that the Engliſh do not uncover their heads ſo much as the other nations of Europe. In a word, there is not a nation (obſerves the humorous Montaigne), even to the people who, when they ſalute, turn their backs on their friends, but that can be juſtified in their cuſtoms. It muſt be obſerved of the negroes, that they are lovers of ludicrous actions, and thus make all their ceremonies farcical. The greater part pull the fingers till they crack. Snelgrave gives an odd repreſentation of the embaſſy which the king of Dahomy ſent to him. The ceremonies of ſalutation conſiſted in the moſt ridiculous contorſions. When two negro monarchs viſit, they embrace in ſnapping three times the middle finger.

Barbarous nations frequently imprint on their ſalutations the diſpoſitions of their character. When the inhabitants of Carmena (ſays Athenæus) would ſhow a peculiar mark of eſteem, they breathed a vein, and preſented for the beverage of their friend the blood as it iſſued. The Franks tore hair from their head, and preſented it to the perſon they ſaluted. The ſlave cut his hair, and offered it to his maſter. The Chineſe are ſingularly affected in their perſonal civilities: they even calculate the number of their reverences. Theſe are their moſt remarkable poſtures. The men move their hands in an affectionate manner, while they are joined together on the breaſt, and bow their head a little. If they reſpect a perſon, they raiſe their hands joined, and then lower them to the earth in bending the body. If two perſons meet after a long ſeparation, they both fall on their knees, and bend the face to the earth, and this ceremony they repeat two or three times. Surely we may differ here with the ſentiment of Montaigne, and confeſs this ceremony to be ridiculous. It ariſes from their national affectation. They ſubſtitute artificial ceremonies for natural actions. Their expreſſions mean as little as their ceremonies. If a Chineſe is aſked how he finds himſelf in health? he anſwers, *Very well; thanks to your abundant felicity*. If they would tell a man that he looks well, they ſay, *Proſperity is painted on your face*; or, *Your air announces your happineſs*. If you render them any ſervice, they ſay, *My thanks ſhould be immortal*. If you praiſe them, they anſwer, *How ſhall I dare to perſuade myſelf of what you ſay of me?* If you dine with them, they tell you at parting, *We have not treated you with ſufficient diſtinction*. The various titles they invent for each other it would be impoſſible to tranſlate.

It is to be obſerved, that all theſe anſwers are preſcribed by the Chineſe ritual, or academy of compliments. There are determined the number of bows; the expreſſions to be employed; the genuflections; and the inclinations which are to be made to the right or left hand: the ſalutations of the maſter before the chair where the ſtranger is to be ſeated, for he ſalutes it moſt profoundly, and wipes the duſt away with the ſkirts of his robe: all theſe and other things are noticed, even to the ſilent geſtures by which you are entreated to enter the houſe. The lower claſs of people are equally nice in theſe punctilios; and ambaſſadors paſs 40 days in practiſing them before they are enabled to appear at court. A tribunal of ceremonies has been erected, and every day very odd decrees are iſſued, to which the Chineſe moſt religiouſly ſubmit.

The marks of honour are frequently arbitrary; to be ſeated, with us, is a mark of repoſe and familiarity; to ſtand up, that of reſpect. There are countries, however, in which princes will only be addreſſed by perſons who are ſeated, and it is conſidered as a favour to be permitted to ſtand in their preſence. This cuſtom prevails in deſpotic countries: a deſpot cannot ſuffer without diſguſt the elevated figure of his ſubjects; he is pleaſed to bend their bodies with their genius: his preſence muſt lay

lay thoſe who behold him proſtrate on the earth: he deſires no eagerneſs, no attention; he would only inſpire terror.

The pope makes no reverence to any mortal except the emperor, to whom he ſtoops a very little when he permits him to kiſs his lips.

SALUTE, in military matters, a diſcharge of artillery, or ſmall arms, or both, in honour of ſome perſon of extraordinary quality. The *colours* likewiſe ſalute royal perſons, and generals commanding in chief; which is done by lowering the point to the ground. In the field, when a regiment is to be reviewed by the king or his general, the drums beat a march as he paſſes along the line, and the officers ſalute one after another, bowing their half-pikes or ſwords to the ground; then recover, and take off their hats. The enſigns ſalute all together, by lowering their colours.

SALUTE, in the navy, a teſtimony of deference or homage rendered by the ſhips of one nation to another, or by ſhips of the ſame nation to a ſuperior or equal. This ceremony is variouſly performed, according to the circumſtances, rank, or ſituation of the parties. It conſiſts in firing a certain number of cannon, or volleys of ſmall arms; in ſtriking the colours or topſails; or in one or more general ſhouts of the whole ſhip's crew, mounted on the maſts or rigging for that purpoſe. The principal regulations with regard to ſalutes in the royal navy are as follow:

"When a flag-officer ſalutes the admiral and commander in chief of the fleet, he is to give him fifteen guns; but when captains ſalute him, they are to give him ſeventeen guns. The admiral and commander in chief of the fleet is to return two guns leſs to flag-officers, and four leſs to captains. Flag-officers ſaluting their ſuperior or ſenior officer are to give him thirteen guns. Flag-officers are to return an equal number of guns to flag-officers bearing their flags on the ſame maſt, and two guns leſs to the reſt, as alſo to captains.

"When a captain ſalutes an admiral of the white or blue, he is to give him fifteen guns; but to vice and rear-admirals, thirteen guns. When a flag-officer is ſaluted by two or more of his majeſty's ſhips, he is not to return the ſalute till all have finiſhed, and then to do it with ſuch a reaſonable number of guns as he ſhall judge proper.

"In caſe of the meeting of two ſquadrons, the two chiefs only are to exchange ſalutes. And if ſingle ſhips meet a ſquadron conſiſting of more than one flag, the principal flag only is to be ſaluted. No ſalutes ſhall be repeated by the ſame ſhips, unleſs there has been a ſeparation of ſix months at leaſt.

"None of his majeſty's ſhips of war, commanded only by captains, ſhall give or receive ſalutes from one another, in whatſoever part of the world they meet.

"A flag-officer commanding in chief ſhall be ſaluted, upon his firſt hoiſting his flag, by all the ſhips preſent, with ſuch a number of guns as is allowed by the firſt, third, or fifth articles.

"When any of his majeſty's ſhips ſhall meet with any ſhip or ſhips belonging to any foreign prince or ſtate, within his majeſty's ſeas (which extend to Cape Finiſterre), it is expected that the ſaid foreign ſhips do ſtrike their topſail, and take in their flag, in acknowledgment of his majeſty's ſovereignty in thoſe ſeas: and if any ſhall refuſe, or offer to reſiſt, it is enjoined to all flag-officers and commanders to uſe their utmoſt endeavours to compel them thereto, and not ſuffer any diſhonour to be done to his majeſty. And if any of his majeſty's ſubjects ſhall ſo much forget their duty, as to omit ſtriking their topſail in paſſing by his majeſty's ſhips, the name of the ſhip and maſter, and from whence, and whither bound, together with affidavits of the fact, are to be ſent up to the ſecretary of the admiralty, in order to their being proceeded againſt in the admiralty court. And it is to be obſerved, that in his majeſty's ſeas, his majeſty's ſhips are in nowiſe to ſtrike to any; and that in other parts, no ſhip of his majeſty is to ſtrike her flag or topſail to any foreigner, unleſs ſuch foreign ſhip ſhall have firſt ſtruck, or at the ſame time ſtrike, her flag or topſail to his majeſty's ſhip.

"The flag-officers and commanders of his majeſty's ſhips are to be careful to maintain his majeſty's honour upon all occaſions, giving protection to his ſubjects, and endeavouring, what in them lies, to ſecure and encourage them in their lawful commerce; and they are not to injure, in any manner, the ſubjects of his majeſty's friends and allies.

"If a foreign admiral meets with any of his majeſty's ſhips, and ſalutes them, he ſhall receive gun for gun. If he be a vice-admiral, the admiral ſhall anſwer with two guns leſs. If a rear-admiral, the admiral and vice-admiral ſhall return two leſs. But if the ſhip be commanded by a captain only, the flag-officer ſhall give two guns leſs, and captains an equal number.

"When any of his majeſty's ſhips come to an anchor in a foreign port or road, within cannon-ſhot of its forts, the captain may ſalute the place with ſuch a number of guns as have been cuſtomary, upon good aſſurance of having the like number returned, but not otherwiſe. But if the ſhip bears a flag, the flag-officer ſhall firſt carefully inform himſelf how flags of like rank, belonging to other crowned heads, have given or returned ſalutes, and to inſiſt upon the ſame terms of reſpect.

"It is allowed to the commanders of his majeſty's ſhips in foreign parts, to ſalute the perſons of any admirals, commanders in chief, or captains of ſhips of war of foreign nations, and foreign noblemen, or ſtrangers of quality, as alſo the factories of the king's ſubjects, coming on board to viſit the ſhip; and the number of guns is left to the commander, as ſhall be ſuitable to the occaſion, and the quality of the perſons viſiting; but he is nevertheleſs to remain accountable for any exceſſes in the abuſe of this liberty. If the ſhip viſited be in company with other ſhips of war, the captain is not to make uſe of the civilities allowed in the preceding articles but with leave and conſent of the commander in chief or the ſenior captain.

"Merchant-ſhips, whether foreigners or belonging to his majeſty's ſubjects, ſaluting the admiral of the fleet, ſhall be anſwered by ſix guns leſs; when they ſalute any other flag-ſhips, they ſhall be anſwered by four guns leſs; and if they ſalute men of war commanded by captains, they ſhall be anſwered by two guns leſs. If ſeveral merchant-ſhips ſalute in company, no return is to be made till all have finiſhed, and then by ſuch a number of guns as ſhall be thought proper; but though the merchant-ſhips ſhould anſwer, there ſhall be no ſecond return.——

"None of his majeſty's ſhips of war ſhall ſalute any of his majeſty's forts or caſtles in Great Britain or Ireland, on any pretence whatſoever."

SALUZZO, called by the French *Saluces*, a town and caſtle of Italy, in Piedmont, and capital of a marquiſate of the ſame name, with a biſhop's ſee. It is ſituated on an eminence at the foot of the Alps near the river Po, in E. lon. 18. 27. N. lat. 44. 35. It is ſubject to the king of Sardinia.

SALUZZO, the marquiſate of, a province of Piedmont in Italy, bounded on the north by Dauphiny and the province of the Four Valleys, on the eaſt by thoſe of Saviglano and Foſſano, on the ſouth by that of Cona and the county of Nice, and on the weſt by Barcelonetta. It was ceded to the duke of Savoy in 1601.

SAMA, a town and fort in the hands of the Dutch on the Gold Coaſt of Africa, ſtands on an eminence, the fort being watered by the pleaſant river of St. George, that diſcharges itſelf into the ſea. The town contains above 200 houſes, which ſeem to form three diſtinct villages, one of which is immediately under the cannon of the Dutch fort St. Sebaſtian. Des Marchais deems this town to be one of the largeſt on the whole coaſt,

Barbot likewiſe agreeing with him in its ſituation, extent, and number of inhabitants. The ſole employment of the natives is fiſhing; a circumſtance which eaſily accounts for their poverty. The government of this place is republican, the magiſtrates having the ſupreme power, being ſubject to periodical changes, and under the authority of the king of Gavi, who ſeldom however interferes in the affairs of the ſtate. This prince reſides ſome leagues diſtant from the ſea, is rich, and much reſpected by his neighbours.

SAMANEANS, in antiquity, a kind of magi or philoſophers, have been confounded by ſome with the Bramins. They proceed from Ariana, a province of Perſia, and the neighbouring countries, ſpread themſelves in India, and taught new doctrines.

The Bramins, before their arrival, it is ſaid, were in the higheſt period of their glory, were the only oracles of India, and their principal reſidence was on the banks of the Ganges, and in the adjacent mountains; while the Samaneans were ſettled towards the Indus. Others ſay, that the Bramins acquired all their knowledge from the Samaneans, before whoſe arrival it would be difficult to prove that the Bramins were the religious teachers of the Indians. The moſt celebrated and antient of the Samanean doctors was Boutta, or Budda, who was born 683 years before Chriſt. His ſcholars paid him divine honours; and his doctrine, which conſiſted chiefly in the tranſmigration of ſouls, and in the worſhip of cows, was adopted not only in India, but alſo in Japan, China, Siam, and Tartary. It was propagated, according to M. de Sainte Croix, in Thibet, in the 8th century, and ſucceeded there the antient religion of Zamolxis. The Samaneans, or Buddiſts, were entirely deſtroyed in India by the jealous rage of the Bramins, whoſe abſurd practices and fables they affected to treat with contempt; but ſeveral of their books are ſtill preſerved and reſpected on the coaſts of Malabar.

We are told, too, that ſeveral of the Bramin orders have adopted their manner of living, and openly profeſs the greateſt part of their doctrines. *L'Ezour Vedam, ou Ancien Comment du Vedam*, publiſhed by M. de S. Croix, Paris 1779. See Bramins.

SAMAR, a Spaniſh iſland not far from Manilla in the Eaſt Indies, is called *Samar* on the ſide which looks towards the other iſles, and *Ibabao* on that next the ocean. It is like the trunk of a man's body, without head or legs. Its greateſt length, from Cape Baliquaton, which, with the point of Manilla, makes the ſtrait of St. Bernardino, in 13 degrees 30 minutes north latitude, extends to that of Guignan in 11 degrees towards the ſouth. The other two points, making the greateſt breadth of the iſland, are Cabo de Spirito Santo, or *Cape of the Holy Ghoſt*, the high mountains of which are the firſt diſcovered by ſhips from New Spain; and that which lying oppoſite to Leyte weſtward, makes another ſtrait, ſcarce a ſtone's throw over. The whole compaſs of the iſland is about 180 miles.

SAMARA, in botany; a genus of the monogynia order, belonging to the tetrandria claſs of plants. The calyx is quadripartite, the corolla tetrapetalous; the ſtamina immerſed in the baſe of the petal; the ſtigma funnel-ſhaped.

SAMARCAND, an antient and populous city of Aſia, in the country of the Uſbeck Tartars, with a caſtle and a univerſity. It was the ſeat of Tamerlane the Great. It carries on a trade in excellent fruits, and is ſeated near the Sogde, which runs into the Amo, 138 miles E. by N. of Bokhara. E. lon. 69. 0. N. lat. 39. 50.

SAMARIA (anc. geog.), one of the three larger Cisjordan diſtricts, ſituated in the middle between Galilee to the north and Judea to the ſouth, beginning at the village Ginæa, in the Campus Magnus, and ending at the toparchy called *Acrobatena* (Joſephus). Its ſoil differing in nothing from that of Judea; both equally hilly and champaign, both equally fertile in corn and fruit (Id.). Called the *Kingdom of Samaria in Ephraim* (Bible); comprising the ten tribes, and conſequently all the country to the north of Judea and eaſt and weſt of Jordan.

Samaria, the capital city of the kingdom of Samaria, or of the ten tribes. It was built by Omri king of Iſrael, who began to reign in the year of the world 3079, and died 3086 (1 Kings xvi. 24.). He bought the hill Samaria of Shemer for two talents of ſilver, or for the ſum of 684l. 7s. 6d. It took the name of *Samaria* from Shemer the owner of the hill; though ſome think there were already ſome beginnings of a city, becauſe, before the reign of Omri, there is mention made of Samaria (1 Kings xiii. 32.) in the year of the world 3030. But others take this for a prolepſis, or an anticipation, in the diſcourſe of the man of God, who ſpeaks of Samaria under the reign of Jeroboam. However this be, it is certain that Samaria was no conſiderable place, and did not become the capital city of the kingdom of Iſrael till after the reign of Omri.

SAMARITANS. We have already ſpoken of the Samaritans under the article Cuth. The Samaritans are the people of the city of Samaria, and the inhabitants of the province of which Samaria was the capital city. In this ſenſe, it ſhould ſeem that we might give the name of Samaritans to the Iſraelites of the ten tribes, who lived in the city and territory of Samaria. However, the ſacred authors commonly give the name of Samaritans only to thoſe ſtrange people whom the kings of Aſſyria ſent from beyond the Euphrates to inhabit the kingdom of Samaria, when they took away captive the Iſraelites that were there before. Thus we may fix the epoch of the Samaritans at the taking of Samaria by Salmaneſer, in the year of the world 3283. This prince carried away captive the Iſraelites that he found in the country, and aſſigned them dwellings beyond the Euphrates, and in Aſſyria, (2 Kings xvii. 24.) He ſent other inhabitants in their ſtead, of which the moſt conſiderable were the Cuthites, a people deſcended from Cuſh, and who are probably of the number of thoſe whom the antients knew by the name of Scythians.

The Samaritans at preſent are very few in number. Joſeph Scaliger, being curious to know their uſages, wrote to the Samaritans of Egypt, and to the high-prieſt of the whole ſect, who reſided at Neapolis in Syria. They returned two anſwers to Scaliger, dated in the year of the Hegira 998. Theſe were preſerved in the French king's library, and were tranſlated into Latin by father Morin, and printed in England in the collection of that father's letters, in 1682, under the title of *Antiquitates Eccleſiæ Orientalis*. There are now ſome Samaritans at Shechem, otherwiſe called Naplouſe. They have prieſts there, who ſay they are of the family of Aaron. They have a high-prieſt, who reſides at Shechem, or at Gerizim, who offers ſacrifices there, and who declares the feaſt of the paſſover, and all the other feaſts, to all the diſperſed Samaritans. Some of them are to be found at Gaza, ſome at Damaſcus, and ſome at Grand Cairo.

SAMBUCUS, elder, in botany: a genus of the trigynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 43d order, *Dumoſæ*. The calyx is quinquepartite; the corolla quinquefid; the berry triſpermous. The moſt remarkable ſpecies are, 1. The *nigra*, or common black elder-tree, riſes with a tree-ſtem, branching numerouſly into a large ſpreading head, twenty or thirty feet high; pinnated leaves, of two or three pair of oval lobes and an odd one; and large five-parted umbels of white flowers towards the ends of the branches, ſucceeded by bunches of black and other different coloured berries, in the varieties; which are—Common black-berried elder-tree—White-berried elder—Green-berried elder—Laciniated or parſley-leaved elder, having the folioles much laciniated, ſo as to reſemble parſley leaves—Gold-ſtriped-leaved elder—Silver-ſtriped elder—Silver-duſted elder. 2. The *racemoſa*, racemoſe red-berried elder, riſes with a tree-like

ftem, branching ten or twelve feet high, having reddifh-brown branches and buds; pinnated leaves of fix or feven oval deeply-fawed lobes; and compound, oval, racemous clufters of whitifh-green flowers, fucceeded by oval clufters of red berries. This is a refident of the mountainous parts of the fouth of Europe, and is retained in our gardens as a flowering fhrub, having a peculiar fingularity in its oval-cluftered flowers and berries. 3. The *Canadenfis*, or Canada fhrubby elder, rifes with a fhrubby ftem, branching eight or ten feet high, having reddifh fhoots; fomewhat bipinnated leaves, often ternate below, the other compofed of five, feven, or nine oval lobes; and, towards the ends of the branches, cymofe quinquepartite umbels of flowers, fucceeded by blackifh-red berries. All the forts of elder are of the deciduous tribe, very hardy, and grow freely anywhere; are generally free fhooters, but particularly the common elder and varieties, which make remarkably ftrong, jointed fhoots, of feveral feet in length, in one feafon; and they flower moftly in fummer, except the racemofe elder, which generally begins flowering in April; and the branches being large, fpreading, and very abundant, are exceedingly confpicuous; but they emit a moft difagreeable odour. The flowers are fucceeded in the moft of the forts by large bunches of ripe berries in autumn, which, although very unpalatable to eat, are in high eftimation for making that well known cordial liquor called *elder wine*, particularly the common black-berried elder. The merit of the elder in gardening may be both for ufe and ornament, efpecially in large grounds.

SAMIAN EARTH, in the materia medica, the name of two fpecies of marl ufed in medicine. viz. 1. The white kind, called by the antients *collyrium famium*, being aftringent, and therefore good in diarrhœas, dyfenteries, and hæmorrhagies; they alfo ufed it externally in inflammations of all kinds. 2. The brownifh-white kind, called *after famius* by Diofcorides; this alfo ftands recommended as an aftringent.

SAMIELS, the Arabian name of a hot wind peculiar to the defert of Arabia. It blows over the defert in the months of July and Auguft from the north-weft quarter, and fometimes it continues with all its violence to the very gates of *Bagdad*, but never affects any body within the walls. Some years it does not blow at all, and in others it appears fix, eight, or ten times, but feldom continues more than a few minutes at a time. It often paffes with the apparent quicknefs of lightning. The Arabians and Perfians, who are acquainted with the appearance of the fky at or near the time this wind arifeth, have warning of its approach by a thick haze, which appears like a cloud of duft arifing out of the horizon; and they immediately upon this appearance throw themfelves with their faces to the ground, and continue in that pofition till the wind is paffed, which frequently happens almoft inftantaneoufly; but if, on the contrary, they are not careful or brifk enough to take this precaution, which is fometimes the cafe, and they get the full force of the wind, it is inftant death.

The above method is the only one which they take to avoid the effects of this fatal blaft; and when it is over, they get up and look round them for their companions; and if they fee any one lying motionlefs, they take hold of an arm or leg, and pull and jerk it with fome force; and if the limb thus agitated feparates from the body, it is a certain fign that the wind has had its full effect; but if, on the contrary, the arm or leg does not come away, it is a fure fign there is life remaining, although to every outward appearance the perfon is dead; and in that cafe they immediately cover him or them with clothes, and adminifter fome warm diluting liquor to caufe a perfpiration, which is certainly but flowly brought about.

The Arabs themfelves can fay little or nothing about the nature of this wind, only that it always leaves behind it a very ftrong fulphureous fmell, and that the air at thefe times is quite clear, except about the horizon, in the north-weft quarter, before obferved, which gives warning of its approach. We have not been able to learn whether the dead bodies are fcorched, or diffolved into a kind of gelatinous fubftance; but from the ftories current about them, there has been frequent reafon to believe the latter; and in that cafe fuch fatal effects may be attributed rather to a noxious vapour than to an abfolute and exceffive heat. The ftory of its going to the gates of Bagdad and no further may be reafonably enough accounted for, if the effects are attributed to a poifonous vapour, and not an exceffive heat. The above-mentioned wind, Samiel, is fo well known in the neighbourhood of Bagdad and Baffora, that the very children fpeak of it with dread.

SAMOGITIA, a province of Poland, bounded on the north by Courland, on the eaft by Lithuania, on the weft by the Baltic Sea, and on the fouth by Regal Pruffia, being about 175 miles in length and 125 in breadth. It is full of forefts and very high mountains, which feed a great number of cattle, and produce a large quantity of honey. There are alfo very active horfes in high efteem. The inhabitants are clownifh, but honeft; and they will not allow a young woman to go out in the night without a candle in her hand and two bells at her girdle. Roffenna and Wormia are the principal places.

SAMOIEDA, a country of the Ruffian empire, between Afiatic Tartary and Archangel, lying along the fea-coaft as far as Siberia. The inhabitants are fo rude a people that they can hardly pretend to humanity, except in their face and figure: they have little underftanding, and in many things refemble brutes, for they will eat carrion of every kind. They travel on the fnow on fledges, drawn with an animal like a reindeer, but with the horns of a ftag. Thofe who have feen them affirm, that no people on the earth make fuch fhocking figures: their ftature is fhort; their fhoulders and faces are broad, with flat broad nofes, great blubber hanging lips, and ftaring eyes; their complexion is dark, their hair long and as black as pitch, and they have very little beards; and it is faid that all the Samoied women have black nipples. If they have any religion at all, it is idolatry, though there have been fome attempts of late to convert them. Their huts are made of birch bark, fewed together, which is laid upon ftakes fet in the ground, and at the top is a hole to let out the fmoke; the fire is made in the middle, and both men and women lie naked round them all night. They have little regard to the nearnefs of kin, and take as many wives as they can keep: their only employment is hunting and fifhing.

SAMOLUS, in botany: a genus of the monogynia order, belonging to the pentandria clafs of plants; and in the natural method ranking under the 21ft order, *Preciæ*. The corolla is falver-fhaped, the ftamina furrounded by fmall fcales at its throat. The capfule is unilocular inferior.

SAMOS (anc. geog.), an ifland at no great diftance from the promontory Mycale, on the continent of the Hither Afia, and oppofite to Ephefus; the diftance only feven ftadia (Strabo); a free ifland, in compafs 87 miles (Pliny); or 100 (Ifidorus); with a cognominal town (Ptolemy, Horace); famous for the worfhip and a temple of Juno, with a noted afylum (Virgil, Strabo, Tacitus); and hence their coin exhibited a peacock (Athenæus): the country of Pythagoras, who, to avoid the oppreffion of tyrants, retired to Italy, the land of freedom. Samos, though not fo happy in producing wine, which Strabo wonders at, all the adjoining iflands yielding a generous fort, yet abounds in all the neceffaries of life. The *Vafa Samia*, among earthen ware, were held in high repute. *Samii*, the people (Ovid).—The ifland is now in the hands of the Turks. It is about 32 miles in length, and 22 in breadth, and extremely fertile. The inhabitants live at their eafe, their taxation by the Turks being moderate. The women are very nafty and ugly, and they never

ſhift above once a month. They are clothed in the Turkiſh manner, except a red coif, and their hair hanging down their backs, with plates of ſilver or block-tin faſtened to the ends.— They have abundance of melons, lentils, kidney-beans, and excellent muſkadine grapes. They have white figs four times as big as the common ſort, but not ſo well taſted. Their ſilk is very fine, and their honey and wax admirable; beſides which, their poultry are excellent: they have iron mines, and moſt of the ſoil is of a ruſty colour: they have alſo emery ſtone, and all the mountains are of white marble. The inhabitants are about 12,000, who are almoſt all Greeks; and the monks and prieſts occupy moſt part of the iſland. They have a biſhop, who reſides at Cora. See POLYCRATES.

SAMPAN, is a Chineſe boat without a keel, looking almoſt like a trough; they are made of different dimenſions, but are moſtly covered. Theſe boats are as long as ſloops, but broader, almoſt like a baking-trough; and have at the end one or more decks of bamboo ſticks: the cover or roof is made of bamboo ſticks, arched over in the ſhape of a grater; and may be raiſed or lowered at pleaſure; the ſides are made of boards, with little holes, with ſhutters inſtead of windows: the boards are faſtened on both ſides to poſts, which have notches like ſteps on the inſides, that the roof may be let down, and reſt on them: on both ends of the deck are commonly two little doors, at leaſt there is one at the hindmoſt end. A fine white ſmooth carpet ſpread up as far as the boards makes the floor, which in the middle conſiſts of looſe boards; but this carpet is only made uſe of to ſleep on. As theſe boats greatly differ from ours in ſhape, they are likewiſe rowed in a different manner: for two rowers, poſting themſelves at the back end of the ſampan, work it forwards very readily by the motion of two oars; and can almoſt turn the veſſel juſt as they pleaſe: the oars, which are covered with a little hollow quadrangular iron, are laid on iron ſwivels, which are faſtened in the ſides of the ſampan: at the iron the oars are pieced, which makes them look a little bent: in common, a rower ſits before with a ſhort oar; but this he is forced to lay aſide when he comes near the city, on account of the great throng of ſampans; and this inconvenience has confirmed the Chineſe in their old way of rowing. Inſtead of pitch, they make uſe of a cement like our putty, which we call *chinam*, but the Chineſe call it *kiang*. Some authors ſay that this cement is made of lime and a reſin exuding from the tree *tong yeu*, and bamboo ockam.

Beſides a couple of chairs, they have the following furniture: two oblong tables or boards on which ſome Chineſe characters are drawn; a lanthorn for the night-time, and a pot to boil rice in. They have alſo a little cover for their houſehold god, decorated with gilt paper and other ornaments: before him ſtands a pot filled with aſhes, into which the tapers are put before the idol. The candles are nothing elſe than bamboo chips, to the upper end of which ſaw-duſt of ſandal wood is ſtuck on with gum. Theſe tapers are everywhere lighted before the idols in the pagodas, and before the doors in the ſtreets; and, in large cities, occaſion a ſmoke very pernicious to the eyes. Before this idol ſtands ſome *ſamſo*, or Chineſe brandy, water, &c. We ought to try whether the Chineſe would not like to uſe juniper-wood inſtead of ſandal-wood; which latter comes from Suratte, and has almoſt the ſame ſmell with juniper.

SAMSON, one of the judges of Iſrael, memorable for his ſupernatural ſtrength, his victories over the Philiſtines, and his tragical end, as related in the book of *Judges*.

SAMSON'S *Poſt*, a ſort of pillar erected in a ſhip's hold, between the lower deck and the kelſon, under the edge of a hatchway, and furniſhed with ſeveral notches that ſerve as ſteps to mount or deſcend, as occaſion requires. This poſt being firmly driven into its place, not only ſerves to ſupport the beam and fortify the veſſel in that place, but alſo to prevent the cargo or materials contained in the hold from ſhifting to the oppoſite ſide, by the rolling of the ſhip in a turbulent and heavy ſea.

BOOKS *of* SAMUEL, two canonical books of the Old Teſtament, as being uſually aſcribed to the prophet Samuel. The books of Samuel and the books of Kings are a continued hiſtory of the reigns of the kings of Iſrael and Judah; for which reaſon the books of Samuel are likewiſe ſtyled *the firſt and ſecond books of Kings*. Since the firſt 24 chapters contain all that relates to the Hiſtory of Samuel, and the latter part of the firſt book and all the ſecond include the relation of events that happened after the death of that prophet, it has been ſuppoſed that Samuel was author only of the firſt 24 chapters, and that the prophets Gad and Nathan finiſhed the work. The firſt book of Samuel comprehends the tranſactions under the government of Eli and Samuel, and under Saul the firſt king; and alſo the acts of David while he lived under Saul; and is ſuppoſed to contain the ſpace of 101 years. The ſecond book contains the hiſtory of about 40 years, and is wholly ſpent in relating the tranſactions of David's reign.

SAMYDA, in botany: a genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The calyx is quinquepartite and coloured; there is no corolla; the capſule in the inſide reſembles a berry, is trivalved and unilocular; the ſeeds neſtling.

SANAA, a large and populous town, capital of Arabia Felix, and in Yemen Proper. It is ſeated among the mountains and fine orchards, 240 miles N. N. E. of Mocha, and 450 S. E. of Mecca. E. lon. 46. 35. N. lat. 17. 28.

SANADON (NOEL ETIENNE), a Jeſuit, was born at Rouen in 1676, and was a diſtinguiſhed profeſſor of humanity at Caen. He there became acquainted with Huet biſhop of Avranches, whoſe taſte for literature and poetry was ſimilar to his own. Sanadon afterwards taught rhetoric at the univerſity of Paris, and was entruſted with the education of the prince of Conti, after the death of Du Morceau. In 1728 he was made librarian to Louis XIV. an office which he retained to his death. He died on the 21ſt of September 1733, in the 5?th year of his age. His works are, 1. Latin Poems, in 12mo, 1715, and reprinted by Barbou, in 8vo. 1754. His ſtyle poſſeſſes the graces of the Auguſtan age. His language is pure and nervous: his verſes are harmonious, and his thoughts are delicate and well choſen; but ſometimes his imagination flags. His Latin poems conſiſt of Odes, Elegies, Epigrams, and others, on various ſubjects. 2. A tranſlation of Horace, with Remarks, in 2 vols. 4to, printed at Paris in 1727; but the beſt edition of this work was printed at Amſterdam in 1735, in 8 vols. 12mo, in which are alſo inſerted the verſions and notes of M. Dacier. Sanadon tranſlated with elegance and taſte; but he has not preſerved the ſublimity of the original in the odes, nor the energy and preciſion in the epiſtles and ſatires. In general, his verſion is rather a paraphraſe than a faithful tranſlation. Learned men have juſtly cenſured him for the liberty which he has taken in making conſiderable changes in the order and ſtructure of the odes. He has alſo given offence by his uncouth orthography. 3. A Collection of Diſcourſes delivered at different times, which afford ſtrong proofs of his knowledge of oratory and poetry. 4. A book entitled *Prieres et Inſtructions Chretiennes*.

SANBALLAT, the chief or governor of the Cuthites or Samaritans, was always a great enemy to the Jews. He was a native of Horon, or Horonaim, a city beyond Jordan, in the country of the Moabites. He lived in the time of Nehemiah, who was his great opponent, and from whoſe book we learn his hiſtory. There is one circumſtance related of him which has occaſioned ſome diſpute among the learned; and the ſtate of the queſtion is as follows: When Alexander the Great came

into Phœnicia, and ſat down before the city of Tyre, Sanballat quitted the intereſts of Darius, king of Perſia, and went at the head of 8000 men to offer his ſervice to Alexander. This prince readily entertained him, and, being much ſolicited by him, gave him leave to erect a temple upon mount Gerizim, where he conſtituted his ſon-in-law Manaſſeh the high-prieſt. But this ſtory carries a flagrant anachroniſm: for 120 years before this, that is, in the year of the world 3550, Sanballat was governor of Samaria; wherefore the learned Dr. Prideaux (in his Connection of the Hiſtories of the Old and New Teſtament) ſuppoſes two Sanballats, and endeavours to reconcile it to truth and probability, by ſhowing it to be a miſtake of Joſephus. This author makes Sanballat to flouriſh in the time of Darius Codomannus, and to build his temple upon mount Gerizim by licenſe from Alexander the Great; whereas it was performed by leave from Darius Nothus, in the 15th year of his reign. This takes away the difficulty ariſing from the great age of Sanballat, and brings him to be contemporary with Nehemiah, as the Scripture hiſtory requires.

SANCHEZ (François), called in Latin *Sanctius*, was of Las Brocas in Spain, and has been dignified by his own countrymen with the pompous titles of *le Pere de la Langue Latine, et le Docteur de tous les Gens-de lettres*. He wrote, 1. An excellent treatiſe entitled Minerva, or *De Cauſis Linguæ Latinæ*, which was publiſhed at Amſterdam in 1714, in 8vo. The authors of the *Portroyal Methode de la Langue Latine* have been much indebted to this work. 2. The Art of Speaking, and the Method of tranſlating Authors. 3. Several other learned pieces on grammar. He died in the year 1600, in his 77th year. We muſt be careful to diſtinguiſh him from another *François Sanchez*, who died at Toulouſe in 1632. This laſt was a Portugueſe phyſician who ſettled at Toulouſe, and, though a Chriſtian, was born of Jewiſh parents. He is ſaid to have been a man of genius and a philoſopher. His works have been collected under the title of *Opera Medica. His juncti ſunt tractatus quidam philoſophici non inſubtiles.* They were printed at Toulouſe in 1636.

SANCHONIATHO, a Phœnician philoſopher and hiſtorian, who is ſaid to have flouriſhed before the Trojan war, about the time of Semiramis. Of this moſt antient writer, the only remains extant are ſundry fragments of coſmogony, and of the hiſtory of the gods and firſt mortals, preſerved by Euſebius and Theodoret; both of whom ſpeak of Sanchoniatho as an accurate and faithful hiſtorian; and the former adds, that his work, which was tranſlated by Philo-Byblius from the Phœnician into the Greek language, contains many things relating to the hiſtory of the Jews which deſerve great credit, both becauſe they agree with the Jewiſh writers, and becauſe the author received theſe particulars from the annals of Hierombalus, a prieſt of the god Jao. Several modern writers, however, of great learning, have called in queſtion the very exiſtence of Sanchoniatho, and have contended with much plauſibility, that the fragments which Euſebius adopted as genuine upon the authority of Porphyry, were forged by that author, or the pretended tranſlator Philo, from enmity to the Chriſtians, and that the Pagans might have ſomething to ſhow of equal antiquity with the books of Moſes. Theſe oppoſite opinions have produced volumes of controverſy. The ſubject, however, has reſolved itſelf into two queſtions: 1. Was there in reality ſuch a writer? 2. Was he of the very remote antiquity which his tranſlator claims for him? To ſo great a length have theſe inquiries extended, that our limits will not even allow of an abſtract. We ſhall therefore refer the reader to *Cumberland's* SANCHONIATHO, which enters fully into the examination.

SANCROFT (WILLIAM), archbiſhop of Canterbury, was born at Freſingfield in Suffolk in 1616; and admitted into Emanuel college, Cambridge, in 1633. In 1642 he was elected a fellow; and, for refuſing to take the covenant, was ejected from his fellowſhip. In 1660 he was choſen one of the univerſity preachers; and in 1663 was nominated to the deanry of York. In 1664 he was inſtalled dean of St. Paul's. In this ſtation he ſet himſelf with unwearied diligence to repair the cathedral, till the fire of London in 1666 employed his thoughts on the more noble undertaking of rebuilding it, toward which he gave 1400l. He alſo rebuilt the deanry, and improved the revenue of it. In 1668 he was admitted archdeacon of Canterbury, on the king's preſentation. In 1677, being now prolocutor of the convocation, he was unexpectedly advanced to the archbiſhopric of Canterbury. In 1678 he was committed to the Tower, with ſix other biſhops, for preſenting a petition to the king againſt reading the declaration of indulgence. Upon king James II.'s withdrawing himſelf, he concurred with the lords in a declaration to the prince of Orange for a free parliament, and due indulgence to the Proteſtant diſſenters. But when that prince and his conſort were declared king and queen, his grace refuſing to take the oaths to their majeſties, he was ſuſpended and deprived. He lived in a very private manner, till he died in 1693. His learning, integrity, and piety, made him an exalted ornament of the church. He publiſhed a volume in 12mo, entitled *Modern Politics*, taken from Machiavel, Borgia, and other choice authors. Familiar Letters to Mr. North, an 8vo pamphlet, and three of his ſermons were printed together after his death.

SANCTIFICATION, the act of ſanctifying, or rendering a thing holy. The reformed divines define ſanctification to be an act of God's grace, by which a perſon's deſires and affections are alienated from the world; and by which he is made to die to ſin, and to live to righteouſneſs; or, in other words, to feel an abhorrence of all vice, and a love of religion and virtue.

SANCTION, the authority given to a judicial act, by which it becomes legal and authentic.

SANCTORIUS, a moſt ingenious and learned phyſician, was a profeſſor in the univerſity of Padua, in the beginning of the 17th century. He contrived a kind of ſtatical chair, by means of which, after eſtimating the aliments received, and the ſenſible diſcharges, he was enabled to determine with great exactneſs the quantity of inſenſible perſpiration, as well as what kind of victuals and drink increaſed or diminiſhed it. On theſe experiments he erected a curious ſyſtem, which he publiſhed under the title of *De medicina ſtatica*; of which we have an Engliſh tranſlation by Dr. Quincy. Sanctorius publiſhed ſeveral other treatiſes, which ſhowed great abilities and learning.

SANCTUARY, among the Jews, alſo called *Sanctum ſanctorum*, or *Holy of holies*, was the holieſt and moſt retired part of the temple of Jeruſalem, in which the ark of the covenant was preſerved, and into which none but the high-prieſt was allowed to enter, and that only once a-year, to intercede for the people. Some diſtinguiſh the ſanctuary from the *ſanctum ſanctorum*, and maintain that the whole temple was called the *ſanctuary*. To *try* and examine any thing by the *weight of the ſanctuary*, is to examine it by a juſt and equal ſcale; becauſe, among the Jews, it was the cuſtom of the prieſts to keep ſtone weights, to ſerve as ſtandards for regulating all weights by, though theſe were not at all different from the royal or profane weights.

SANCTUARY, in the Romiſh church, is alſo uſed for that part of the church in which the altar is placed, encompaſſed with a rail or baluſtrade.

SANCTUARY, in our antient cuſtoms, the ſame with ASYLUM.

SAND, in natural hiſtory, a genus of foſſils, the characters of which are, that they are found in minute concretions; forming together a kind of powder, the genuine particles of which are all of a tendency to one determinate ſhape, and appear regular though more or leſs complete concretions; not to be diſſolved or diſunited by water, or formed into a coherent maſs by

means of it, but retaining their figure in it; tranſparent, vitrifiable by extreme heat, and not diſſoluble in nor effervescing with acids. Sands are ſubject to be variouſly blended, both with homogene and heterogene ſubſtances, as that of talcs, &c. and hence, as well as from their various colours, are ſubdivided into, 1. White ſands, whether pure or mixed with other arenaceous or heterogeneous particles; of all which there are ſeveral ſpecies, differing no leſs in the fineneſs of their particles than in the different degrees of colour, from a bright and ſhining white, to a browniſh, yellowiſh, greeniſh, &c. white. 2. The red and reddiſh ſands, both pure and impure. 3. The yellow ſands, whether pure or mixed, are alſo very numerous. 4. The brown ſands, diſtinguiſhed in the ſame manner. 5. The black ſands, whereof there are only two ſpecies, viz. a fine ſhining greyiſh-black ſand, and another of a fine ſhining reddiſh-black colour. 6. The green kind; of which there is only one known ſpecies, viz. a coarſe variegated duſky-green ſand, common in Virginia.

Sand is of great uſe in the glaſs-manufacture; a white kind of ſand being employed for making of the white glaſs, and a coarſe greeniſh-looking ſand for the green glaſs.

In agriculture, it ſeems to be the office of ſand to make unctuous earths fertile, and fit to ſupport vegetables, &c. For earth alone, we find, is liable to coaleſce, and gather into a hard coherent maſs, as appears in clay; and being thus embodied, and as it were glued together, is no way diſpoſed to nouriſh vegetables. But if ſuch earth be mixed with ſand, its pores are thereby kept open, and the earth itſelf looſe, ſo as thus to give room for the juices to aſcend, and for plants to be nouriſhed thereby. A vegetable planted only in ſand, or in a fat glebe, or in earth, receives little growth or increaſe; but a mixture of both renders the maſs fertile. In effect, earth is in ſome meaſure made organical by means of ſand; pores and ſpaces, ſomething analogous to veſſels, being thereby maintained, by which the juices may be conveyed, prepared, digeſted, circulated, and at length diſcharged. Common ſand is, therefore, a very good addition, by way of manure, to all ſorts of clay lands; it warms them, and makes them more open and looſe.

SAND-*Bags*, in the art of war. See SACKS *of Earth*.

SAND *Eel*, in ichthyology. See AMMODYTES.

SAND-*Floods*, a name given to the flowing of ſand ſo common in the deſerts of Arabia. Mr. Bruce gives the following accurate deſcription of ſome that he ſaw in travelling through that long and dreary deſert. "At one o'clock (ſays he) we alighted among ſome acacia-trees at Waadi el Halboub, having gone twenty-one miles. We were here at once ſurpriſed and terrified by a ſight ſurely one of the moſt magnificent in the world. In that vaſt expanſe of deſert from weſt and to north-weſt of us, we ſaw a number of prodigious pillars of ſand at different diſtances, at times moving with great celerity, at others ſtalking on with a majeſtic ſlowneſs: at intervals we thought they were coming in a few minutes to overwhelm us; and ſmall quantities of ſand did actually more than once reach us. Again they would retreat ſo as to be almoſt out of ſight, their tops reaching to the very clouds. There the tops often ſeparated from the bodies; and theſe, once disjoined, diſperſed in the air, and did not appear more. Sometimes they were broken near the middle, as if ſtruck with a large cannon-ſhot. About noon they began to advance with conſiderable ſwiftneſs upon us, the wind being very ſtrong at north. Eleven of them ranged alongſide of us about the diſtance of three miles. The greateſt diameter of the largeſt appeared to me at that diſtance as if it would meaſure ten feet. They retired from us with a wind at ſouth eaſt, leaving an impreſſion upon my mind to which I can give no name, though ſurely one ingredient in it was fear, with a conſiderable deal of wonder and aſtoniſhment. It was in vain to think of flying, the ſwifteſt horſe or faſteſt ſailing ſhip could be of no uſe to carry us out of this danger; and the full perſuaſion of this riveted me as if to the ſpot where I ſtood, and let the camels gain on me ſo much in my ſtate of lameneſs, that it was with ſome difficulty I could overtake them.

"The ſame appearance of moving pillars of ſand preſented themſelves to us this day in form and diſpoſition like thoſe we had ſeen at Waadi Halboub, only they ſeemed to be more in number and leſs in ſize. They came ſeveral times in a direction cloſe upon us, that is, I believe, within leſs than two miles. They began immediately after ſun-riſe, like a thick wood, and almoſt darkened the ſun: his rays ſhining through them for near an hour, gave them an appearance of pillars of fire. Our people now became deſperate: the Greek ſhrieked out, and ſaid it was the day of judgment. Iſmael pronounced it to be hell, and the Tucorories, that the world was on fire. I aſked Idris if ever he had before ſeen ſuch a ſight? He ſaid he had often ſeen them as terrible, though never worſe; but what he feared moſt was that extreme redneſs in the air, which was a ſure preſage of the coming of the ſimoom." See SIMOOM.

The flowing of ſand, though far from being ſo tremendous and hurtful as in Arabia, is of very bad conſequences in this country, as many valuable pieces of land have thus been entirely loſt; of which we give the following inſtances from Mr. Pennant, together with a probable means of preventing them in future. "I have more than once (ſays he), on the eaſtern coaſts of Scotland, obſerved the calamitous ſtate of ſeveral extenſive tracts, formerly in a moſt flouriſhing condition, at preſent covered with ſands, unſtable as thoſe of the deſerts of Arabia. The pariſh of Furvie, in the county of Aberdeen, is now reduced to two farms, and above 500l. a-year loſt to the Errol family, as appears by the oath of the factor in 1600, made before the court of ſeſſion, to aſcertain the miniſter's ſalary. Not a veſtige is to be ſeen of any buildings, unleſs a fragment of the church.

"The eſtate of Coubin, near Forres, is another melancholy inſtance. This tract was once worth 300l. a year, at this time overwhelmed with ſand. This ſtrange inundation was ſtill in motion in 1769, chiefly when a ſtrong wind prevailed. Its motion is ſo rapid, that I have been aſſured, that an apple tree has been ſo covered with it in one ſeaſon, that only the very ſummit appeared. This diſtreſs was brought on about ninety years ago, and was occaſioned by the cutting down ſome trees, and pulling up the bent or ſtar which grew on the ſand-hills; which at laſt gave riſe to the act of 15 George II. c. 33. to prohibit the deſtruction of this uſeful plant.

"I beg leave to ſuggeſt to the public a poſſible means of putting a ſtop to theſe deſtructive ravages. Providence hath kindly formed this plant to grow only in pure ſand. Mankind was left to make, in after-times, an application of it ſuitable to their wants. The ſand hills, on a portion of the Flintſhire ſhores, in the pariſh of Llanaſa, are covered with it naturally, and kept firm in their place. The Dutch perhaps owe the exiſtence of part at leaſt of their country to the ſowing of it on the *mobile ſolum*, their ſand banks.

"My humane and amiable friend, the late Benjamin Stillingfleet, Eſq. recommended the ſowing of this plant on the ſandy wilds of Norfolk, that its matted roots might prevent the deluges of ſand which that country experiences. It has been already remarked, that whereſoever this plant grows the ſalutary effects are ſoon obſerved to follow. A ſingle plant will fix the ſand, and gather it into a hillock; theſe hillocks, by the increaſe of vegetation, are formed into larger, till by degrees a barrier is made often againſt the encroachments of the ſea; and might as often prove preventative of the calamity in queſtion. I cannot, therefore, but recommend the trial to the inhabitants of many parts of North Britain. The plant grows in moſt places near the ſea, and is known to the Highlanders by the

name of *murab*; to the English by that of *bent-ſtar*, *mat-graſs*, or *marram*. Linnæus calls it *arundo arenaria*. The Dutch call it *helm*. This plant hath ſtiff and ſharp-pointed leaves, growing like a ruſh, a foot and a half long: the roots both creep and penetrate deeply into their ſandy beds: the ſtalk bears an ear five or ſix inches long, not unlike rye; the ſeeds are ſmall, brown and roundiſh. By good fortune, as old Gerard obſerves, no cattle will eat or touch this vegetable, allotted for other purpoſes ſubſervient to the uſe of mankind."

SAND-*Piper*, in ornithology. See TRINGA.

SAND-*Stone*, a genus of ſtones belonging to the order of ſaxa; and including all thoſe which conſiſt of ſuch minute particles that they cannot eaſily be diſcerned by the eye. The ſpecies enumerated by Cronſtedt are, 1. Thoſe cemented by a clay, of which there are two varieties; one with porcelain clay, the other with common clay. The former is met with in Sweden under the ſtratum of coal in a coal-mine in the province of Shone, and is very hard and refractory in the fire; the other is found in the iſland of Gothland. 2. With lime, reſembling mortar made with coarſe ſand. There are two varieties, one conſiſting of tranſparent grey-coloured grains of quartz and white lime-ſtone, the other of a looſe texture, hardening in the air; but having the particles too fine to be viſible. The former of theſe is found in Sweden, the latter in France and Livonia. 3. Sand-ſtone having its particles bound together by an unknown cement. Of this there are four varieties: 1. Looſe; 2. Somewhat hard; 3. Compact; 4. Very hard; all of them found in different parts of Sweden. 4. Cemented by ruſt of iron, found in the form of looſe ſtones in ſeveral places.

Cronſtedt informs us that the greateſt part of ſand-ſtones conſiſt of quartz and mica, being thoſe ſubſtances which moſt readily admit of granulation without being reduced to powder. Some years ago the Baron de Dietrich ſhowed a ſingular variety of ſand-ſtone at Paris. It conſiſts of ſmall grains of hard quartz which ſtrike fire with ſteel, united with ſome micaceous particles. It is flexible and elaſtic, the flexibility depending on the micaceous part, and ſoftneſs of the gluten with which the particles are cemented. This elaſtic ſtone is ſaid to have been found at Brazil, and brought to Germany by his excellency the marquis de Lavradio. There are alſo two tables of white marble, kept in the palace of Borgheſe at Rome, which have the ſame property. But the ſparry particles of their ſubſtance, though tranſparent, are rather ſoft, and may be eaſily ſeparated by the nail. They effervesce with aquafortis, and there is alſo a ſmall mixture of minute particles of talc or mica.

Sand-ſtones are of great uſe in buildings which are required to reſiſt air, water, and fire. Some of them are ſoft in the quarry, but become hard when expoſed to the air. The looſe ones are moſt uſeful, but the ſolid and hard ones crack in the fire, and take a poliſh when uſed as grindſtones. Stones of this kind ought therefore to be nicely examined before they are employed for the uſual purpoſes. Our author obſerves that the working maſons, or ſtone-cutters, ought to wear a piece of frize or baize before their mouths, to preſerve themſelves from a conſumption, which their buſineſs is otherwiſe apt to bring on. Limeſtone, however, is not obſerved to have this effect.

To the liſt of ſand-ſtones Fabroni adds gritſtone, of greater or leſs hardneſs; moſtly of a grey, and ſometimes of a yellowiſh colour, compoſed of a ſiliceous and micaceous ſand, but rarely of a ſparry kind, with greater or leſſer particles cloſely connected with an argillaceous cement. It ſtrikes fire with ſteel, vitrifies in a ſtrong fire, and is generally indiſſoluble in acids. It is uſed for mill-ſtones, whet-ſtones, and ſometimes for filtering ſtones, as well as for building.

SANDAL, in antiquity, a rich kind of ſlipper worn on the feet by the Greek and Roman ladies, made of gold, ſilk, or other precious ſtuff; conſiſting of a ſole, with a hollow at one extreme to embrace the ancle, but leaving the upper part of the foot bare.

SANDAL, is alſo uſed for a ſhoe or ſlipper worn by the pope and other Romiſh prelates when they officiate. It is alſo the name of a ſort of ſlipper worn by ſeveral congregations of reformed monks. This laſt conſiſts of no more than a mere leathern ſole, faſtened with latches or buckles, all the reſt of the foot being left bare. The capuchins wear ſandals; the recollets, clogs; the former are of leather, and the latter of wood.

SANDAL-*Wood*. See SAUNDERS.

SANDARACH, in natural hiſtory, a very beautiful native foſſil, though too often confounded with the common factitious red arſenic, and with the red matter formed by melting the common yellow orpiment. It is a pure ſubſtance, of a very even and regular ſtructure, is throughout of that colour which our dyers term an *orange ſcarlet*, and is conſiderably tranſparent even in the thickeſt pieces. But though, with reſpect to colour, it has the advantage of cinnabar while in the maſs, it is vaſtly inferior to it when both are reduced to powder. It is moderately hard, and remarkably heavy; and, when expoſed to a moderate heat, melts and flows like oil: if ſet on fire, it burns very briſkly. It is found in Saxony and Bohemia, in the copper and ſilver mines; and is ſold to the painters, who find it a very fine and valuable red: but its virtues or qualities in medicine are no more aſcertained at this time than thoſe of the yellow orpiment.

Gum-SANDARACH, is a dry and hard reſin, uſually met with in looſe granules, of the bigneſs of a pea, a horſe-bean, or larger; of a pale whitiſh yellow colour, tranſparent, and of a reſinous ſmell, brittle, very inflammable, of an acrid and aromatic taſte, and diffuſing a very pleaſant ſmell when burning. It is produced from a ſpecies of the juniper (ſee JUNIPERUS). It flows only from theſe trees in hot countries: but the natives promote its diſcharge by making inciſions in the bark. Sandarach is eſteemed good in diarrhœas and in hæmorrhagies. The varniſh-makers make a kind of varniſh of it, by diſſolving it in oil of turpentine or linſeed, or in ſpirit of wine.

Pounded SANDARACH. See POUNCE.

SANDEMANIANS, in eccleſiaſtical hiſtory, a modern ſect that originated in Scotland about the year 1728; where it is at this time diſtinguiſhed by the name of *Glaſſites*, after its founder Mr. John Glaſs, who was a miniſter of the eſtabliſhed church in that kingdom, but, being charged with a deſign of ſubverting the national covenant, and ſapping the foundation of all national eſtabliſhments, by the kirk judicatory, was expelled by the ſynod from the church of Scotland. His ſentiments are fully explained in a tract publiſhed at that time, entitled, "The Teſtimony of the King of Martyrs," and preſerved in the firſt volume of his works. In conſequence of Mr. Glaſs's expulſion, his adherents formed themſelves into churches, conformable in their inſtitution and diſcipline to what they apprehended to be the plan of the firſt churches recorded in the New Teſtament. Soon after the year 1755, Mr. Robert Sandeman, an elder in one of theſe churches in Scotland, publiſhed a ſeries of letters addreſſed to Mr. Hervey, occaſioned by his Theron and Aſpaſio; in which he endeavoured to ſhow, that his notion of faith is contradictory to the ſcripture account of it, and could only ſerve to lead men, profeſſedly holding the doctrines commonly called *Calviniſtic*, to eſtabliſh their own righteouſneſs upon their frames, inward feelings, and various acts of faith. In theſe letters Mr. Sandeman attempts to prove, that faith is neither more nor leſs than a ſimple aſſent to the divine teſtimony concerning Jeſus Chriſt, recorded in the New Teſtament; and he maintains, that the word *faith*, or *belief*, is conſtantly uſed by the apoſtles to ſignify what is denoted by it in common diſcourſe, viz. a perſuaſion of the truth of any propoſition, and that there is no difference between

believing any common teſtimony, and believing the apoſtolic teſtimony, except that which reſults from the nature of the teſtimony itſelf. This led the way to a controverſy, among thoſe who were called *Calviniſts*, concerning the nature of juſtifying faith: and thoſe who adopted Mr. Sandeman's notion of it, and who took the denomination of *Sandemanians*, formed themſelves into church order, in ſtrict fellowſhip with the churches in Scotland, but holding no kind of communion with other churches. The chief opinions and practices in which this ſect differs from other Chriſtians, are, their weekly adminiſtration of the Lord's ſupper; their love-feaſts, of which every member is not only allowed but required to partake, and which conſiſt of their dining together at each other's houſes, in the interval between the morning and afternoon ſervice; their kiſs of charity uſed on this occaſion, at the admiſſion of a new member, and at other times, when they deem it to be neceſſary or proper; their weekly collection before the Lord's ſupper, for the ſupport of the poor, and defraying other expenſes; mutual exhortation; abſtinence from blood and things ſtrangled; waſhing each other's feet, the precept concerning which, as well as other precepts, they underſtand literally; community of goods, ſo far as that every one is to conſider all that he has in his poſſeſſion and power as liable to the calls of the poor and church; and the unlawfulneſs of laying up treaſures on earth, by ſetting them apart for any diſtant, future, and uncertain uſe. They allow of public and private diverſions, ſo far as they are not connected with circumſtances really ſinful; but, apprehending a lot to be ſacred, diſapprove of playing at cards, dice, &c. They maintain a plurality of elders, paſtors, or biſhops, in each church; and the neceſſity of the preſence of two elders in every act of diſcipline, and at the adminiſtration of the Lord's ſupper. In the choice of theſe elders, want of learning, and engagements in trade, &c. are no ſufficient objection; but ſecond marriages diſqualify for the office; and they are ordained by prayer and faſting, impoſition of hands, and giving the right hand of fellowſhip. In their diſcipline they are ſtrict and ſevere; and think themſelves obliged to ſeparate from the communion and worſhip of all ſuch religious ſocieties as appear to them not to profeſs the ſimple truth for their only ground of hope, and who do not walk in obedience to it. We ſhall only add, that in every church tranſaction they eſteem unanimity to be abſolutely neceſſary. From this abſtract of the account which they have publiſhed of their tenets and practices, it does not ſeem to be probable that their number ſhould be very conſiderable.

SANDERS. See SAUNDERS.

SANDIVER, a whitiſh ſalt, continually caſt up from the *metal*, as it is called, whereof glaſs is made; and, ſwimming on its ſurface, is ſkimmed off. Sandiver is alſo plentifully thrown out in the eruptions of volcanoes; ſome is of a fine white, and others tinged blueiſh or yellowiſh. Sandiver is ſaid to be detergent, and good for foulneſſes of the ſkin. It is alſo uſed by gilders of iron.

SANDIX, a kind of minium, or red-lead, made of ceruſe, but much inferior to the true minium.

SANDOMIR, a city, the capital of a palatinate of the ſame name, in Little Poland, on the Viſtula. The Swedes blew up the caſtle in 1656; and here, in 1659, was a dreadful battle between the Tartars and Ruſſians. It is 84 miles ſouth-eaſt of Cracow. Lat. 49. 26. Lon. 22. 10.

SANDORICUM, in botany: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 23d order, *Trihillatæ*. The calyx is quinquedentate; the petals five, and linear-ſhaped: the nectarium has ten dentæ, on which the antheræ grow; the fruit is a drupa, and five in number, each of which has one ſeed. There is only one ſpecies, *viz.* the *indicum*, a native of Africa and the Eaſt-Indies.

SANDPU, or SANPOO, the vulgar name of one of the moſt mighty rivers in the world. The name it generally goes by and by which it is beſt known, is that of *Burrampooter*. Of this moſt majeſtic body of waters we have the following very animated account in *Maurice's Indian Antiquities*. "An object equally novel and grand now claims our attention; ſo novel, as not to have been known to Europeans in the real extent of its magnificence before the year 1765, and ſo awfully grand, this the aſtoniſhed geographer, thinking the language of proſe inadequate to convey his conception, has had recourſe to the more expreſſive and energetic language of poetry: but

—— Scarce the Muſe herſelf
Dares ſtretch her wing o'er this enormous maſs
Of ruſhing waters; to whoſe dread expanſe,
Continuous depth, and wondrous length of courſe,
Our floods are rills.

"This ſtupendous object is the Burrampooter, a word which in Shanſcrit ſignifies *the ſon of Brahma*; for no meaner origin could be aſſigned to ſo wonderful a progeny. This ſupreme monarch of Indian rivers derives its ſource from the oppoſite ſide of the ſame mountain from which the Ganges ſprings, and taking a bold ſweep towards the eaſt, in a line directly oppoſite to the courſe of that river, waſhes the vaſt country of Tibet, where, by way of diſtinction, it is denominated *Sanpoo*, or *the river*. Winding with a rapid current through Tibet, and, for many a league, amidſt dreary deſerts and regions remote from the habitations of men, it waters the borders of the territory of Laſſa, the reſidence of the grand Lama; and then deviating with a cometary irregularity, from an eaſt to a ſouth-eaſt courſe, the *mighty wanderer* approaches within 200 miles of the weſtern frontiers of the vaſt empire of China. From this point its more direct path to the ocean lay through the gulph of Siam; but, with a deſultory courſe peculiar to itſelf, it ſuddenly turns to the weſt through Aſſam, and enters Bengal on the north-eaſt quarter. Circling round the weſtern point of the Garrow mountains, the Burrampooter now takes a ſouthern direction, and for 60 miles before it meets the Ganges, its ſiſter in point of origin, but not its rival in point of magnitude, glides majeſtically along in a ſtream which is regularly from four to five miles wide, and, but for its freſhneſs, Mr. Rennel ſays, might paſs for an arm of the ſea. About 40 miles from the ocean theſe mighty rivers unite their ſtreams; but that gentleman is of opinion that their junction was formerly higher up, and that the accumulation of two ſuch vaſt bodies of water ſcooped out the amazing bed of the Megna lake. Their preſent conflux is below Luckipoor; and by that confluence a body of freſh running water is produced, hardly equalled, and not exceeded, either in the old or the new hemiſphere. So ſtupendous is that body of water, that it has formed a gulph of ſuch extent as to contain iſlands that rival our Iſle of Wight in ſize and fertility; and with ſuch reſiſtleſs violence does it ruſh into the ocean, that in the rainy ſeaſon the ſea itſelf, or at leaſt its ſurface, is perfectly freſh for many leagues out."

SANDWICH, a town of Kent, one of the cinque ports, and which has the title of an earldom. It conſiſts of about 1500 houſes, moſt of them old, and built with wood, though there are a few new ones built with brick and flints. It has three long narrow ſtreets paved, and thirty croſs-ſtreets or alleys, with about 6000 inhabitants, but no particular manufactory. The town is walled round, and alſo fortified with ditches and ramparts; but the walls are much decayed, on account of the harbour being ſo choked up with ſand that a ſhip of 100 tons burthen cannot get in. E. lon. 1. 20. N. lat. 51. 20.

SANDWICH *Iſlands*, a group of iſlands in the South Seas, lying near New Ireland, were among the laſt diſcoveries of captain Cook, who ſo named them in honour of the earl of Sandwich,

under whose adminiftration thefe difcoveries were made. They confift of eleven iflands, extending in latitude from 18. 54. to 22. 15. N. and in longitude from 150. 54. to 160. 24. W. They are called by the natives, Owhyhee, Mowee, Ranai, *Morotoi*, Tahoorowa, Woahoo, Atooi, *Neeheeheow*, *Oreehoua*, *Morotinne*, and Tahoora, all inhabited except the two laft. An account of the moft remarkable of which will be found in their alphabetical order, in their proper places in this work. The climate of thefe iflands differs very little from that of the Weft Indies in the fame latitude, though perhaps more temperate; and there are no traces of thofe violent winds and hurricanes, which render the ftormy months in the Weft Indies fo dreadful. There is alfo more rain at the Sandwich Ifles, where, the mountainous parts being generally enveloped in a cloud, fucceffive fhowers fall in the inland parts, with fine weather, and a clear fky, on the fea fhore. Hence it is, that few of thofe inconveniences, to which many tropical countries are fubject, either from heat or moifture, are experienced here. The winds, in the winter months, are generally from eaft-fouth-eaft to north-eaft. The vegetable productions are nearly the fame as thofe of the other iflands in this ocean; but the taro root is here of a fuperior quality. The bread-fruit trees thrive not in fuch abundance as in the rich plains of Otaheite, but produce double the quantity of fruit. The fugar-canes are of a very unufual fize, fome of them meafuring eleven inches and a quarter in circumference, and having fourteen feet eatable. There is alfo a root of a brown colour, fhaped like a yam, and from fix to ten pounds in weight, the juice of which is very fweet, of a pleafant tafte, and is an excellent fubftitute for fugar. The quadrupeds are confined to the three ufual forts, hogs, dogs, and rats. The fowls are alfo of the common fort; and the birds are beautiful and numerous, though not various. Goats, pigs, and European feeds, were left by captain Cook; but the poffeffion of the goats foon gave rife to a conteft between two diftricts, in which the breed was entirely deftroyed. The inhabitants are undoubtedly of the fame race that poffeffes the iflands fouth of the equator; and in their perfons, language, cuftoms, and manners, approach nearer to the New Zealanders than to their lefs diftant neighbours, either of the Society or Friendly Iflands. They are in general about the middle fize, and well made; they walk very gracefully, run nimbly, and are capable of bearing very great fatigue. Many of both fexes have fine open countenances; and the women in particular have good eyes and teeth; with a fweetnefs and fenfibility of look, that render them very engaging. There is one peculiarity, characteriftic of every part of thefe iflands, that even in the handfomeft faces there is a fulnefs of the noftril, without any flatnefs or fpreading of the nofe. They fuffer their beards to grow, and wear their hair after various fafhions. The drefs of both men and women nearly refembles thofe of New Zealand, and both fexes wear necklaces of fmall variegated fhells. Tattowing the body is practifed by every colony of this nation. The hands and arms of the women are alfo very neatly marked, and they have the fingular cuftom of tattowing the tip of the tongue. Like the New Zealanders, they have adopted the method of living together in villages, containing from a hundred to two hundred houfes, built pretty clofely together, without any order, and having a winding path between them. They are generally flanked towards the fea with detached walls, which are meant both for fhelter and defence. Thefe walls confift of loofe ftones, and the inhabitants are very dexterous in fhifting them fuddenly to fuch places as the direction of the attack may require. In the fides of the hills, or furrounding eminences, they have alfo little holes, or caves, the entrance to which is alfo fecured by a fence of the fame kind. They ferve for places of retreat in cafes of extremity, and may be defended by a fingle perfon againft feveral affailants. Their houfes are of different fizes, fome of them being large and commodious, from forty to fifty feet long, and from twenty to thirty broad; while others are mere hovels. The food of the lower clafs confifts principally of fifh and vegetables, to which the people of higher rank add the flefh of dogs and hogs. The manner of fpending their time admits of little variety. They rife with the fun, and, after enjoying the cool of the evening, retire to reft a few hours after fun-fet. The making of canoes, mats, &c. forms the occupations of the men; the women are employed in manufacturing cloth, and the fervants are principally engaged in the plantations and fifhing. Their idle hours are filled up with various amufements, fuch as dancing, boxing, wreftling, &c. Their agriculture and navigation bear a great refemblance to thofe of the South-fea iflands. Their plantations, which are fpread over the whole fea-coaft, confift of the taro, or eddy-root, and fweet potatoes, with plants of the cloth-trees fet in rows. The bottoms of their canoes are of a fingle piece of wood, hollowed out to the thicknefs of an inch, and brought to a point at each end. The fides confift of three boards, each about an inch thick, neatly fitted and lafhed to the bottom part. Some of their double canoes meafure 70 feet in length, three and a half in depth, and twelve in breadth. Their cordage, fifh-hooks, and fifhing-tackle, differ but little from thofe of the other iflands. Among their arts muft not be forgotten that of making falt, which they have in great abundance, and of a good quality. Their inftruments of war are fpears, daggers, clubs, and flings; and for defenfive armour they wear ftrong mats, which are not eafily penetrated by fuch weapons as theirs. As the iflands are not united under one fovereign, wars are frequent among them, which, no doubt, contribute greatly to reduce the number of inhabitants, which, according to the proportion affigned to each ifland, does not exceed 400,000. The fame fyftem of fubordination prevails here as at the other iflands, the fame abfolute authority on the part of the chiefs, and the fame unrefifting fubmiffion on the part of the people. The government is likewife monarchical and hereditary. At Owhyhee there is a regular fociety of priefts living by themfelves, and diftinct in all refpects from the reft of the people. Human facrifices are here frequent; not only at the commencement of a war, or any fignal enterprife, but the death of every confiderable chief calls for a repetition of thefe horrid rites. Nothwithftanding the irreparable lofs in the death of captain Cook, who was here murdered through fudden refentment and violence, they are acknowledged to be of the moft mild and affectionate difpofition. They live in the utmoft harmony and friendfhip with each other; and in hofpitality to ftrangers they are not exceeded even by the inhabitants of the Friendly Iflands. Their natural capacity feems in no refpect below the common ftandard of mankind; and their improvements in agriculture, and the perfection of their manufactures, are certainly adequate to the circumftances of their fituation, and the natural advantages which they enjoy.

SANDYS (Sir Edwin), fecond fon of Dr. Edwin Sandys archbifhop of York, was born about 1561, and educated at Oxford under Mr. Richard Hooker, author of the Ecclefiaftical Polity. In 1581 he was collated to a prebend in the cathedral of York. He travelled into foreign countries; and, upon his return, grew famous for learning, prudence, and virtue. While he was at Paris, he drew up a tract, publifhed under the title of *Europæ Speculum*. In 1602, he refigned his prebend; and, the year following, was knighted by king James I. who employed him in feveral important affairs. He was dexterous in any great employment, and a good patriot. However, oppofing the court with vigour in the parliament held in 1621, he, with Mr. Selden, was committed to cuftody for a month. He died in 1629, having bequeathed 1500l. to the univerfity of Oxford, for the endowment of a metaphyfical lecture.

Sandys (George), brother of the foregoing Sir Edwin, and

youngeſt ſon of archbiſhop Sandys, was born in 1577. He was a moſt accompliſhed gentleman; travelled over ſeveral parts of Europe and the Eaſt; and publiſhed a relation of his journey in folio, in 1615. He made an elegant tranſlation of Ovid's Metamorphoſes; and compoſed ſome poetical pieces of his own, that were greatly admired in the times of their being written. He alſo paraphraſed the Pſalms; and has left behind him a Tranſlation, with Notes, of one Sacred Drama written originally by Grotius, under the title of *Chriſtus Patiens*; on which, and *Adamus Exul*, and *Maſenius*, is founded Lauder's impudent charge of plagiariſm againſt our immortal Milton. Our author became one of the privy chamber to Charles I. and died in 1643.

SAN Fernando, near the entrance of the Golfo Dolce, in 15 degrees 18 minutes north latitude, has lately been fortified by the Spaniards, with an intent to curb the Muſquito-men, logwood-cutters, and bay-men. It is a very good harbour, with ſafe anchorage from the north and eaſt winds, in eight fathoms water.

SANGUIFICATION, in the animal œconomy, the converſion of the chyle into true blood. See Blood.

SANGUINARIA, blood-wort, in botany: A genus of the monogynia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the 27th order, *Rhoeadeæ*. The corolla is octopetalous: the calyx diphyllous; the ſiliqua ovate and unilocular. There is only one ſpecies, viz. the *canadenſis*, a native of the northern parts of America, where it grows plentifully in the woods; and in the ſpring, before the leaves of the trees come out, the ſurface of the ground is in many places covered with the flowers, which have ſome reſemblance to our wood anemone; but they have ſhort naked pedicles, each ſupporting one flower at top. Some of theſe flowers will have 10 or 12 petals, ſo that they appear to have a double range of leaves, which has occaſioned their being termed *double flowers*; but this is only accidental, the ſame roots in different years producing different flowers.—The plant can bear the open air in this country, but ſhould be placed in a looſe ſoil and ſheltered ſituation, not too much expoſed to the ſun. It is propagated by the roots; which may be taken up and parted, in September, every other year. The Indians paint themſelves yellow with the juice of theſe plants.

SANGUISORBA, greater wild burnet, in botany: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 54th order, *Miſcellaneæ*. The calyx is diphyllous; the germen ſituated betwixt the calyx and corolla. The moſt remarkable ſpecies is the *officinalis*, with oval ſpikes. This grows naturally in moiſt meadows in many parts of Britain. The ſtalks riſe from two to three feet high, branching towards the top; and are terminated by thick oval ſpikes of flowers of a grayiſh brown colour, which are divided into four ſegments almoſt to the bottom. Theſe are ſucceeded by four oblong cornered ſeeds. The leaves of this ſort are compoſed of five or ſix pair of lobes placed along a midrib, terminated by an odd one. Theſe are heart-ſhaped, deeply ſawed on their edges, and a little downy on the under ſides. The cultivation of this plant has been greatly recommended as food to cattle. See Husbandry.

SANHEDRIM, or Sanhedrin, from the Greek word Συνεδριον, which ſignifies a council or aſſembly of perſons ſitting together, was the name whereby the Jews called the great council of the nation, aſſembled in an apartment of the temple of Jeruſalem to determine the moſt important affairs both of their church and ſtate. This council conſiſted of ſeventy ſenators. The room they met in was a rotunda, half of which was built without the temple, and half within; that is, one ſemicircle was within the compaſs of the temple; the other ſemicircle, they tell us, was built without, for the ſenators to ſit in; it being unlawful for any one to ſit down in the temple. The Naſi, or prince of the ſanhedrim, ſat upon a throne at the end of the hall, having his deputy at his right hand, and his ſub-deputy on his left. The other ſenators were ranged in order on each ſide.

The rabbins pretend that the ſanhedrim has always ſubſiſted in their nation from the time of Moſes down to the deſtruction of the temple by the Romans. They date the eſtabliſhment of it from what happened in the Wilderneſs, ſome time after the people departed from Sinai (Numb. xi. 16.), in the year of the world 2514. Moſes, being diſcouraged by the continual murmurings of the Iſraelites, addreſſed himſelf to God, and deſired to be relieved, at leaſt, from ſome part of the burthen of the government. Then the Lord ſaid to him, "Gather unto me 70 men of the elders of Iſrael, whom thou knoweſt to be the elders of the people, and officers over them; and bring them unto the tabernacle of the congregation, that they may ſtand there with thee: And I will come down and talk with thee there; and I will take of the ſpirit which is upon thee, and will put it upon them; and they ſhall bear the burthen of the people with thee, that thou bear it not thyſelf alone." The Lord, therefore, poured out his ſpirit upon theſe men, who began at that time to propheſy, and have not ceaſed from that time. The ſanhedrim was compoſed of 70 counſellors, or rather 72, ſix out of each tribe; and Moſes, as preſident, made up the number 73. To prove the uninterrupted ſucceſſion of the judges of the ſanhedrim, there is nothing unattempted by the partiſans of this opinion. They find a proof where others cannot ſo much as perceive any appearance of a ſhadow of it. Grotius may be conſulted in many places of his Commentaries, and in his firſt book *De jure belli & pacis*, c. 3. art. 20. and *Selden de Synedriis veterum Hebræorum*. Alſo, Calmet's Diſſertation concerning the polity of the antient Hebrews, printed before his Comment upon the Book of Numbers.

As to the perſonal qualifications of the judges of this bench, their birth was to be untainted. They were often taken from the race of the prieſts or Levites, or out of the number of the inferior judges, or from the leſſer ſanhedrim, which conſiſted only of 23 judges.—They were to be ſkilful in the law, as well traditional as written. They were obliged to ſtudy magic, divination, fortune-telling, phyſic, aſtrology, arithmetic, and languages. The Jews ſay, they were to know to the number of 70 tongues; that is, they were to know all the tongues, for the Hebrews acknowledged but 70 in all, and perhaps this is too great a number. Eunuchs were excluded from the ſanhedrim, becauſe of their cruelty, uſurers, decrepid perſons, players at games of chance, ſuch as had any bodily deformities, thoſe that had brought up pigeons to decoy others to their pigeon-houſes, and thoſe that made a gain of their fruits in the ſabbatical year. Some alſo exclude the high-prieſt and the king, becauſe of their too great power; but others will have it, that the king always preſided in the ſanhedrim, while there were any kings in Iſrael.—Laſtly, it was required that the members of the ſanhedrim ſhould be of a mature age, a handſome perſon, and of conſiderable fortune. We ſpeak now according to the notions of the rabbins, without pretending to warrant their opinions.

The authority of the great ſanhedrim was vaſtly extenſive. This council decided ſuch cauſes as were brought before it by way of appeal from the inferior courts. The king, the high-prieſt, the prophets, were under its juriſdiction. If the king offended againſt the law—for example, if he married above 18 wives, if he kept too many horſes, if he hoarded up too much gold and ſilver, the ſanhedrim had him ſtripped and whipped in their preſence. But whipping they ſay among the Hebrews was not at all ignominious; and the king bore this correction by

way of penance, and himself made choice of the person that was to exercise this discipline over him. Also the general affairs of the nation were brought before the sanhedrim. The right of judging in capital cases belonged to this court, and this sentence could not be pronounced in any other place, but in the hall called *Lascbat haggazith*, or the *hall paved with stones*, supposed by some to be the Λιθόστρωτος, or *pavement*, mentioned in John xix. 13. From whence it came to pass, that the Jews were forced to quit this hall when the power of life and death was taken out of their hands, 40 years before the destruction of their temple, and three years before the death of Jesus Christ. In the time of Moses this council was held at the door of the tabernacle of the testimony. As soon as the people were in possession of the land of promise, the sanhedrim followed the tabernacle. It was kept successively at Gilgal, at Shiloh, at Kirjath-jearim, at Nob, at Gibeon in the house of Obed-edom; and lastly, it was settled at Jerusalem, till the Babylonish captivity. During the captivity it was kept up at Babylon. After the return from Babylon, it continued at Jerusalem to the time of the Sicarii, or Assassins. Then finding that these profligate wretches, whose number increased every day, sometimes escaped punishment by the favour of the president or judges, it was removed to Hanoth, which were certain abodes situated, as the rabbins tell us, upon the mountain of the temple. From thence they came down into the city of Jerusalem, withdrawing themselves by degrees from the temple. Afterwards they removed to Jamnia, thence to Jericho, to Uzzah, to Shepharvaim, to Bethsanim, to Sephoris, last of all to Tiberias, where they continued to the time of their utter extinction. And this is the account the Jews themselves give us of the sanhedrim.

But the learned do not agree with them in all this. Father Petau fixes the beginning of the sanhedrim not till Gabinius was governor of Judea, who, according to Josephus, erected tribunals in the five principal cities of Judea; at Jerusalem, at Gadara, at Amathus, at Jericho, and at Sephora or Sephoris, a city of Galilee. Grotius places the origin of the sanhedrim under Moses, as the rabbins do; but he makes it determine at the beginning of Herod's reign. Mr. Basnage at first thought that the sanhedrim began under Gabinius: but afterwards he places it under Judas Maccabæus, or under his brother Jonathan. We see indeed, under Jonathan Maccabæus, (1 Macc. xii. 6.), in the year 3860, that the senate with the high-priest sent an embassy to the Romans. The rabbins say that Alexander Janneus, king of the Jews, of the race of the Asmonæans, appeared before the sanhedrim, and claimed a right of sitting there, whether the senators would or not. Josephus informs us, that when Herod was but yet governor of Galilee, he was summoned before the senate, where he appeared. It must be therefore acknowledged, that the sanhedrim was in being before the reign of Herod. It was in being afterwards, as we find from the Gospel and from the Acts. Jesus Christ in St. Matthew (v. 22.) distinguishes two tribunals. —"Whosoever is angry with his brother without a cause shall be in danger of the judgment." This, they say, is the tribunal of the 23 judges. "And whosoever shall say to his brother Racha, shall be in danger of the council;" that is, of the great sanhedrim, which had the right of life and death, at least generally, and before this right was taken away by the Romans. Some think that the jurisdiction of the council of 23 extended to life and death also; but it is certain that the sanhedrim was superior to this council. See also Mark xiii. 9. xiv. 55. xv. 1.; Luke xxii. 52. 66.; John xi. 47.; Acts iv. 15. v. 21. where mention is made of the synedrion.

From all this it may be concluded, that the origin of the sanhedrim is by no means to be depended upon; for the council of the 70 elders established by Moses was not what the Hebrews understand by the name of sanhedrim. Besides, we cannot perceive that this establishment subsisted either under Joshua, the Judges, or the Kings. We find nothing of it after the captivity, till the time of Jonathan Maccabæus. The tribunals erected by Gabinius were still very different from the sanhedrim. This was the only one of its kind, and fixed at Jerusalem; whereas Gabinius established five at five different cities, which tribunals do not appear to be subordinate one to another. Lastly, it is certain that this senate was in being in the time of Jesus Christ, and when St. Matthew, Mark, Luke, and John, wrote their gospels, since they are mentioned in their writings; but the Jews inform us themselves that they had no longer then the power of life and death. (John xviii. 31.).

SANJACKS, a people inhabiting the Curdistan, or Persian mountains, subsisting chiefly by plunder, and the scanty pittance afforded by their own mountainous country. "They were much reduced (says Mr. Ives) by the late bashaw Achmet of Bagdad, who pursued them in person to their subterranean retreats, and destroyed many by the sword, and carried off great numbers of prisoners, who were sold for slaves." Notwithstanding this check, in the year 1758 they were again become so daring that they would attack caravans of 700 men. and sometimes carry all off. They are mostly professed worshippers of the devil. See ZAAVE.

SAN JUAN DE PUERTO RICO. The harbour is so spacious, that the largest ships may lie with great safety. On the west side of this city is the Castillo del Morro, a strong citadel, which commands and defends it, while the mouth of the harbour is protected by the El Convelo, a large and well fortified castle. In 1595 Sir Francis Drake burnt all the ships in the harbour; but finding it impossible to keep the place, without abandoning his other designs, he declined it. A few years after the earl of Cumberland reduced the island; but losing 400 or 500 men in a month, by a contagious disease, he was glad to depart. In 1615, the Dutch sent a strong fleet against it with little success: they only took and plundered the city, but were unable to reduce the castle with its forts.

SANICULA, SANICLE, or *Self-heal*, in botany: a genus of the digynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The umbels are close together, almost in a round head; the fruit is scabrous; the flowers of the disk abortive. There is but one species, viz. the *europæa*, found in many parts both of Scotland and England. This plant was long celebrated for its healing virtues both internally and externally; but it is now totally disregarded.

SANIDIUM. in natural history, the name of a genus of fossils of the class of the selenitæ, but neither of the rhomboidal nor columnar kinds, nor any other way distinguishable by its external figure; being made up of several plain flat plates.

SANIES, in medicine, a serous putrid matter, issuing from wounds. It differs from pus, which is thicker and whiter.

SANNAZARIUS (JAMES), in Latin *Actius Cincenis Sannazarius*, a celebrated Latin and Italian poet, born at Naples in 1458. He by his wit ingratiated himself into the favour of king Frederic; and, when that prince was dethroned, attended him into France, where he staid with him till his death, which happened in 1504. Sannazarius then returned into Italy, where he applied himself to polite literature, and particularly to Latin and Italian poetry. His gay and facetious humour made him sought for by all companies; but he was so afflicted at the news that Philibert prince of Orange, general of the emperor's army, had demolished his country-house, that it threw him into an illness, of which he died in 1530. It is said, that being informed a few days before his death, that the prince of Orange was killed in battle, he cried out, "I shall die contented, since Mars has

puniſhed this barbarous enemy of the Muſes." He wrote a great number of Italian and Latin poems: among thoſe in Latin, his *De partu Virginis*, and Eclogues, are chiefly eſteemed; and the moſt celebrated of his Italian pieces is his *Arcadia*.

SANSCULOTIDES, five days, ſo named in the French republican calendar. The origin and deſign of theſe is contained in the following report to the National Aſſembly: "Our anceſtors, the Gauls, (ſays the reporter) from the remoteſt antiquity, had conceived themſelves honoured by this denomination. Hiſtory informs us that a part of Gaul, afterwards called *Lyonoiſe*, the country of the Lyonois, was entitled *Gallia braccata*, *breeched Gaul*. Conſequently the reſt of Gaul, as far as the banks of the Rhine, was *Gallia non braccata*, *un-breeched Gaul*: our forefathers were therefore Sans-culottes. Whether the origin of the denomination be antient or modern, as liberty has rendered it illuſtrious, ſo ſhould it be dear to us: this is ſufficient to give it a ſolemn conſecration. We ſhall accordingly call the five days, collectively taken, the *Sanſculotides*. The five *Sanſculotide* days, compoſing a half-decade, are to be denominated *Primdi*, *Duodi*, *Tridi*, *Quartidi*, and *Quintidi*: and, in the biſſextile year, the fixth day *Sextidi*. On the following day the new year commences by *Primdi* the firſt of *Vendémiaire*."

SANTA CRUZ, an iſland in the Pacific Ocean, one of the moſt conſiderable of thoſe of Solomon, being 250 miles in circumference. W. lon. 130. 0. S. lat. 10. 21.

SANTA CRUZ, in Teneriff. See TENERIFF.

SANTA CRUZ, a town of Africa, on the coaſt of Barbary, and in the province of Suez and kingdom of Morocco, with a harbour and a fort. The Moors took it from the Portugueſe in 1536. It is ſeated at the extremity of Mount Atlas, on the Cape Aguer. W. lon. 9. 55. N. lat. 36. 30.

SANTA CRUZ *de la Sierra*, a town of South America, and capital of a province of that name in Peru, and in the audience of Los Charcas, with a biſhop's ſee. It is ſeated at the foot of a mountain, in a country abounding in good fruits, on the river Guapy. W. lon. 59. 35. S. lat. 20. 40.

SANTA *Fé de Bogata*, the capital of the new kingdom of Granada, in South America, with an archbiſhop's ſee and a univerſity. It is the ſeat of a new viceroyalty eſtabliſhed in the preſent century, the juriſdiction of which includes the whole of Terra Firma, and the audience of Quito in Peru. It is ſeated on the river Madalena, in a country abounding in corn and fruit, with mines of ſilver in the mountains, 360 miles ſouth of Carthagena. W. lon. 73. 5. N. lat. 3. 58.

SANTALUM, in botany: a genus of the monogynia order, belonging to the octandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The calyx is ſuperior; the corolla monopetalous; the ſtamina placed in the tube; the ſtigma is ſimple; the fruit a berry.

The ſantalum, or ſanders, grows to the ſize of a walnut-tree. Its leaves are entire, oval, and placed oppoſite to each other. Its flower is of one ſingle piece, charged with eight ſtamina, and ſupported upon the piſtil, which becomes an inſipid berry, reſembling in form that of the laurel. Its wood is white in the circumference, and yellow in the centre when the tree is old. This difference of colour conſtitutes two kinds of ſanders, both employed for the ſame purpoſes, and having equally a bitter taſte, and an aromatic ſmell. With the powder of this wood a paſte is prepared, with which the Chineſe, Indians, Perſians, Arabians, and Turks, anoint their bodies. It is likewiſe burnt in their houſes, and yields a fragrant and wholeſome ſmell. The greateſt quantity of this wood, to which a ſharp and attenuating virtue is aſcribed, remains in India. The red ſanders, though in leſs eſtimation, and leſs generally uſed, is ſent by preference into Europe. This is the produce of a different tree, which is common on the coaſt of Coromandel. Some travellers confound it with the wood of Caliatour, which is uſed in dyeing.

The *ſantalum album*, or white ſanders, is brought from the Eaſt Indies in billets about the thickneſs of a man's leg, of a pale whitiſh colour. It is that part of the yellow ſanders wood which lies next the bark. Great part of it, as met with in the ſhops, has no ſmell or taſte, nor any ſenſible quality that can recommend it to the notice of the phyſician.

The *ſantalum flavum*, or yellow ſanders, is the interior part of the wood of the ſame tree which furniſhes the former, is of a pale yellowiſh colour, of a pleaſant ſmell, and a bitteriſh aromatic taſte, accompanied with an agreeable kind of pungency. This elegant wood might undoubtedly be applied to valuable medical purpoſes, though at preſent very rarely uſed. Diſtilled with water, it yields a fragrant eſſential oil, which thickens in the cold into the conſiſtence of a balſam. Digeſted in pure ſpirit, it imparts a rich yellow tincture; which being committed to diſtillation, the ſpirit ariſes without bringing over any thing conſiderable of the flavour of the ſanders. The reſiduum contains the virtues of ſix times its weight of the wood. Hoffman looks upon this extract as a medicine of ſimilar virtues to ambergris; and recommends it as an excellent reſtorative in great debilities.

SANTAREN, a handſome town of Portugal in Eſtremadura, ſeated on a mountain near the river Tajo, in a country very fertile in wheat, wine, and oil. They get in their harveſt here two months after they have ſown their corn. It was taken from the Moors in 1447. W. lon. 7. 45. N. lat. 39. 12.

SANTEN, a town of Germany, in the circle of Weſtphalia, and in the duchy of Cleves. It has a handſome church belonging to the Roman Catholics, wherein is an image of the Virgin Mary, which they pretend performs a great many miracles. Here the fine walks begin that run as far as Weſel, from which it is five miles diſtant to the north-weſt. E. lon. 6. 33. N. lat. 51. 38.

SANTEUIL, or rather SANTEUL (JOHN BAPTIST DE), in Latin *Santolius Victorinus*, an excellent Latin poet, was born at Paris in 1630. Having finiſhed his ſtudies in Louis the Great's college, he applied himſelf entirely to poetry, and celebrated in his verſe the praiſes of ſeveral great men; by which he acquired univerſal applauſe. He enriched Paris with a great number of inſcriptions, which are to be ſeen on the public fountains, and the monuments conſecrated to poſterity. At length ſome new hymns being to be compoſed for the Breviary of Paris, Claude Santeuil his brother, and M. Boſſuet, perſuaded him to undertake that work; and he ſucceeded in it with the greateſt applauſe. On which the order of Clugny deſiring him to compoſe ſome for their Breviary, he complied with their requeſt; and that order, out of gratitude, granted him letters of filiation, with an annual penſion. Santeuil was careſſed by all the learned men of his time; and had for his admirers the two princes of Condé, the father and ſon, from whom he frequently received favours. Louis XIV. alſo gave him a proof of his eſteem, by beſtowing a penſion upon him. He attended the duke of Bourbon to Dijon, when that prince went thither in order to hold the ſtates of Burgundy; and died there in 1697, as he was preparing to return to Paris. Beſides his Latin hymns, he wrote a great number of Latin poems, which have all the fire and marks of genius diſcoverable in the works of great poets.

To Santeuil we are indebted for many fine church hymns, as above mentioned. Santeuil read the verſes he made for the inhabitants of heaven with all the agitations of a demoniac. Deſpreaux ſaid he was the devil whom God compelled to praiſe ſaints,

He was among the number of poets whoſe genius was as impetuous as his muſe was decent.

La Bruyere has painted the character of this ſingular and truly original poet in the moſt lively colours. "Image a man of great facility of temper, complaiſant and docile, in an inſtant violent, choleric, paſſionate, and capricious. A man ſimple, credulous, playful, volatile, puerile; in a word, a child in gray hairs: but let him collect himſelf, or rather call forth his interior genius, I venture to ſay, without his knowledge or privacy, what ſallies! what elevation! what images! what latinity! Do you ſpeak of one and the ſame perſon? you will aſk. Yes, of the ſame; of Theodas, and of him alone. He ſhrieks, he jumps, he rolls upon the ground, he roars, he ſtorms; and in the midſt of this tempeſt, a flame iſſues that ſhines, that rejoices. Without a figure, he rattles like a fool, and thinks like a wiſe man. He utters truths in a ridiculous way; and in an idiotic manner rational and ſenſible things. It is aſtoniſhing to find good ſenſe diſcloſe itſelf from the boſom of buffoonery, accompanied with grimaces and contortions. What ſhall I ſay more? He does and he ſays better than he knows. Theſe are like two ſouls that are unacquainted with each other, which have each their turn and ſeparate functions. A feature would be wanting in this extraordinary portrait, if I omitted ſaying, that he has at once an inſatiable thirſt for praiſe, ready to throw himſelf at the mercy of the critics, and at the bottom ſo docile as to profit by their cenſure. I begin to perſuade myſelf that I have been drawing the portraits of two different perſons: it would not be impoſſible to find a third in Theodas; for he is a good man, a pleaſant man, an excellent man."

This poet ought not to be confounded with *Claude de Santeuil*, his brother, a learned eccleſiaſtic, who alſo wrote ſeveral hymns in the Paris Breviary under the name of *Santolius Maglioranus*, a name given him from his having lived a long time in the ſeminary of St. Magliore at Paris, in quality of ſecular eccleſiaſtic. He was eſteemed not only for his poetical abilities, but alſo for his profound erudition and his exemplary piety. He died at Paris in 1684, aged 57. He wrote ſeveral other pieces of poetry, beſides his hymns, which are printed with his brother's works.

SANTILLANE, a ſea-port town of Spain, in the province of Aſturias, of which it is the capital. It is ſeated on the ſea-coaſt, 55 miles eaſt of Oviedo, and 200 north-weſt of Madrid. W. lon. 4. 33. N. lat. 43. 30.

SANTOLINA, LAVENDER-COTTON, in botany: a genus of the order of polygamia æqualis, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is paleaceous; there is no pappus; the calyx imbricated and hemiſpherical. The moſt remarkable ſpecies are, 1. The *chamæcypariſſus*, or common lavender-cotton, which has been long known in the Engliſh gardens; it was formerly titled *abrotanum fœmina*, or *female ſouthernwood*, and by the corruption of words was called *brotany* by the market-people: it grows naturally in Spain, Italy, and the warm parts of Europe. This has a ligneous ſtalk, dividing into many branches, garniſhed with ſlender hoary leaves, that are four ways indented, and have a rank, ſtrong odour when handled. The branches are terminated by a ſingle flower, compoſed of many hermaphrodite florets, which are fiſtular, cut into five parts at the top, of a ſulphur colour, and are included in one common ſcaly empalement, having no borders or rays. Theſe are ſucceeded by ſmall, oblong, ſtriated ſeeds, which are ſeparated by ſcaly chaff, and ripen in the empalement; the plants love a dry ſoil and a ſheltered ſituation. 2. The *villoſa*, with woolly leaves, has a ſhrubby ſtalk, which branches out like the former, but the plants ſeldom grow ſo tall. The branches are garniſhed very cloſely below with leaves ſhaped like thoſe of the other ſort, but ſhorter, thicker, and whiter; the flowers are much larger, and the brims of the florets are more reflexed; they are of a deeper ſulphur colour than the other. It grows naturally in Spain. 3. The *decumbens*, with linear leaves, is of lower ſtature than either of the former, ſeldom riſing more than 15 or 16 inches high. The branches ſpread horizontally near the ground, and are garniſhed with ſhorter leaves than either of the former, which are hoary and finely indented; the ſtalks are terminated by ſingle flowers, of a bright yellow colour, which are larger than thoſe of the firſt ſort. 4. The *virens*, with very long linear leaves, riſes higher than either of the former. The branches are more diffuſed; they are ſlender, ſmooth, and garniſhed with very narrow long leaves, which are of a deep green colour, but two ways indented; the ſtalks are ſlender, naked towards the top, and terminated by ſingle flowers of a gold colour. 5. The *roſmarinifolia*, with linear entire leaves, hath ſhrubby ſtalks, which riſe about three feet high, ſending out long ſlender branches, garniſhed with ſingle linear leaves of a pale-green colour. The ſtalks are terminated by large, ſingle, globular flowers, of a pale ſulphur colour. 6. The *minor*, with linear obtuſe leaves, is ſomewhat like the fifth; but the branches are ſhorter, thicker, and cloſer garniſhed with leaves, which come out in cluſters. The flower-ſtalks are ſparſedly diſpoſed, and have leaves to their top; the flowers are ſmall, and of a yellow colour. 7. The *chamæmelifolia*, with obtuſe woolly leaves, hath ſhrubby ſtalks, which riſe three feet high, garniſhed with broader leaves than either of the former, whoſe indentures are looſer, but double; they are hoary, and when bruiſed have an odour like chamomile. The leaves are placed pretty far aſunder, and the ſtalks are garniſhed with them to the top. The ſtalks are divided likewiſe at the top into two or three foot-ſtalks, each ſuſtaining one pretty large ſulphur-coloured flower.

All theſe plants may be cultivated ſo as to become ornaments to a garden, particularly in ſmall boſquets of ever-green ſhrubs, where, if they are artfully intermixed with other plants of the ſame growth, and placed in the front line, they will make an agreeable variety; eſpecially if care be taken to trim them twice in a ſummer, to keep them within bounds, otherwiſe their branches are apt to ſtraggle, and in wet weather to be borne down and diſplaced, which renders them unſightly; but when they are kept in order, their hoary and different-coloured leaves will have a pretty effect in ſuch plantations.—They may be propagated by planting ſlips or cuttings during the ſpring, in a border of light freſh earth, but muſt be watered and ſhaded in hot dry weather, until they have taken root; after which they will require no further care but to keep them clean from weeds till autumn, when they ſhould be tranſplanted where they are deſigned to remain: but if the ground is not ready by that time to receive them, it will be proper to let them remain in the border until ſpring; for, if they are tranſplanted late in autumn, they are liable to be deſtroyed by cold in winter.

SANTORINI, an iſland of the Archipelago, to the north of Candia, and to the ſouth-weſt of Nanphio. It is eight miles in length, and near as much in breadth, and almoſt covered with pumice-ſtone, whence the ſoil in general muſt be dry and barren; it is, however, greatly improved by the labour and induſtry of the inhabitants, who have turned it into a garden. It affords a great deal of barley, plenty of cotton, and large quantities of wine. Fruit is ſcarce except figs; and they have neither oil nor wood. The inhabitants are all Greeks, and are about 10,000 in number. Pyrgos is the capital town, and there are ſeveral little towns and villages. They have but one ſpring in the iſland, for which reaſon they preſerve the rain-water in ciſterns.

Though subject to the Turks, they choose their own magistrates. E. lon. 25. 5. N. lat. 39. 10.

SANZIO (Raphael). See Raphael.

SAO, a territory, called a kingdom, of Africa, on the gold-coast of Guinea, hardly two miles in length along the shore. It produces abundance of Indian corn, yams, potatoes, palm-wine, and oil. The inhabitants are very treacherous, and there is no dealing with them without a great deal of caution. It contains several villages, of which Sabo is the principal; and the Dutch have a fort here called *Nassau*.

SAONE, Upper, a department of France, including part of the late province of the Isle of France. It is named from a river, which rises in Mont Vosges, and falls into the Rhone at Lyons. The capital is Vesoul.

SAP, the juice found in vegetables. We observed, when treating of Plants, that it has been long disputed whether the sap of plants be analogous to the blood of animals, and circulates in the same manner. We also mentioned the conclusions that Dr. Hales drew from his numerous experiments, which were all in opposition to the doctrine that the sap circulates. As the subject is curious and interesting, and as additional light has been thrown upon it of late years, we wish to communicate it to our readers as fully as our limits will permit.

As the vegetable œconomy is still but imperfectly understood, and experiments made for tracing the motion of the sap may lead to important discoveries, we are happy to find, that of late years this subject has been again revived. Dr. Walker, professor of natural history in the university of Edinburgh, has published in the 1st volume of the Philosophical Transactions of Edinburgh an account of a course of very accurate and ingenious experiments, accompanied with observations and conclusions made with a caution which inspires confidence, and is indeed worthy of a disciple of Bacon. He is the first person, as far as we know, who thought of comparing the thermometer with the motion of the sap.

It is well known that in the spring vegetables contain a great quantity of sap; and there are some trees, as the birch and plane, which, if wounded, will discharge a great portion of it. Whence is this moisture derived? Whether is it imbibed from the atmosphere, or does it flow from the soil through the roots? These are the questions which require first to be answered; and Dr. Walker's experiments enable us to answer them with confidence.

He selected a vigorous young birch, 30 feet high, and 26 inches in circumference at the ground. He bored a hole just above the ground on the 1st of February, and cut one of its branches at the extremity. He repeated this every second day: but no moisture appeared at either of the places till the 5th of May, when a small quantity flowed on making an incision near the ground. He then cut 21 incisions in the trunk of the tree, on the north side, at the distance of a foot from one another, and reaching from the ground to the height of 20 feet. The incisions were solid triangles, each side being an inch long and an inch deep, and penetrating through the bark and wood. Dr. Walker visited the tree almost every day for two months, and marked exactly from which of the incisions the sap flowed. He observed that it flowed from the lowest incision first, and gradually ascended to the highest. The following table will show the progress of the sap upwards, and its correspondence with the thermometer.

The first column is the day of the month on which the observation was made; the second expresses the number of incisions from which the sap flowed on the day of the month opposite; and the third column the degree of the thermometer at noon. Some days are omitted in March, as the incisions, though made on the 5th, did not bleed till the 11th. Some days are also passed over in April, because no observation was made on account of rain.

March.	No. of In.	Ther. Noon.	March.	N. of In.	Ther. Noon.
5	—	46	30	8	50
11	2	49	31	7	62
12	2	49			
13	1	44	April 2	7	46
14	4	48	4	10	53
15	5	52	7	11	49
16	5	47	8	11	48
17	4	44	9	12	50
18	5	47	10	13	53
19	6	48	11	13	45
20	5	44	12	13	44
21	7	48	13	13	43
22	7	45	14	14	55
23	8	46	15	14	49
24	9	47	16	16	56
25	9	42	18	16	50
26	7	39	19	17	54
27	8	45	20	19	56
28	8	49	21	20	54
29	8	46	22	21	52

Dr. Walker found that the sap ascends through the wood, and still more copiously between the wood and the bark; but none could be perceived ascending through the pith or the bark. He found also, that when the thermometer at noon is about 49, or between 46 and 50, the sap rises about one foot in 24 hours; that when the thermometer is about 45 at noon, it ascends about one foot in two days; and that it does not ascend at all unless the mid-day heat be above 40. He observed that it moves with more velocity through young than through old branches. In one young branch it moved through seven feet in one day, the thermometer being at 49, while it moved in the trunk of the tree only seven feet in seven days. Dr. Walker has thus explained the reason why the buds on the extremities of branches unfold first: because they are placed on the youngest wood, to which the sap flows most abundantly.

The effects produced by the motion of the sap deserve to be attended to. In those parts to which it has mounted, the bark easily separates from the wood, and the ligneous circles may without difficulty be detached from one another. The buds begin to swell and their scales to separate, while those branches to which the sap has not ascended remain closely folded. When the sap has reached the extremities of the branches, and has thus pervaded the whole plant, it is soon covered with opening buds, and ceases to bleed. The bleeding ceases first in the upper parts of the tree, and in the lower parts successively downwards, and the wood becomes dry. An inverted branch flows more copiously when cut than those which are erect. This is a proof that the ascent of the sap is not occasioned by capillary attraction, for water which has risen in a small glass tube by this attraction will not descend when the tube is inverted.

It is evident that there is an intimate connection between heat and the ascent of the sap. It did not begin to flow till the thermometer stood at a certain point: when it fell below 40, it was arrested in its progress. The south side of the tree, when the sun was bright, bled more profusely than the north side; and at sunset the incisions at the top ceased to bleed, where it was exposed most to the cold air, while it still continued to flow from the incisions next to the ground; the ground retaining its heat longer than the air.

Sap, in sieges, is a trench, or an approach made under cover, of 10 or 12 feet broad, when the besiegers come near the place.

and the fire from the garrifon grows fo dangerous that they are not able to approach uncovered.—There are feveral forts of faps; the fingle, which has only a fingle parapet; the double, having one on each fide; and the flying, made with gabions, &c. In all faps traverfes are left to cover the men.

SAPINDUS, the SOAP-BERRY TREE, in botany: A genus of the digynia order, belonging to the octandria clafs of plants; and in the natural method ranking under the 23d order, *Tribilatæ*. The calyx is tetraphyllous; the petals four; the capfules are flefhy, connate, and ventricofe.

The fpecies are four, the faponaria, fpinofus, trifoliatus, and chinenfis. The faponaria, with winged leaves, grows naturally in the iflands of the Weft Indies, where it rifes with a woody ftalk from 20 to 30 feet high, fending out many branches garnifhed with winged leaves compofed of feveral pair of fpear-fhaped lobes. The midrib has a membranaceous or leafy border, running on each fide from one pair of lobes to the other, which is broadeft in the middle between the lobes; the flowers are produced in loofe fpikes at the end of the branches; they are fmall and white, fo make no great appearance. Thefe are fucceeded by oval berries as large as middling cherries, fometimes fingle, at others, two, three, or four are joined together; thefe have a faponaceous fkin or cover, which inclofes a very fmooth roundifh nut of the fame form, of a fhining black when ripe. The fkin or pulp which furrounds the nuts is ufed in America to wafh linen; but it is very apt to burn and deftroy it if often ufed, being of a very acrid nature.

Thefe plants are propagated by feeds; they muft be put into fmall pots, and plunged into a hot-bed of tanner's bark. In five or fix weeks the plants will appear, when the glaffes of the hot-bed fhould be raifed every day in warm weather, to admit frefh air to the plants. In three weeks or a month after the plants appear, they will be fit to be tranfplanted, when they muft be fhaken out of the pots, and carefully parted, fo as not to injure their roots, and each planted in a feparate fmall pot, and plunged into the hot-bed again, obferving to fhade them from the fun until they have taken new root; after which time they muft have free air admitted to them every day when the weather is warm, and will require to be frequently watered.

SAPONARIA, SOPEWORT, in botany: A genus of the digynia order, belonging to the decandria clafs of plants; and in the natural method ranking under the 22d order, *Caryophyllea*. The calyx is monophyllous and naked; there are five unguIated petals; the capfule is oblong and unilocular.

There are eight fpecies, the officinalis, vaccaria, cretica, porrigens, illyrica, ocymoides, orientalis, and lutea. The officinalis, which is a Britifh plant, has a creeping root, fo that in a fhort time it would fill a large fpace of ground. The ftalks are about two feet high, and of a purplifh colour. The footftalks of the flowers arife from the wings of the leaves oppofite; they fuftain four, five, or more purple flowers each; which have generally two fmall leaves placed under them. The ftalk is alfo terminated by a loofe bunch of flowers growing in form of an umbel; they have each a large fwelling cylindrical empalement, and five broad obtufe petals, which fpread open, of a purple colour. Thefe are fucceeded by oval capfules, with one cell filled with fmall feeds.—The decoction of this plant is ufed to cleanfe and fcour woollen cloths: the poor people in fome countries ufe it inftead of foap for wafhing; from which ufe it had its name.

SAPOR, TASTE. See TASTE.

SAPOTA, PLUM, in botany. See ACHRAS.

SAPPERS, are foldiers belonging to the royal artillery, whofe bufinefs it is to work at the faps, for which they have an extraordinary pay. A brigade of fappers generally confifts of eight men, divided equally into two parties; and whilft one of thefe parties is advancing the fap, the other is furnifhing the gabions, fafcines, and other neceffary implements. They relieve each other alternately.

SAPPHIRA, was the wife of a rich merchant in Gueldres, and equally diftinguifhed for her beauty and virtue. Rhinfauld, a German officer, and governor of the town of Gueldres, fell in love with her; and not being able to feduce her either by promifes or prefents, he imprifoned her hufband, pretending that he kept up a traitorous correfpondence with the enemies of the ftate. Sapphira yielded to the paffion of the governor, in order to relieve her hufband from chains; but private orders had already been given to put him to death. His unhappy widow, overwhelmed with grief, complained to Charles duke of Burgundy. He ordered Rhinfauld to marry her, after having made over to her all his poffeffions. As foon as the deed was figned, and the marriage over, Charles commanded him to be put to death. Thus the children of a wife whom he had feduced, and of a hufband whom he had murdered, became lawful heirs to all his wealth.

SAPPHIRE, a genus of precious ftones, of a blue colour, and the hardeft of all except the ruby and diamond. They are found in the fame countries with the ruby; alfo in Bohemia, Alface, Siberia, and Auvergne. M. Romé de l'Ifle mentions one found at Auvergne, which appeared quite green or blue according to the pofition in which it was viewed. Cronftedt, however, informs us, that the blue fluor fpars are frequently met with in collections under the name of *fapphires*; and it is certain from Pliny, b. 37. chap. 9. that the fapphire of the antients was our lapis lazuli. They are feldom found of a deep blue colour throughout, or free from parallel veins; and when they are but flightly tinged, they are named *white fapphires*. The late unfortunate king of France had one with a ftripe of fine yellow topaz in the middle. Some are found half green and half red, and are foliated like the ruby. The fine hard fapphires, called by the jewellers *oriental*, are of the fame nature with the ruby and topaz, excepting the mere circumftance of colour. They are commonly in two oblong hexagon pyramids, joined at their bafe, and pointed at top; fometimes alfo in hexagonal columns.

The fineft fapphires, like moft of the gems, come from the Eaft Indies. Ruffia does not produce the fapphire. In Scotland they are found of a hardnefs and luftre equal to the oriental, both light and deep coloured, at Benachie, and Invercauld, Aberdeenfhire; Portfoy in Banfffhire, and many other places. Mr. Deuchar, feal-engraver in Edinburgh, has in his poffeffion a beautiful fapphire, which was found in a double cryftal. On one of thefe is cut a head, which was effected with the greateft difficulty, on account of its hardnefs; the other is cut into facets, and has a fine water, and great brilliancy.

The fpecific gravity of thefe precious ftones, according to Bergman, is from 3,650 to 3,940. According to others, the fpecific gravity of the oriental fapphires is 3,994; that of the Brafilian 3,1307; and of thofe from Puy in Auvergne, 4,0769. When powdered, they are fufible with borax, or microcofmic falt, into a tranfparent glafs; and the fame thing happens on treating them with magnefia alba. They are faid to lofe their colour by fire, and to become fo hard and tranfparent as fometimes to pafs for diamonds; but Mr. Achard found this to be a miftake, and that the true fapphires are not in the leaft altered either in colour, hardnefs, or weight, by the moft intenfe fire. Thofe of Puy in Auvergne, however, though by their colour and hardnefs they feem to approach the oriental fapphires, lofe both their colour and tranfparency in the fire, becoming black, and even vitrifying; which plainly fhows them to be of a different kind. Engeftroom informs us, that the fapphires, in their rough or native ftate, generally cryftallize in two oblong hexa-

gonal pyramids pointed at top, and joined at their bafes, but are fometimes found of a hexagonal or columnar form.—A good fapphire of ten carats is valued at 50 guineas; if it weighs 20 carats, is valued at 200 guineas; and if under ten carats, its value may be found by multiplying the carat at 10s. 6d. by the fquare of its weight.—Sapphires are preferable to common rubies for jewelling watches, on account of the homogeneous hardnefs of their fubftance; fome red ftones refembling rubies being met with, which are not uniformly hard.

SAPPHO, a famous poetefs of antiquity, who for her excellence in her art has been called the *Tenth Mufe*, was born at Mitylene in the ifle of Lefbos, about 610 years before Chrift. She was contemporary with Stefichorus and Alcæus; which laft was her countryman, and, as fome think, her fuitor. A verfe of this poet, in which he infinuates to her his paffion, is preferved in Ariftotle, *Rhet. lib.* i. *cap.* 9. together with the fair damfel's anfwer.

M. la Fevre obferves that Sappho was not in her ufual good-humour when fhe gave fo cold an anfwer to a requeft, for which, at another time, perhaps, fhe would not have waited. It has been thought, too, that Anacreon was one of her lovers, and his editor Barnes has taken fome pains to prove it: but chronology will not admit this; fince, upon inquiry, it will be found that Sappho was probably dead before Anacreon was born. Of the numerous poems which this lady wrote, there is nothing remaining but fome fmall fragments, which the antient fcholiafts have cited; a hymn to Venus, preferved by Dionyfius of Halicarnaffus; and an ode to one of her miftreffes: which laft piece confirms a tradition delivered down from antiquity, that her amorous paffion extended even to perfons of her own fex, and that fhe was willing to have her miftreffes as well as her gallants.

Ovid introduces her making a facrifice to Phaon, one of her male paramours; from which we learn that Sappho's love for her own fex did not keep her from loving ours. She fell defperately in love with Phaon, and did all fhe could to win him; but in vain: upon which fhe threw herfelf headlong from a rock, and died. It is faid that Sappho could not forbear following Phaon into Sicily, whither he retired that he might not fee her; and that during her ftay in that ifland fhe probably compofed the hymn to Venus, ftill extant, in which fhe begs fo ardently the affiftance of that goddefs. Her prayers, however, proved ineffectual: Phaon was cruel to the laft degree. The unfortunate Sappho was forced to take the dreadful leap; fhe went to the promontory Leucas, and threw herfelf into the fea. The cruelty of Phaon will not furprife us fo much, if we reflect that fhe was a widow (for fhe had been married to a rich man in the ifle of Andros, by whom fhe had a daughter, named *Cleis*); that fhe had never been handfome; that fhe had obferved no meafure in her paffion to both fexes; and that Phaon had long known all her charms. She was, however, a very great wit, and for that alone deferves to be remembered. The Mitylenians held her merit in fuch high efteem, that they paid her fovereign honours after her death, and ftamped their money with her image. The Romans afterwards erected a noble ftatue of porphyry to her; and in fhort, antients as well as moderns have done honour to her memory. Voffius fays that none of the Greek poets excelled Sappho for fweetnefs of verfe; and that fhe made Archilochus the model of her ftyle, but at the fame time took care to foften the feverity of his expreffion. It muft be granted, fays Rapin, from what is left us of Sappho, that Longinus had great reafon to extol the admirable genius of this woman; for there is in what remains of her fomething delicate, harmonious, and impaffioned to the laft degree.

SARABAND, a mufical compofition in the triple time, the motions of which are flow and ferious. Saraband is alfo a dance to the fame meafure, which ufually terminates when the hand that beats the time falls; and is otherwife much the fame as the minuet. The faraband is faid to be originally derived from the Saracens, and is ufually danced to the found of the guitar or caftanettes.

SARACA, in botany; a genus of the hexandria order, belonging to the diadelphia clafs of plants.—There is no calyx: the corolla is funnel-fhaped and quadrifid; the filaments are on each fide the throat of the corolla; the legumen is pedicellated.

SARACENS, the inhabitants of Arabia; fo called from the word *fara*, which fignifies a defert, as the greateft part of Arabia is; and this being the country of Mahomet, his difciples were called Saracens.

SARAGOSSA, a city of Spain, in the kingdom of Arragon, with an archbifhop's fee, an univerfity, and a court of inquifition. It is faid to have been built by the Phœnicians; and the Romans fent a colony here in the reign of the emperor Auguftus, whence it had the name of *Cæfar Auguftus*, which by corruption has been changed into Saragoffa. It is a large, handfome, and well-built town. The ftreets are long, broad, well-paved, and very clean, and the houfes from three to fix ftories high. It is adorned with many magnificent buildings; and they reckon 17 large churches, and 14 handfome monafteries, not to mention others lefs confiderable. The river Ebro runs crofs the place, dividing it into two; and on its banks is a handfome quay, which ferves for a public walk. The Holy-ftreet is the largeft, and fo broad that it may be taken for a fquare; and here they have their bull-fights: in this ftreet there are feveral noblemen's families, particularly that of the viceroy. The convents are handfome and richly adorned, as well as the churches. The cathedral church is a fpacious building, after the Gothic tafte; but the fineft church is that of Nueftra Signora del Pilar, feated on the fide of the Ebro, and is a place of the greateft devotion in Spain. They tell us the Virgin appeared to St. James, who was preaching the gofpel, and left him her image, with a handfome pillar of jafper: it is ftill in this church, which they pretend is the firft in the world built to her honour. This image ftands on a marble pillar, with a little Jefus in her arms; but the place is fo dark, that it cannot be feen without the affiftance of lamps, which are 50 in number, and all of filver. There are alfo chandeliers and baluftrades of maffy filver. The ornaments of this image are the richeft that can be imagined, her crown being full of precious ftones of an ineftimable price; in fhort, there is fcarce any thing to be feen but gold and jewels, and a vaft number of people come in pilgrimage hither. The town-houfe is a fumptuous ftructure, adorned with fine columns: in the hall are the pictures of all the kings of Arragon; and in a corner of it St. George on horfeback, with a dragon of white marble under him. It is feated in a very large plain, where the Ebro receives two other rivers; and over it are two bridges, one of ftone and the other of wood, which laft has been thought the moft beautiful in Europe. A victory was obtained here over the French and Spaniards in 1710, but it was abandoned by the allies foon after. It is 97 miles weft by north of Tarragona, 137 weft of Barcelona, and 150 north-eaft of Madrid. W. lon. 0. 48. N. lat. 41. 47.

SARANNE. See Lilium.

SARCASM, in rhetoric, a keen bitter expreffion which has the true point of fatire, by which the orator fcoffs and infults his enemy; fuch as that of the Jews to our Saviour: "He faved others, himfelf he cannot fave."

SARCOCELE, in furgery, a fpurious rupture or hernia, wherein the tefticle is confiderably tumefied or indurated, like a fcirrhus, or much enlarged by a flefhy excrefcence, which is frequently attended with acute pains, fo as to degenerate at laft into a cancerous difpofition. See Surgery.

SARCOCOLLA, a concrete juice brought from Perfia and Arabia, in fmall whitifh-yellow grains, with a few of a reddifh and fometimes of a deep red colour mixed with them; the whiteft

tears are preferred, as being the freſheſt : its taſte is bitter, accompanied with a dull kind of ſweetneſs. This drug diſſolves in watery liquors, and appears chiefly to be of the gummy kind; with a ſmall admixture of reſinous matter. It is principally celebrated for conglutinating wounds and ulcers (whence its name *σαρκοκολλα fleſh-glue)*; a quality which neither this nor any other drug has any juſt title to.

SARCOLOGY, is that part of anatomy which treats of the ſoft parts, *viz.* the muſcles, inteſtines, arteries, veins, nerves, and fat.

SARCOMA, in ſurgery, denotes any fleſhy excreſcence.

SARCOPHAGUS, in antiquity, a ſort of ſtone coffin or grave, wherein the antients laid thoſe they had not a mind to burn. The word, as derived from the Greek, literally ſignifies *fleſh eater*; becauſe at firſt they uſed a ſort of ſtone for the making of tombs, which quickly conſumed the bodies. See the following article.

Sarcophagus, or *Lapis Aſſius*, in the natural hiſtory of the antients, a ſtone much uſed among the Greeks in their ſepultures, is recorded to have always perfectly conſumed the fleſh of human bodies buried in it in forty days. This property it was much famed for, and all the antient naturaliſts mention it. There was another very ſingular quality alſo in it, but whether in all, or only in ſome peculiar pieces of it, is not known: that is, its turning into ſtone any thing that was put into veſſels made of it. This is recorded only by Mutianus and Theophraſtus, except that Pliny had copied it from theſe authors, and ſome of the later writers on theſe ſubjects from him. The account Mutianus gives of it is, that it converted into ſtone the ſhoes of perſons buried in it, as alſo the utenſils which it was in ſome places cuſtomary to bury with the dead, particularly thoſe which the perſon while living moſt delighted in. The utenſils this author mentions, are ſuch as muſt have been made of very different materials; and hence it appears that this ſtone had a power of conſuming not only fleſh, but that its petrifying quality extended to ſubſtances of very different kinds. Whether ever it really poſſeſſed this laſt quality has been much doubted; and many, from the ſeeming improbability of it, have been afraid to record it. What has much encouraged the general diſbelief of it is, Mutianus's account of its taking place on ſubſtances of very different kinds and textures; but this is no real objection, and the whole account has probably truth in it. Petrifactions in thoſe early days might not be diſtinguiſhed from incruſtations of ſparry and ſtony matter on the ſurfaces of bodies only, as we find they are not with the generality of the world even to this day; the incruſtations of ſpar on moſſes and other ſubſtances in ſome of our ſprings being at this time called by many *petrified moſs*, &c. and incruſtations like theſe might eaſily be formed on ſubſtances incloſed in veſſels made of this ſtone, by water paſſing through its pores, diſlodging from the common maſs of the ſtone, and carrying with it particles of ſuch ſpar as it contained; and afterwards falling in repeated drops on whatever lay in its way, it might again depoſit them on ſuch ſubſtances in form of incruſtations. By this means, things made of ever ſo different matter, which happened to be incloſed, and in the way of the paſſage of the water, would be equally incruſted with and in appearance turned into ſtone, without regard to the different configuration of their pores and parts.

The place from whence the antients tell us they had this ſtone was Aſſos, a city of Lycia, in the neighbourhood of which it was dug; and De Boot informs us, that in that country, and in ſome parts of the Eaſt, there are alſo ſtones of this kind, which, if tied to the bodies of living perſons, would in the ſame manner conſume their fleſh. *Hill's Notes on Theophraſtus*, p. 14.

SARCOTICS, in ſurgery, medicines which are ſuppoſed to generate fleſh in wounds.

SARDANAPALUS, the laſt king of Aſſyria, whoſe character is one of the moſt infamous in hiſtory. He is ſaid to have ſunk ſo far in depravity, that, as far as he could, he changed his very ſex and nature. He clothed himſelf as a woman, and ſpun amidſt companies of his concubines. He painted his face, and behaved in a more lewd manner than the moſt laſcivious harlot. In ſhort, he buried himſelf in the moſt unbounded ſenſuality, quite regardleſs of ſex and the dictates of nature. Having grown odious to all his ſubjects, a rebellion was formed againſt him by Arbaces the Mede, and Beleſis the Babylonian. They were attended, however, with very bad ſucceſs at firſt, being defeated with great ſlaughter in three pitched battles. With great difficulty Beleſis prevailed upon his men to keep the field only five days longer; when they were joined by the Bactrians, who had come to the aſſiſtance of Sardanapalus, but had been prevailed upon to renounce their allegiance to him. With this reinforcement they twice defeated the troops of Sardanapalus, who ſhut himſelf up in Nineveh, the capital of his empire. The city held out for three years; at the end of which, Sardanapalus finding himſelf unable to hold out any longer, and dreading to fall into the hands of an enraged enemy, retired into his palace, in a court of which he cauſed a vaſt pile of wood to be raiſed; and heaping upon it all his gold and ſilver, and royal apparel, and at the ſame time incloſing his eunuchs and concubines in an apartment within the pile, he ſet fire to it, and ſo deſtroyed himſelf and all together.

SARDINIA, an iſland of the Mediterranean, 142 miles from north to ſouth, and 80 from eaſt to weſt. The ſoil is fertile in corn, wine, oranges, citrons and olives. On the coaſt is a fiſhery for anchovies and coral, of which large quantities are ſent to Genoa and Leghorn. Beeves and ſheep are numerous, as well as horſes, which are good for labour and the road. They are fed in the little iſlands about it which abound in game; and in that of Aſnaria are a great number of turtles. The air is very unhealthy, from the marſhy land. Here are mines of ſilver, lead, ſulphur, and alum; and they make a good deal of ſalt. This iſland has undergone various revolutions: in 1708 it was taken by the Engliſh for the emperor Charles VI; and in 1720 ceded to the duke of Savoy, as an equivalent for that of Sicily. It was then erected into a kingdom; but his Sardinian majeſty keeps his court at Turin, the capital of his Piedmonteſe territories. He has a viceroy at Cagliari, the capital of this iſland.

SARDIS, or Sardes, now called *Sardo* or *Sart*, is an antient town of Natolia in Aſia, about 40 miles eaſt of Smyrna. It was much celebrated in early antiquity, was enriched by the fertility of the ſoil, and had been the capital of the Lydian kings. It was ſeated on the ſide of mount Tmolus; and the citadel, placed on a lofty hill, was remarkable for its great ſtrength. It was the ſeat of king Crœſus, and was in his time taken by Cyrus; after which the Perſian ſatrap or commandant reſided at Sardis as the emperor did at Suſa. The city was alſo taken, burnt, and then evacuated by the Mileſians in the time of Darius, and the city and fortreſs ſurrendered on the approach of Alexander after the battle of Granicus. Under the Romans Sardis was a very conſiderable place till the time of Tiberius Cæſar, when it ſuffered prodigiouſly by an earthquake. The munificence of the emperor, however, was nobly exerted to repair the various damages it then ſuſtained. Julian attempted to reſtore the heathen worſhip in the place. He erected temporary altars where none had been left, and repaired the temples if any veſtiges remained. In the year 400 it was plundered by the Goths, and it ſuffered conſiderably in the ſubſequent troubles of Aſia. On the incurſion of the Tartars in 1304, the Turks were permitted to occupy a portion of the citadel, ſeparated by a ſtrong wall with a gate, and were afterwards murdered in their ſleep. The ſite of this once noble city is now

green and flowery, the whole being reduced to a poor village, containing nothing but wretched huts. There are, however, some curious remains of antiquity about it, and some ruins which display its antient grandeur. See *Chandler's Travels in Asia Minor*, p. 251, &c. There is in the place a large caravansary, where travellers may commodiously lodge. The inhabitants are generally shepherds, who lead their sheep into the fine pastures of the neighbouring plain. The Turks have a mosque here, which was a Christian church, at the gate of which there are several columns of polished marble. There are a few Christians, who are employed in gardening. E. lon. 28. 5. N. lat. 37. 51.

SARDONIUS RISUS, *Sardonian Laughter*. A convulsive involuntary laughter; thus named from the herba sardonia, which is a species of ranunculus, and is said to produce such convulsive motions in the cheeks as resemble those motions which are observed in the face during a fit of laughter. This complaint is sometimes speedily fatal. If the ranunculus happens to be the cause, the cure must be attempted by means of a vomit, and frequent draughts of hydromel with milk.

SARDONYX, a precious stone consisting of a mixture of the chalcedony and carnelian, sometimes in strata, but at other times blended together. It is found, 1. Striped with white and red strata, which may be cut in *cameo* as well as the onyx. 2. White with red dendritical figures, greatly resembling the mocha-stone; but with this difference, that the figures in the sardonyx are of a red colour, in the other black. There is no real difference, excepting in the circumstance of hardness, between the onyx, carnelian, chalcedony, sardonyx, and agate, notwithstanding the different names bestowed upon them. Mongez informs us, that the yellow, or orange-coloured agates, with a wavy or undulating surface, are now commonly called sardonyx. See CARNELIAN and ONYX.

SARGUS, in ichthyology. See SPARUS.

SARIMPATAM, a country of Indostan, lying at the back of the dominions of the Samorin of Malabar, and which, as far as we know, was never subdued by any foreign power. Mr. Grose relates, that "it has been constantly a maxim with the inhabitants of this country never to make any but a defensive war; and even then, not to kill any of their adversaries in battle, but to cut off their noses. To this service the military were peculiarly trained up, and the dread of the deformity proved sufficiently strong to keep their neighbours, not much more martial than themselves, from effectually attacking them."

SARMENTOSÆ (from *sarmentum*, a long shoot like that of a vine); the name of the 11th class in Linnæus's Fragments of a Natural Method, consisting of plants which have climbing stems and branches, that, like the vine, attach themselves to the bodies in their neighbourhood for the purpose of support. See BOTANY.

SAROTHRA, in botany: A genus of the trigynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 20th order, *Rotaceæ*. The corolla is pentapetalous; the capsule unilocular, trivalved, and coloured.

SARPLAR *of* WOOL, a quantity of wool, otherwise called a *pocket* or *half-sack*; a sack containing 80 tod; a tod two stone; and a stone 14 pounds.—In Scotland it is called *sarpliath*, and contains 80 stone.

SARRACONIA, in botany: A genus of the monogynia order, belonging to the polyandria class of plants; and in the natural method ranking under the 54th order, *Miscellaneæ*. The corolla is pentapetalous; the calyx is double, and triphyllous below; pentaphyllous above; the capsule quinquelocular; the style has a stigma of the form of a shield.

SARSAPARILLA, in botany. See SMILAX.

SARTORIUS, in ANATOMY. See ANATOMY, *Table of the Muscles*.

SARUM, OLD, an antient borough in Wilts, which, though now reduced to a single farm-house, sends two members to parliament. It once covered the summit of a steep hill, and was strongly fortified; but nothing is to be seen except the ruins and traces of the walls. It is a little to the north of Salisbury. W. lon. 1. 42. N. lat. 51. 7.

SASAFRAS. See LAURUS.

SASHES, in military dress, are badges of distinction worn by the officers of most nations, either round their waist or over their shoulders. Those for the British army are made of crimson silk: for the imperial army, crimson and gold; for the Prussian army, black silk and silver; the Hanoverians, yellow silk; the Portuguese, crimson silk with blue tassels.

SASINE, or SEISIN. See LAW.

SASSA. See MYRRH, OPOCALPASUM, and *Bruce's Travels*, vol. v. p. 27, &c.

SATAN, a name very common in Scripture, means the devil, or chief of the fallen angels. See DEVIL.

SATELLITE, in astronomy, the same with a secondary planet or moon.

SATIRE. See SATYR.

SATRAPA, or SATRAPES, in Persian antiquity, denotes an admiral; but more commonly the governor of a province.

SATTIN, a glossy kind of silk stuff, the warp of which is very fine, and stands so as to cover the coarser woof.

SATTINET, a slight thin kind of sattin, commonly striped, and ordinarily used by the ladies for summer night-gowns.

SATURANTS, in anatomy, the same with ABSORBENTS.

SATURATION, in chemistry, is the impregnating an acid with an alkali, or *vice versa*, till either will receive no more, and the mixture will then become neutral.

SATURDAY, the seventh and last day of the week, so called from the idol Seater, worshipped on this day by the antient Saxons, and thought to be the same as the Saturn of the Latins.

SATUREIA, SAVORY, in botany: A genus of the gymnospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 42d order, *Verticillatæ*. The segments of the corolla are nearly equal; the stamina standing asunder. The *Species* are, 1. The *hortensis*, or summer savory, is an annual plant, which grows naturally in the south of France and Italy, but is cultivated in this country both for the kitchen and medicinal use. 2. The *montana*, or winter savory, is a perennial plant, growing naturally in the south of France and Italy, but is cultivated in gardens both for culinary and medicinal purposes. Both kinds are propagated by seeds. Those of the first kind should be sown in the beginning of April upon a bed of light earth, either where they are to remain, or for transplanting. If the plants are to stand unremoved they should be sown thinly; but if they are to be transplanted, they may be sown closer. The second species may be sown upon a poor dry soil, where the plants will endure the severest winters, though they are often killed by the frost when planted in good ground. The plants will continue several years; but when they are old, the shoots will be short, and not so well furnished with leaves: it will therefore be proper to raise a supply of young plants every year. Summer savory is a very warm pungent aromatic; and affords in distillation with water a subtile essential oil, of a penetrating smell, and very hot acrid taste. It yields little of its virtues by infusion to aqueous liquors; rectified spirit extracts the whole of its taste and smell, and elevates nothing in distillation.

SATURN, in astronomy, one of the planets of our solar system, revolving at the distance of more than 900 millions of miles from the sun. See ASTRONOMY. Dr. Herschel, who has so much

ſignalized himſelf by his diſcoveries in the celeſtial regions, has not omitted to make his obſervations on this planet, which he conſiders as one of the moſt engaging objects that aſtronomy offers to our view. His attention was firſt drawn to it in the year 1774, when he ſaw its ring, reſembling in appearance a narrow line, extending on both ſides not much leſs than the diameter of the planet's diſk. The obſervation was taken with a five and a half feet reflector on the 17th of March, and on the 3d of April, the ſame year; when the planet appeared totally deprived of this noble appendage, by reaſon of the edge of the ring being then turned directly towards the earth, and inviſible on account of its thinneſs, or incapacity to reflect the light to ſuch a diſtance. During the ſucceeding year, the ring appeared gradually opened, and at laſt aſſumed the ſhape of an ellipſe. "It ſhould be noticed (ſays he), that the black diſk or belt upon the ring of Saturn is not in the middle of its breadth. Nor is the ring ſubdivided by many ſuch lines, as has been repreſented in ſeveral treatiſes of aſtronomy; but that there is one ſingle, dark, conſiderably broad line. belt, or zone, upon the ring, which I have always permanently found in the place where my figure repreſents it."

This zone, which is on the northern part of the ring, does not change its ſhape or colour like the belts of Jupiter, ſo that it is probably owing to ſome permanent projection. It cannot, however, be the ſhadow of a chain of mountains, as it is viſible all round the ring; and there could be no ſhades viſible at the ends of the anſæ, on account of the direction of the ſun's illumination, which would be in the line of the chain; and the ſuppoſed argument will hold good againſt the ſuppoſition of caverns or concavities. It is likewiſe evident, that this dark zone is contained between two concentric circles, as all the phenomena anſwer to the projection of ſuch a zone. The doctor gives a figure, repreſenting the planet as it appeared to him on the 10th of May 1780; whence we ſee that the zone is continued all the way round, with a gradual decreaſe towards the middle, anſwering to the appearance of a narrow circular plane projected into an ellipſis. See Philoſoph. Tranſ. for 1790, p. 3, &c.

Saturn, in chemiſtry, an appellation given to lead.

Saturn, in heraldry, denotes the black colour in blazoning the arms of ſovereign princes.

Saturn, one of the principal of the Pagan deities, was the ſon of Cœlus and Terra, and the father of Jupiter. He depoſed and caſtrated his father; and obliged his brother Titan to reſign his crown to him, on condition of his bringing up none of his male iſſue, that the ſucceſſion might at length devolve on him. For this purpoſe he devoured all the ſons he had by his wife Rhea or Cybele: but ſhe bringing forth at one time Jupiter and Juno, ſhe preſented the latter to her huſband, and ſent the boy to be nurſed on mount Ida; when Saturn being informed of her having a ſon, demanded the child; but in his ſtead his wife gave him a ſtone ſwaddled up like an infant, which he inſtantly ſwallowed. Titan finding that Saturn had violated the contract he had made with him, put himſelf at the head of his children, and made war on his brother, and, having made him and Cybele priſoners, confined them in Tartarus: but Jupiter being in the mean time grown up, raiſed an army in Crete, went to his father's aſſiſtance, defeated Titan, and reſtored Saturn to the throne. Some time after, Saturn, being told that Jupiter intended to dethrone him, endeavoured to prevent it; but the latter, being informed of his intention, depoſed his father, and threw him into Tartarus. But Saturn eſcaping from thence, fled into Italy, where he was kindly received by Janus king of the country, who aſſociated him to the government: whence Italy obtained the name of *Saturnia Tellus*; as alſo that of *Latium*, from *lateo*, "to lie hid." There Saturn, by the wiſdom and mildneſs of his government, is ſaid to have produced the golden age.

Saturn is repreſented as an old man with four wings, armed with a ſcythe; ſometimes he is delineated under the figure of a ſerpent with its tail in its mouth. This is emblematic of the ſeaſons, which roll perpetually in the ſame circle. Sometimes alſo Saturn is painted with a ſand glaſs in his hand. The Greeks ſay, that the ſtory of his mutilating his father and deſtroying his children is an allegory, which ſignifies, that Time devours the paſt and preſent, and will alſo devour the future. The Romans in honour of him built a temple, and celebrated a feſtival, which they called *Saturnalia*. During this feſtival no buſineſs or profeſſion was allowed to be carried on except cookery; all diſtinctions of rank ceaſed; ſlaves could ſay what they pleaſed to their maſters with impunity; they could even rally them with their faults before their faces.

SATURNALIA, in Roman antiquity, a feſtival obſerved about the middle of December, in honour of the god Saturn, whom Lucan introduces giving an account of the ceremonies obſerved on this occaſion, thus. "During my whole reign, which laſts but for one week, no public buſineſs is done; there is nothing but drinking, ſinging, playing, creating imaginary kings, placing ſervants with their maſters at table, &c. There ſhall be no diſputes, reproaches, &c. but the rich and poor, maſters and ſlaves, ſhall be equal," &c. On this feſtival the Romans ſacrificed bare-headed, contrary to their cuſtom at other ſacrifices.

SATURNINE, an appellation given to perſons of a melancholy diſpoſition, as being ſuppoſed under the influence of the planet Saturn.

SATURNITE, a name given by Mr. Kirwan to a new metallic ſubſtance, ſuppoſed to be diſcovered by M. Monnet. It was met with in ſome lead founderies at a place named *Poulla ouen* in Brittany; being ſeparated from the lead ore during its torrefaction. It reſembles lead in colour, weight, ſolubility in acids, and other properties, but differs from it in being more fuſible, brittle, eaſily ſcorified and volatilized, and likewiſe not being miſcible with lead in fuſion. Meſſieurs Haſſenfratz and Girond contended, that this ſaturnite was nothing but a compound of different ſubſtances, and accordingly gave an analyſis of it as conſiſting of lead, copper, iron, ſilver, and ſulphur; the proportions of which muſt naturally vary according to the quality of the ore put into the furnace. M. Monnet, however, inſiſted that the ſubſtance analyſed by them was not that which he had diſcovered; but when he again viſited the mines above mentioned, he could meet with none of the ſubſtance there which he found before.

SATYAVARTA, or Menue, in Indian mythology, is believed by the Hindoos to have reigned over the whole world in the earlieſt age of their chronology, and to have reſided in the country of Dravira on the coaſt of the eaſtern Indian peninſula. His patronymic name was *Vaivaſwata*, or *child of the ſun*. In the *Bhagavat* we are informed, that the Lord of the Univerſe, intending to preſerve him from the ſea of deſtruction, cauſed by the depravity of the age, thus told him how he was to act. "In ſeven days from the preſent time, O thou tamer of enemies, the three worlds will be plunged in an ocean of death; but, in the midſt of the deſtroying waves, a large veſſel, ſent by me for thy uſe, ſhall ſtand before thee. Then ſhalt thou take all medicinal herbs, all the variety of ſeeds; and accompanied by ſeven ſaints, encircled by pairs of all brute animals, thou ſhalt enter the ſpacious ark, and continue in it, ſecure from the flood, on one immenſe ocean, without light, except the radiance of thy holy companions. When the ſhip ſhall be agitated by an impetuous wind, thou ſhalt faſten it with a large ſea ſerpent on my horn; for I will be near thee: drawing the veſſel, with thee and thy attendants, I will remain on the ocean, O chief of men, until a night of Brahma ſhall be completely ended. Thou ſhalt then

know my true greatneſs, rightly named the ſupreme Godhead; by my favour, all thy queſtions ſhall be anſwered, and thy mind abundantly inſtructed." All this is ſaid to have been accompliſhed; and the ſtory is evidently that of Noah diſguiſed by Aſiatic fiction and allegory. It proves, as Sir William Jones has rightly obſerved, an antient Indian tradition of the univerſal deluge deſcribed by Moſes; and enables us to trace the connection between the eaſtern and weſtern traditions relating to that event. The ſame learned author has ſhown it to be in the higheſt degree probable, that the *Satyavrata* of India is the *Cronus* of Greece and the *Saturn* of Italy. See SATURN; and *Aſiatic Reſearches*, vol. i. p. 230, &c.

SATYR, or SATIRE, in matters of literature, a diſcourſe or poem, expoſing the vices and follies of mankind. See POETRY. The chief ſatiriſts among the antients are, Horace, Juvenal, and Perſius: thoſe among the moderns are, Regnier and Boileau, in French; Butler, Dryden, Rocheſter, Buckingham, Swift, Pope, Young, &c. among the Engliſh; and Cervantes among the Spaniards.

SATYRIASIS, in medicine, the ſame as FUROR UTERINUS; an hyſterical diſeaſe to which young and laſcivious females are ſaid to be ſubject.

SATYRIUM, in botany: A genus of the diandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the 42d order, *Verticillatæ*. The nectarium is ſcrotiform, or inflated double behind the flower.

SATYRS (in antient mythology), a ſpecies of demi-gods who dwelt in the woods. They are repreſented as monſters, half men and half goats; having horns on their heads, a hairy body, with the feet and tail of a goat. They are generally in the train that follows Bacchus. As the poets ſuppoſed that they were remarkable for piercing eyes and keen raillery, they have placed them in the ſame pictures with the Graces, Loves, and even with Venus herſelf.

SAVAGE (RICHARD), one of the moſt remarkable characters that is to be met with, perhaps, in all the records of biography, was the ſon of Anne counteſs of Macclesfield by the earl of Rivers, according to her own confeſſion; and was born in 1698. This confeſſion of adultery was made in order to procure a ſeparation from her huſband the earl of Macclesfield: yet, having obtained this deſired end, no ſooner was her ſpurious offspring brought into the world, than, without the dread of ſhame or poverty to excuſe her, ſhe diſcovered the reſolution of diſowning him; and, as long as he lived, treated him with the moſt unnatural cruelty. She delivered him over to a poor woman to educate as her own; prevented the earl of Rivers from leaving him a legacy of 6000l. by declaring him dead; and in effect deprived him of another legacy which his godmother Mrs. Lloyd had left him, by concealing from him his birth, and thereby rendering it impoſſible for him to proſecute his claim. She endeavoured to ſend him ſecretly to the plantations; but this plan being either laid aſide or fruſtrated, ſhe placed him apprentice with a ſhoemaker. In this ſituation, however, he did not long continue; for, his nurſe dying, he went to take care of the effects of his ſuppoſed mother; and found in her boxes ſome letters which diſcovered to young Savage his birth, and likewiſe the cauſe of its concealment.

From the moment of this diſcovery it was natural for him to become diſſatisfied with his ſituation as a ſhoemaker. He now conceived that he had a right to ſhare in the affluence of his real mother; and therefore he directly, and perhaps indiſcreetly, applied to her, and made uſe of every art to awaken her tenderneſs and attract her regard. But in vain did he ſolicit this unnatural parent: ſhe avoided him with the utmoſt precaution, and took meaſures to prevent his ever entering her houſe on any pretence whatever.

Savage was at this time ſo touched with the diſcovery of his birth, that he frequently made it his practice to walk before his mother's door in hopes of ſeeing her by accident; and often did he warmly ſolicit her to admit him to ſee her; but all to no purpoſe: he could neither ſoften her heart nor open her hand.

Mean time, while he was aſſiduouſly endeavouring to rouſe the affections of a mother in whom all natural affection was extinct, he was deſtitute of the means of ſupport, and reduced to the miſeries of want. We are not told by what means he got rid of his obligation to the ſhoemaker, or whether he ever was actually bound to him; but we now find him very differently employed in order to procure a ſubſiſtence. In ſhort, the youth had parts, and a ſtrong inclination towards literary purſuits, eſpecially poetry. He wrote a poem; and afterwards two plays, *Woman's a Riddle* and *Love in a Veil*: but the author was allowed no part of the profits from the firſt; and from the ſecond he received no other advantage than the acquaintance of Sir Richard Steel and Mr. Wilks, by whom he was pitied, careſſed, and relieved. However, the kindneſs of his friends not affording him a conſtant ſupply, he wrote the tragedy of *Sir Thomas Overbury*; which not only procured him the eſteem of many perſons of wit, but brought him in 200l. The celebrated Aaron Hill, Eſq. was of great ſervice to him in correcting and fitting this piece for the ſtage and the preſs; and extended his patronage ſtill further. But Savage was, like many other wits, a bad manager, and was ever in diſtreſs. As faſt as his friends raiſed him out of one difficulty, he ſunk into another; and, when he found himſelf greatly involved, he would ramble about like a vagabond, with ſcarce a ſhirt on his back. He was in one of theſe ſituations all the time wherein he wrote his tragedy above mentioned; without a lodging, and often without a dinner: ſo that he uſed to ſcribble on ſcraps of paper picked up by accident, or begged in the ſhops, which he occaſionally ſtepped into, as thoughts occurred to him, craving the favour of pen and ink, as it were juſt to take a memorandum.

Mr. Hill alſo earneſtly promoted a ſubſcription to a volume of *Miſcellanies*, by Savage; and likewiſe furniſhed part of the poems of which the volume was compoſed. To this miſcellany Savage wrote a preface, in which he gives an account of his mother's cruelty, in a very uncommon ſtrain of humour.

The profits of his Tragedy and his Miſcellanies together had now, for a time, ſomewhat raiſed poor Savage both in circumſtances and credit; ſo that the world juſt began to behold him with a more favourable eye than formerly, when both his fame and life were endangered by a moſt unhappy event. A drunken frolic in which he one night engaged ended in a fray, and Savage unfortunately killed a man; for which he was condemned to be hanged: his friends earneſtly ſolicited the mercy of the crown, while his mother as earneſtly exerted herſelf to prevent his receiving it. The counteſs of Hertford at length laid his whole caſe before queen Caroline, and Savage in conſequence obtained a pardon.

Savage had now loſt that tenderneſs for his mother, which the whole ſeries of her cruelty had not been able wholly to repreſs; and, conſidering her as an implacable enemy, whom nothing but his blood could ſatisfy, threatened to haraſs her with lampoons, and to publiſh a copious narrative of her conduct, unleſs ſhe conſented to allow him a penſion. This expedient proved ſucceſsful: and the lord Tyrconnel, upon his promiſe of laying aſide his deſign of expoſing his mother's cruelty, took him into his family, treated him as an equal, and engaged to allow him a penſion of 200l. a year. This was the golden part of Savage's life. He was courted by all who endeavoured to be thought men of genius, and careſſed by all who valued themſelves upon a refined taſte. In this gay period of his life he publiſhed the *Temple of Health and Mirth*, on the recovery of lady Tyrconnel from a languiſhing illneſs; and *The Wanderer*, a moral poem, which he dedicated to lord Tyrconnel, in ſtrains

of the highest panegyric: but these praises he in a short time found himself inclined to retract, being discarded by the man on whom they were bestowed. Of this quarrel lord Tyrconnel and Mr. Savage assigned very different reasons. Our author's known character pleads too strongly against him; for his conduct was ever such as made all his friends, sooner or later, grow weary of him, and even forced most of them to become his enemies.

Being thus once more turned adrift upon the world, Savage, whose passions were very strong, and whose gratitude was very small, became extremely diligent in exposing the faults of lord Tyrconnel. He, moreover, now thought himself at liberty to take revenge upon his mother.—Accordingly he wrote *The Bastard*, a poem, remarkable for the vivacity of its beginning (where he finely enumerates the imaginary advantages of base birth), and for the pathetic conclusion, wherein he recounts the real calamities which he suffered by the crime of his parents.

This poem had an extraordinary sale; and its appearance happening at the time when his mother was at Bath, many persons there took frequent opportunities of repeating passages from the Bastard in her hearing. This was perhaps the first time that ever she discovered a sense of shame, and on this occasion the power of wit was very conspicuous: the wretch who had, without scruple, proclaimed herself an adulteress, and who had first endeavoured to starve her son, then to transport him, and afterwards to hang him, was not able to bear the representation of her own conduct; but fled from reproach, though she felt no pain from guilt; and left Bath with the utmost haste, to shelter herself among the crowds of London.

Some time after this, Savage formed the resolution of applying to the queen; who having once given him life, he hoped she might further extend her goodness to him by enabling him to support it.—With this view, he published a poem on her birth-day, which he entitled *The Volunteer Laureat;* for which she was pleased to send him 50l. with an intimation that he might annually expect the same bounty. But this annual allowance was nothing to a man of his strange and singular extravagance. His usual custom was, as soon as he had received his pension, to disappear with it, and secrete himself from his most intimate friends till every shilling of the 50l. was spent; which done, he again appeared, pennyless as before: but he would never inform any person where he had been, nor in what manner his money had been dissipated.—From the reports, however, of some who found means to penetrate his haunts, it would seem that he expended both his time and his cash in the most sordid and despicable sensuality; particularly in eating and drinking, in which he would indulge in the most unsocial manner, sitting whole days and nights by himself, in obscure houses of entertainment, over his bottle and trencher, immersed in filth and sloth, with scarce decent apparel; generally wrapped up in a horseman's great coat; and, on the whole, with his very homely countenance, and altogether, exhibiting an object the most disgusting to the sight, if not to some other of the senses.

His wit and parts, however, still raised him new friends as fast as his misbehaviour lost him his old ones. Yet such was his conduct, that occasional relief only furnished the means of occasional excess; and he defeated all attempts made by his friends to fix him in a decent way. He was even reduced so low as to be destitute of a lodging; insomuch that he often passed his nights in those mean houses that are set open for casual wanderers; sometimes in cellars amidst the riot and filth of the most profligate of the rabble; and not seldom would he walk the streets till he was weary, and then lie down in summer on a bulk, or in winter with his associates among the ashes of a glass-house.

Yet, amidst all his penury and wretchedness, had this man so much pride, and so high an opinion of his own merit, that he ever kept up his spirits, and was always ready to repress, with scorn and contempt, the least appearance of any slight or indignity towards himself, in the behaviour of his acquaintance; among whom he looked upon none as his superior. He would be treated as an equal, even by persons of the highest rank. We have an instance of this preposterous and inconsistent pride, in his refusing to wait upon a gentleman who was desirous of relieving him when at the lowest ebb of distress, only because the message signified the gentleman's desire to see him at nine in the morning. Savage could not bear that any one should presume to prescribe the hour of his attendance, and therefore he absolutely rejected the proffered kindness. This life, unhappy as it may be already imagined, was yet rendered more unhappy by the death of the queen, in 1738; which stroke deprived him of all hopes from the court. His pension was discontinued, and the insolent manner in which he demanded of Sir Robert Walpole to have it restored, for ever cut off this considerable supply; which possibly had been only delayed, and might have been recovered by proper application.

His distress now became so great, and so notorious, that a scheme was at length concerted for procuring him a permanent relief. It was proposed that he should retire into Wales, with an allowance of 50l. *per annum*, on which he was to live privately, in a cheap place, for ever quitting his town haunts, and resigning all further pretensions to fame. This offer he seemed gladly to accept; but his intentions were only to deceive his friends by retiring for a while, to write another tragedy, and then to return with it to London in order to bring it upon the stage.

In 1739 he set out for Swansey, in the Bristol stage-coach, and was furnished with 15 guineas to bear the expense of his journey. But, on the 14th day after his departure, his friends and benefactors, the principal of whom was no other than the great Mr. Pope, who expected to hear of his arrival in Wales, were surprised with a letter from Savage, informing them that he was yet upon the road, and could not proceed for want of money. There was no other remedy than a remittance; which was sent him, and by the help of which he was enabled to reach Bristol, from whence he was to proceed to Swansey by water. At Bristol, however, he found an embargo laid upon the shipping; so that he could not immediately obtain a passage. Here, therefore, being obliged to stay for some time, he, with his usual facility, so ingratiated himself with the principal inhabitants, that he was frequently invited to their houses, distinguished at their public entertainments, and treated with a regard that highly gratified his vanity, and therefore easily engaged his affections. At length, with great reluctance, he proceeded to Swansey; where he lived about a year, very much dissatisfied with the diminution of his salary; for he had, in his letters, treated his contributors so insolently, that most of them withdrew their subscriptions. Here he finished his tragedy, and resolved to return with it to London: which was strenuously opposed by his great and constant friend Mr. Pope; who proposed that Savage should put this play into the hands of Mr. Thomson and Mr. Mallet, in order that they might fit it for the stage, that his friends should receive the profits it might bring in, and that the author should receive the produce by way of annuity. This kind and prudent scheme was rejected by Savage with the utmost contempt.—He declared he would not submit his works to any one's correction; and that he would no longer be kept in leading-strings. Accordingly he soon returned to Bristol, in his way to London: but at Bristol, meeting with a repetition of the same kind treatment he had before found there, he was tempted to make a second stay in that opulent city for some time. Here he was again not only caressed and treated, but the sum of 30l. was raised for him, with which it had been happy if he had immediately departed for London. But he never considered that a frequent repetition

of ſuch kindneſs was not to be expected, and that it was poſſible to tire out the generoſity of his Briſtol friends, as he had before tired his friends every where elſe. In ſhort, he remained here till his company was no longer welcome. His viſits in every family were too often repeated; his wit had loſt its novelty, and his irregular behaviour grew troubleſome. Neceſſity came upon him before he was aware; his money was ſpent, his clothes were worn out, his appearance was ſhabby, and his preſence was diſguſtful at every table. He now began to find every man from home at whoſe houſe he called; and he found it difficult to obtain a dinner. Thus reduced, it would have been prudent in him to have withdrawn from the place; but prudence and Savage were never acquainted. He ſtaid, in the midſt of poverty, hunger, and contempt, till the miſtreſs of a coffee-houſe, to whom he owed about eight pounds, arreſted him for the debt. He remained for ſome time, at a great expenſe, in the houſe of the ſheriff's officer, in hopes of procuring bail: which expenſe he was enabled to defray, by a preſent of five guineas from Mr. Naſh at Bath. No bail, however, was to be found; ſo that poor Savage was at laſt lodged in Newgate, a priſon ſo named in Briſtol.

But it was the fortune of this extraordinary mortal always to find more friends than he deſerved. The keeper of the priſon took compaſſion on him, and greatly ſoftened the rigours of his confinement by every kind of indulgence; he ſupported him at his own table, gave him a commodious room to himſelf, allowed him to ſtand at the door of the gaol, and even frequently took him into the fields for the benefit of the air and exerciſe; ſo that, in reality, Savage endured fewer hardſhips in this place than he had uſually ſuffered during the greateſt part of his life.

While he remained in this not intolerable priſon, his ingratitude again broke out, in a bitter ſatire on the city of Briſtol; to which he certainly owed great obligations, notwithſtanding the circumſtances of his arreſt; which was but the act of an individual, and that attended with no circumſtances of injuſtice or cruelty. This ſatire he entitled *London and Briſtol delineated;* and in it he abuſed the inhabitants of the latter, with ſuch a ſpirit of reſentment, that the reader would imagine he had never received any other than the moſt injurious treatment in that city.

When Savage had remained about ſix months in this hoſpitable priſon, he received a letter from Mr. Pope, (who ſtill continued to allow him 20l. a year) containing a charge of very atrocious ingratitude. What were the particulars of this charge we are not informed; but, from the notorious character of the man, there is reaſon to fear that Savage was but too juſtly accuſed. He, however, ſolemnly proteſted his innocence; but he was very unuſually affected on this occaſion. In a few days after he was ſeized with a diſorder, which at firſt was not ſuſpected to be dangerous: but growing daily more languid and dejected, at laſt a fever ſeized him; and he expired on the 1ſt of Auguſt 1743, in the 46th year of his age.

Thus lived, and thus died, Richard Savage, Eſq.; leaving behind him a character ſtrangely chequered with vices and good qualities. Of the former we have ſeen a variety of inſtances in this abſtract of his life; of the latter, his peculiar ſituation in the world gave him but few opportunities of making any conſiderable diſplay. He was, however, undoubtedly a man of excellent parts; and had he received the full benefits of a liberal education, and had his natural talents been cultivated to the beſt advantage, he might have made a reſpectable figure in life. He was happy in quick diſcernment, a retentive memory, and a lively flow of wit, which made his company much coveted; nor was his judgment both of writings and of men inferior to his wit: but he was too much a ſlave to his paſſions, and his paſſions were too, eaſily excited. He was warm in his friendſhips, but implacable in his enmity; and his greateſt fault, which is indeed the greateſt of all faults, was ingratitude. He ſeemed to think every thing due to his merit, and that he was little obliged to any one for thoſe favours which he thought it their duty to confer on him: it is therefore the leſs to be wondered at, that he never rightly eſtimated the kindneſs of his many friends and benefactors, or preſerved a grateful and due ſenſe of their generoſity towards him

The works of this original writer, after having long lain diſperſed in magazines and fugitive publications, have been lately collected, and publiſhed in an elegant edition, in 2 vols. 8vo; to which are prefixed, the admirable Memoirs of Savage, written by Dr. Samuel Johnſon.

SAVAGE is a word ſo well underſtood as ſcarcely to require explanation. When applied to inferior animals, it denotes that they are wild, untamed, and cruel; when applied to man, it is of much the ſame import with *barbarian*, and means a perſon who is untaught and uncivilized, or who is in the rude ſtate of uncultivated nature. That ſuch men exiſt at preſent, and have exiſted in moſt ages of the world, is undeniable; but a queſtion naturally occurs reſpecting the origin of this ſavage ſtate, the determination of which is of conſiderable importance in developing the nature of man, and aſcertaining the qualities and powers of the human mind. Upon this ſubject, as upon moſt others, opinions are very various, and the ſyſtems built upon them are conſequently very contradictory. A large ſect of antient philoſophers maintained that man ſprung at firſt from the earth like his brother vegetables; that he was without ideas and without ſpeech; and that many ages elapſed before the race acquired the uſe of language, or attained to greater knowledge than the beaſts of the foreſt. Other ſects again, with the vulgar, and almoſt all the poets, maintained that the firſt mortals were wiſer and happier, and more powerful, than any of their offspring; that mankind, inſtead of being originally ſavages, and riſing to the ſtate of civilization by their own gradual and progreſſive exertions, were created in a high degree of perfection; that, however, they degenerated from that ſtate, and that all nature degenerated with them. Hence the various ages of the world have almoſt every where been compared to gold, ſilver, braſs, and iron, the golden having been always ſuppoſed to be the firſt age.

Since the revival of letters in Europe, and eſpecially during the preſent century, the ſame queſtion has been much agitated both in France and England, and by far the greater part of the moſt faſhionable names in modern ſcience have declared for the original ſavagiſm of men. Such of the antients as held that opinion were countenanced by the atheiſtic coſmogony of the Phœnicians, and by the early hiſtory of their own nations; the moderns build their ſyſtem upon what they ſuppoſe to be the conſtitution of the human mind, and upon the late improvements in arts and ſciences. As the queſtion muſt finally be decided by hiſtorical evidence, before we make our appeal to facts, we ſhall conſider the force of the modern reaſonings from the ſuppoſed innate powers of the human mind; for that reaſoning is totally different from the other, and to blend them together would only prevent the reader from having an adequate conception of either.

Upon the ſuppoſition that all mankind were originally ſavages, deſtitute of the uſe of ſpeech, and, in the ſtricteſt ſenſe of the words, *mutum et turpe pecus*, the great difficulty is to conceive how they could emerge from that ſtate, and become at laſt enlightened and civilized. The modern advocates for the univerſality of the ſavage ſtate remove this difficulty by a number of inſtincts or internal ſenſes, with which they ſuppoſe the human mind endowed, and by which the ſavage is, without reflection, not only enabled to diſtinguiſh between right and wrong, and prompted to do every thing neceſſary to the preſervation of his exiſtence, and the continuance of the ſpecies, but alſo led to the diſcovery of what will contribute, in the firſt inſtance, to the eaſe and accommodations of life. Theſe inſtincts, they think,

brought mankind together, when the reasoning faculty, which had hitherto been dormant, being now roused by the collisions of society, made its observations upon the consequences of their different actions, taught them to avoid such as experience showed to be pernicious, and to improve upon those which they found beneficial; and thus was the progress of civilization begun. But this theory is opposed by objections which we know not how to obviate. The bundle of instincts with which modern idleness, under the denomination of philosophy, has so amply furnished the human mind, is a mere chimera. (See INSTINCT.) But granting its reality, it is by no means sufficient to produce the consequences which are derived from it. That it is not the parent of language, we have shown at large in another place (see LANGUAGE); and we have the confession of some of the ablest advocates for the original savagism of man, that large societies must have been formed before language could have been invented. How societies, at least large societies, could be formed and kept together without language, we have not indeed been told; but we are assured by every historian and every traveller of credit, that in such societies only have mankind been found civilized. Among known savages the social storge is very much confined; and therefore, had it been in the first race of men of as enlarged a nature, and as safe a guide, as the instinctive philosophers contend that it was, it is plain that those men could not have been savages. Such an appetite for society, and such a director of conduct, instead of enabling mankind to have emerged from savagism, would have effectually prevented them from ever becoming savage; it would have knit them together from the very first, and furnished opportunities for the progenitors of the human race to have begun the process of civilization from the moment that they dropped from the hands of their Creator. Indeed, were the modern theories of internal senses and social affections well founded, and were these senses and affections sufficient to have impelled the first men into society, it is not easy to be conceived how there could be at this day a savage tribe on the face of the earth. Natural causes, operating in the same direction and with the same force, must in every age produce the same effects; and if the social affections of the first mortals impelled them to society, and their reasoning faculties immediately commenced the process of civilization, surely the same affections and the same faculties would in a greater or less degree have had the same effect in every age and on every tribe of their numerous offspring; and we should every where observe mankind advancing in civilization, instead of standing still as they often do, and sometimes retreating by a retrograde motion. This, however, is far from being the case. Hordes of savages exist in almost every quarter of the globe; and the Chinese, who have undoubtedly been in a state of civilization for at least 2000 years, have during the whole of that long period been absolutely stationary, if they have not lost some of their antient arts. (See PORCELAIN.) The origin of civilization, therefore, is not to be looked for in human instincts or human propensities, carrying men forward by a natural progress; for the supposition of such propensities is contrary to fact; and by fact and historical evidence, in conjunction with what we know of the nature of man, must this great question be at last decided.

In the article RELIGION, it has been shown, that the first men, if left to themselves without any instruction, instead of living the life of savages, and in process of time advancing towards civilization, must have perished before they acquired even the use of some of their senses. It has also been shown, that Moses, as he is undoubtedly the oldest historian extant, wrote likewise by immediate inspiration; and that therefore, as he represents our first parents and their immediate descendants as in a state far removed from that of savages, it is vain to attempt to deduce the originality of such a state from hypothetical theories of human nature. We have, indeed, heard it observed by some of the advocates for the antiquity and universality of the savage state, that to the appeal to revelation they have no objection, provided we take the Mosaic account as it stands, and draw not from it conclusions which it will not support.

They contend at the same time, that there is no argument fairly deducible from the book of Genesis which militates against their position. Now we beg leave to remark, that besides the reasoning which we have already used in the article just referred to, we have as much positive evidence against their position as the nature of the Mosaic history could be supposed to afford.

We are there told that God created man after his own image; that he gave him dominion over every thing in the sea, in the air, and over all the earth; that he appointed for his food various kinds of vegetables; that he ordained the Sabbath to be observed by him, in commemoration of the works of creation; that he prepared for him a garden to till and to dress; and that, as a test of his religion and submission to his Creator, he forbade him, under severe penalties, to eat of a certain tree in that garden. We are then told that God brought to him every animal which had been created; and we find that Adam was so well acquainted with their several natures as to give them names. When too a helpmate was provided for him, he immediately acknowledged her as bone of his bone, flesh of his flesh, and called her *woman*, because she was taken out of man.

How these facts can be reconciled to a state of ignorant savagism is to us absolutely inconceivable; and it is indeed strange, that men who profess Christianity should appeal to reason, and stick by its decision on a question which revelation has thus plainly decided against them. But it is agreeable to their theory to believe that man rose by slow steps to the full use of his reasoning powers. To us, on the other hand, it appears equally plausible to suppose that our first parents were created, not in full maturity, but mere infants, and that they went through the tedious process of childhood and youth, &c. as to suppose that their minds were created weak, uninformed, and uncivilized, as are those of savages.

But if it be granted that Adam had a tolerable share of knowledge, and some civilization, nothing can be more natural than to suppose that he would teach his descendants what he knew himself; and if the Scriptures are to be believed, we are certain that some of them possessed more than savage knowledge, and better than savage manners. But instead of going on to further perfection, as the theory of modern philosophers would lead us to suppose, we find that mankind degenerated in a most astonishing degree; the causes of which we have already in part developed in the article POLYTHEISM.

This early degeneracy of the human race, or their sudden progress towards ignorance and savagism, appears to lead to an important consequence. If men so very soon after their creation, possessing, as we have seen they did, a considerable share of knowledge and of civilization, instead of improving in either, degenerated in both respects, it would not appear that human nature has that strong propensity to refinement which many philosophers imagine; or that, had all men been originally savage, they would have civilized themselves by their own exertions.

Of the ages before the Flood we have no certain account anywhere but in Scripture; where, though we find mankind represented as very wicked, we have no reason to suppose them to have been absolute savages. On the contrary, we have much reason, from the short account of Moses, to conclude that they were far advanced in the arts of civil life. Cain, we are told, built a city; and two of his early descendants invented the harp and organ, and were artificers in brass and iron. Cities are not built, nor musical instruments invented, by savages, but by men highly cultivated: and surely we have no reason to suppose that the righteous posterity of Seth were behind the apostate descendants of Cain in any branch of knowledge that was really useful.

That Noah and his family were far removed from ſavagiſm, no one will controvert who believes that with them was made a new covenant of religion; and it was unqueſtionably their duty, as it muſt otherwiſe have been their wiſh, to communicate what knowledge they poſſeſſed to their poſterity. Thus far then every conſiſtent Chriſtian, we think, muſt determine againſt original and univerſal ſavagiſm.

In the preliminary diſcourſe to Sketches of the Hiſtory of Man, lord Kaimes would infer, from ſome facts which he ſtates, that many pairs of the human race were at firſt created, of very different forms and natures, but all depending entirely on their own natural talents. But to this ſtatement he rightly obſerves, that the Moſaic account of the Creation oppoſes inſuperable objections. "Whence then (ſays his lordſhip) the degeneracy of all men into the ſavage ſtate? To account for that diſmal cataſtrophe, mankind muſt have ſuffered ſome dreadful convulſion." Now, if we miſtake not, this is taking for granted the very thing to be proved. We deny that, at any period ſince the creation of the world, *all* men were ſunk into the ſtate of ſavages; and that they were, no proof has yet been brought, nor do we know of any that can be brought, unleſs our faſhionable philoſophers chooſe to prop their theories by the buttreſs of Sanchoniatho's Phœnician coſmogony. (See SANCHONIATHO.) His lordſhip, however, goes on to ſay, or rather to *ſuppoſe*, that the confuſion at Babel, &c. was this dreadful convulſion: For, ſays he, "by confounding the language of men, and ſcattering them abroad upon the face of all the earth, they were rendered ſavages." Here again we have a poſitive aſſertion, without the leaſt ſhadow of proof; for it does not at all appear that the confuſion of language, and the ſcattering abroad of the people, was a circumſtance ſuch as could induce univerſal ſavagiſm. There is no reaſon to think that all the men then alive were engaged in building the tower of Babel; nor does it appear from the Hebrew original, that the language of thoſe who were engaged in it was ſo much changed as the reader is apt to infer from our Engliſh verſion. (See PHILOLOGY.) That the builders were *ſcattered*, is indeed certain; and if any of them were driven, in very ſmall tribes, to a great diſtance from their brethren, they would in proceſs of time inevitably become ſavages. (See POLYTHEISM, and LANGUAGE.) But it is evident, from the Scripture account of the peopling of the earth, that the deſcendants of Shem and Japheth were not ſcattered over the face of all the earth, and that therefore they could not be rendered ſavage by the cataſtrophe at Babel. In the chapter which relates that wonderful event, the generations of Shem are given in order down to Abram; but there is no indication that they had ſuffered with the builders of the tower, or that any of them had degenerated into the ſtate of ſavages. On the contrary, they appear to have poſſeſſed a conſiderable degree of knowledge; and if any credit be due to the tradition which repreſents the father of Abraham as a ſtatuary, and himſelf as ſkilled in the ſcience of aſtronomy, they muſt have been far advanced in the arts of refinement. Even ſuch of the poſterity of Ham as either emigrated, or were driven from the plain of Shinar in large bodies, ſo far from ſinking into ſavagiſm, retained the accompliſhments of their antediluvian anceſtors, and all became afterwards the inſtructors of the Greeks and Romans. This is evident from the hiſtory of the Egyptians and other eaſtern nations, who in the days of Abraham were powerful and highly civilized. And that for many ages they did not degenerate into barbariſm, is apparent from its having been thought to exalt the character of Moſes, that he was learned in all the wiſdom of the Egyptians, and from the wiſdom of Solomon having been ſaid to excel all the wiſdom of the eaſt country and of Egypt.

Thus decided are the Scriptures of the Old Teſtament againſt the univerſal prevalence of ſavagiſm in that period of the world; nor are the moſt authentic Pagan writers of antiquity of a different opinion. Mochus the Phœnician, Democritus, and Epicurus, appear to be the firſt champions of the ſavage ſtate, and they are followed by a numerous body of poets and rhapſodiſts, among the Greeks and Romans, who were unqueſtionably devoted to fable and fiction. The account which they have given of the origin of man, the reader will find under THEOLOGY. But we hardly think that he will employ it in ſupport of the faſhionable doctrine of original ſavagiſm. Againſt the wild reveries of this ſchool are poſted all the leaders of the other ſects, Greeks and barbarians; the philoſophers of both Academies, the ſages of the Italian and Alexandrian ſchools; the magi of Perſia; the Bramins of India, and the Druids of Gaul, &c. The teſtimony of the early hiſtorians among all the antient nations, indeed, who are avowedly fabuliſts, is very little to be depended on, and has been called in queſtion by the moſt judicious writers of Pagan antiquity. (See *Plutarchi Vita Theſ. ſub init. Thucyd.* l. 1. cap. 1. *Strabo*, l. 11. p.507. *Liv. Pref.* and *Varro ap. Auguſt. de Civ. Dei.*) The more populous and extenſive kingdoms and ſocieties were civilized at a period prior to the records of profane hiſtory: the preſumption, therefore, without taking revelation into the account, certainly is, that they were civilized from the beginning. This is rendered further probable from other circumſtances. To account for their ſyſtem, the advocates of ſavagiſm are obliged, as we have ſeen, to have recourſe to numerous ſuppoſitions. They imagine, that ſince the creation dreadful convulſions have happened, which have ſpread ruin and devaſtation over the earth, which have deſtroyed learning and the arts, and brought on ſavagiſm by one ſudden blow. But this is reaſoning at random, and without a veſtige of probability; for the only convulſion that can be mentioned is that of Babel, which we have already ſhown to be inadequate.

Further, it does not appear that any people who were once civilized, and in proceſs of time had degenerated into the ſavage or barbarous ſtate, have ever recovered their priſtine condition without foreign aid. From whence we conclude, that man, once a ſavage, would never have raiſed himſelf from that hopeleſs ſtate. This appears evident from the hiſtory of the world; for that it requires ſtrong incitements to keep man in a very high ſtate of knowledge and civilization, is evident from what we know of the numerous nations which were famed in antiquity, but which are now degenerated in an aſtoniſhing degree. That man cannot, or, which is the ſame thing, has not riſen from barbariſm to civilization and ſcience by his own efforts and natural talents, appears further from the following facts. The rudiments of all the learning, religion, laws, arts, and ſciences, and other improvements that have enlightened Europe, a great part of Aſia, and the northern coaſt of Africa, were ſo many rays diverging from two points, on the banks of the Euphrates and the Nile. In proportion as nations receded from theſe two ſources of humanity and civilization, in the ſame proportion were they more and more immerſed in ignorance and barbariſm. The Greeks had made no progreſs towards civilization when the Titans firſt, and afterwards colonies from Egypt and Phœnicia, taught them the very elements of ſcience and urbanity. The aborigines of Italy were in the ſame ſtate prior to the arrival of the Pelaſgi, and the colonies from Arcadia and other parts of Greece. Spain was indebted for the firſt ſeeds of improvement to the commercial ſpirit of the Phœnicians. The Gauls, the Britons, and the Germans, derived from the Romans all that in the early periods of their hiſtory they knew of ſcience, or the arts of civil life, and ſo on of other nations in antiquity. The ſame appears to be the caſe in modern times. The countries which have been diſcovered by the reſtleſs and inquiſitive ſpirit of Europeans have been generally found in the loweſt ſtate of ſavagiſm; from which if they have emerged at all, it has been exactly in proportion to their connection with the inhabitants of Europe. Even weſtern Europe itſelf, when ſunk in ignorance,

during the reign of monkery, did not recover by the efforts of its own inhabitants. Had not the Greeks, who in the 15th century took refuge in Italy from the cruelty of the Turks, brought with them their antient books, and taught the Italians to read them, we who are difputing about the origin of the favage ftate, and the innate powers of the human mind, had at this day been grofs and ignorant favages ourfelves, incapable of reafoning with accuracy upon any fubject. That we have now advanced far before our mafters is readily admitted; for the human mind, when put on the right track, and fpurred on by emulation and other incitements, is capable of making great improvements; but between improving fcience, and emerging from favagifm, every one perceives there is an immenfe difference.

Lord Kaimes obferves, that the people who inhabit a grateful foil, where the neceffaries of life are eafily procured, are the firft who invent ufeful and ingenious arts, and the firft who figure in the exercifes of the mind. But the Egyptians and Chaldeans, who are thought to fupport this remark, appear from what we have feen to have derived their knowledge from their antediluvian progenitors, and not from any advantages of fituation or ftrength of genius. Befides, the inhabitants of a great part of Africa, of North and South America, and of many of the iflands lately difcovered, live in regions equally fertile, and equally productive of the neceffaries of life, with the regions of Chaldea and Egypt; yet thefe people have been favages from time immemorial, and continue ftill in the fame ftate. The Athenians, on the other hand, inhabited the moft barren and ungrateful region of Greece, while their perfection in the arts and fciences has never been equalled. The Norwegian colony which fettled in Iceland about the beginning of the 8th century, inhabited a moft bleak and barren foil, and yet the fine arts were eagerly cultivated in that dreary region when the reft of Europe was funk in ignorance and barbarifm. Again, there are many parts of Africa, and of North and South America, where the foil is neither fo luxuriant as to beget indolence, nor fo barren and ungrateful as to deprefs the fpirits by labour and poverty; where, notwithftanding, the inhabitants ftill continue in an uncultured ftate. From all which, and from numerous other inftances which our limits permit us not to bring forward, we infer that fome external influence is neceffary to impel towards civilization favages; and that in the hiftory of the world, or the nature of the thing, we find no inftance of any people emerging from barbarifm by the progreffive efforts of their own genius. On the contrary, as we find in focieties highly cultivated and luxurious a ftrong tendency to degenerate, fo in favages we not only find no mark of tendency to improvement, but rather a rooted averfion to it. Among them, indeed, the focial appetite never reaches beyond their own horde. It is, therefore, too weak and too confined to difpofe them to unite in large communities; and of courfe, had all mankind been once in the favage ftate, they never could have arrived at any confiderable degree of civilization.

Inftead of trufting to any fuch natural progrefs, as is contended for, the Providence of Heaven, in pity to the human race, appears at different times, and in different countries, to have raifed up fome perfons endowed with fuperior talents, or, in the language of poetry, fome heroes, demi gods, or god-like men, who having themfelves acquired fome knowledge in nations already civilized, by ufeful inventions, legiflation, religious inftitutions, and moral arrangements, fowed the firft feeds of civilization among the hordes of wandering difunited barbarians. Thus we find the Chinefe look up to their Fohee, the Indians to Brahma, the Perfians to Zoroafter, the Chaldeans to Oanes, the Egyptians to Thoth, the Phœnicians to Melicerta, the Scandinavians to Odin, the Italians to Janus, Saturn, and Picus, and the Peruvians to Manco. In later times, and almoft within our own view, we find the barbarous nations of Ruffia reduced to fome order and civilization by the aftonifhing powers and exertions of Peter the Great. The endeavours of fucceeding monarchs, and efpecially of the late emprefs, have powerfully contributed to the improvement of this mighty empire. In many parts of it, however, we ftill find the inhabitants in a ftate very little fuperior to favagifm; and through the moft of it, the lower, and perhaps the middling orders, appear to retain an almoft invincible averfion to all further progrefs. A fact which, when added to numerous others of a fimilar nature which occur in the hiftory of the world, feems to prove indifputably that there is no fuch natural propenfity to improvement in the human mind as we are taught by fome authors to believe. The origin of favagifm, if we allow mankind to have been at firft civilized, is eafily accounted for by natural means: The origin of civilization, if at any period the whole race were favages, cannot, we think, be accounted for otherwife than by a miracle, or repeated miracles.

To many perfons, in the prefent day efpecially, the doctrine we have now attempted to eftablifh will appear very humiliating; and perhaps it is this alone that has prevented many from giving the fubject fo patient a hearing as its importance feems to require. It is a fafhionable kind of philofophy to attribute to the human mind very pre eminent powers; which fo flatter our pride, as in a great meafure, perhaps, to pervert our reafon, and blind our judgment. The hiftory of the world, and of the difpenfations of God to man, are certainly at variance with the popular doctrine refpecting the origin of civilization: for, if the human mind be poffeffed of that innate vigour which that doctrine attributes to it, it will be extremely difficult to account for thofe numerous facts which feem with irrefiftible evidence to proclaim the contrary; for that unceafing care with which the Deity appears to have watched over us; and for thofe various and important revelations He has vouchfafed to us. Let us rejoice and be thankful that we are men, and that we are Chriftians; but let not a vain philofophy tempt us to imagine that we are angels or gods.

SAVAGE *Iflands*, one of the fmall iflands in the South Sea, lying in S. lat. 19. 1. W. lon. 169. 37. It is about feven leagues in circuit, of a good height, and has deep water clofe to its fhores. Its interior parts are fuppofed to be barren, as there was no foil to be feen upon the coaft; the rocks alone fupplying the trees with humidity. The inhabitants are exceedingly warlike and fierce, fo that captain Cook could not have any intercourfe with them.

SAVANNA-LA-MAR, a town of Jamaica, fituated in the county of Cornwall in that ifland.—It is the county-town, where the affize courts are held, the laft Tuefdays in March, June, September, and December. It has lately been ornamented by an elegant court-houfe, and contains about one hundred other houfes. It belongs to Weftmoreland parifh, in which are 89 fugar eftates, 106 other eftates, and 18,000 flaves.

SAVANNAH, the capital of the country of Georgia in North America, fituated in W. lon. 101. 20. N. lat. 32. 0.

SAVARY (JAMES), an eminent French writer on the fubject of trade, was born at Done, in Anjou, in 1622. Being bred to merchandize, he continued in trade till 1658; when he left off the practice, to cultivate the theory. He had married in 1650; and in 1660, when the king declared a purpofe of affigning privileges and penfions to fuch of his fubjects as had twelve children alive, Mr. Savary was not too rich to put in his claim to the royal bounty. He was afterwards admitted of the council for the reformation of commerce; and the orders which paffed in 1670 were drawn up by his inftructions and advice. He wrote *Le Parfait Negociant*, 4to; and *Avis et confeils fur les plus importantes matieres du Commerce*, in 4to. He died in 1690; and out of 17 children whom he had by one wife, left 11. Two of his fons, James and Philemon Lewis, laboured jointly on a great work, *Dictionnaire Univerfelle du Commerce*, 2 vols.

folio. This work was begun by James, who was inſpector-general of the manufactures at the cuſtom-houſe, Paris; who called in the aſſiſtance of his brother Philemon Lewis, although a canon of the royal church of St. Maur; and by his death left him to finiſh it. This work appeared in 1723, and Philemon afterwards added a third ſupplemental volume to the former. Poſtlethwayte's Engliſh Dictionary of Trade and Commerce is a tranſlation, with conſiderable improvements, from Savary.

Savary, an eminent French traveller and writer, was born at Vitre, in Brittany, about the year 1748. He ſtudied with applauſe at Rennes, and in 1776 travelled into Egypt, where he remained almoſt three years. During this period he was wholly engaged in the ſtudy of the Arabian language, in ſearching out antient monuments, and in examining the national manners. After making himſelf acquainted with the knowledge and philoſophy of Egypt, he viſited the iſlands in the Archipelago, where he ſpent 18 months. On his return to France, in 1780, he publiſhed, 1. A Tranſlation of the Koran, with a ſhort Life of Mahomet, in 1783, 2 vols. 8vo. 2. The Morality of the Koran, or a collection of the moſt excellent maxims in the Koran; a work extracted from his tranſlation, which is eſteemed both elegant and faithful. 3. Letters on Egypt, in 3 vols. 8vo. in 1785. In theſe the author makes his obſervations with accuracy, paints with vivacity, and renders intereſting every thing he relates. His deſcriptions are in general faithful, but are perhaps in ſome inſtances too much ornamented. He has been juſtly cenſured for painting modern Egypt and its inhabitants in too high colours. Theſe Letters, however, were bought up by the curious public, and read with pleaſure and advantage. Encouraged by this flattering reception, he prepared his Letters upon Greece. He died ſoon after at Paris of a malady contracted from too intenſe application. A ſenſible obſtruction in the right lobe of the liver had made a deciſive progreſs, which the return of ſummer, ſome ſimple medicines, a ſtrict regimen, and travelling ſeemed to remove.

On his return into the country adjacent to Paris, his health however was ſtill doubtful; for it is well known that when the organization of one of the viſcera has been much deranged, deep traces of it will ever remain. His active mind, however, made him regardleſs of his health, and he conceived it his duty to profit by thoſe appearances of recovery which he experienced at the cloſe of the ſummer and the beginning of autumn, to put into order his Travels into the iſlands of the Archipelago, intended as a continuation of his Letters on Egypt. His warmth of temper was exaſperated by ſome lively criticiſms which had been made on his former productions, and he gave himſelf up to ſtudy with a degree of activity, of which the conſequences were ſufficiently obvious. An obſtruction in the liver again took place, and made a new progreſs; his digeſtion became extremely languid; ſleep quite forſook him, both by night and by day; a dry and troubleſome cough came on; his face appeared bloated, and his legs more and more inflamed. The uſe of barley water and cream of tartar ſtill however promoted, in ſome degree, the urinary ſecretions, and afforded ſome little glimmering of hope. In this ſituation he returned to Paris in the beginning of the year 1788, to attend to the publication of his new work concerning the iſlands of the Archipelago, particularly the iſle of Candia. He had then all the ſymptoms of a dangerous dropſy, which became ſtill more alarming from the very exhauſted ſtate of the viſcera. The right lobe of the liver was extremely hard and ſenſible. The patient had ſhiverings without any regular returns, and his ſtrength was undermined by a hectic fever. At the ſame time ſtill more uneaſy ſymptoms took place, thoſe of a dropſy in the cheſt; but the circumſtances which deſtroyed all hope, and announced his approaching diſſolution, were a ſevere pain in the left ſide, with a very troubleſome cough, and a copious and bloody expectoration (*in hepaticis*, ſays Hippocrates, *ſputum, cruentum mortiferum*); his reſpiration became more and more difficult; his ſtrength was exhauſted, and his death took place on the 4th of February 1788, attended with every indication of the moſt copious over-flowing in the cheſt, and of an abſceſs in the liver.—Thus was deſtroyed, in the vigour of his age, an author whoſe character and talents rendered him worthy of the happieſt lot.

Mr. Savary's genius was lively and well cultivated; his heart warm and benevolent; his imagination vigorous; his memory retentive. He was cheerful and open; and had ſo great a talent for telling a ſtory, that his company was not leſs agreeable than inſtructive. He did not mingle much with the world, but was ſatisfied with performing well the duties of a ſon, of a brother, and of a friend.

SAUCISSE, or Saucisson, in mining, is a long pipe or bag made of cloth well pitched, or ſometimes of leather, of about an inch and a half diameter, filled with powder, going from the chamber of the mine to the entrance of the gallery. It is generally placed in a wooden pipe called an *auget*, to prevent its growing damp. It ſerves to give fire to mines, caiſſons, bomb-cheſts, &c.

Saucisson, is likewiſe a kind of faſcine, longer than the common ones; they ſerve to raiſe batteries and to repair breaches. They are alſo uſed in making epaulements, in ſtopping paſſages, and in making traverſes over a wet ditch, &c.

SAVE, a river of Germany, which has its ſource in Upper Carniola, on the frontiers of Carinthia.—It runs through Carniola from weſt to eaſt, afterwards ſeparates Sclavonia from Croatia, Boſnia, and part of Servia, and then falls into the Danube at Belgrade.

SAVER-kraut. See Croute.

SAVERNAKE-Forest is ſituated near Marlborough in Wiltſhire, and is 12 miles in circumference, well ſtocked with deer, and delightful from the many viſtas cut through the woods and coppices with which it abounds. Eight of theſe viſtas meet, like the rays of a ſtar, in a point near the middle of the foreſt, where an octagon tower is erected to correſpond with the viſtas; through one of which is a view of Tottenham Park, lord Aileſbury's ſeat, a ſtately edifice erected after the model, and under the direction, of our modern Vitruvius, the earl of Burlington, who to the ſtrength and convenience of the Engliſh architecture has added the elegance of the Italian.

SAVILE (Sir George), afterwards marquis of Halifax, and one of the greateſt ſtateſmen of his time, was born about the year 1630; and ſome time after his return from his travels was created a peer, in conſideration of his own and his father's merits. He was a ſtrenuous oppoſer of the bill of exclusion; but propoſed ſuch limitations of the duke of York's authority as ſhould diſable him from doing any harm either in church or ſtate; as the taking out of his hands all power in eccleſiaſtical matters, the diſpoſal of the public money, and the power of making peace and war; and lodging theſe in the two houſes of parliament. After that bill was rejected in the houſe of lords, he preſſed them, though without ſucceſs, to proceed to the limitation of the duke's power; and began with moving, that during the king's life he might be obliged to live five hundred miles out of England. In Auguſt 1682 he was created a marquis, and ſoon after made privy-ſeal. Upon king James's acceſſion, he was made preſident of the council; but on his refuſal to conſent to the repeal of the teſt, he was diſmiſſed from all public employments. In that aſſembly of the lords which met after king James's withdrawing himſelf the firſt time from Whitehall, the marquis was choſen their preſident; and upon the king's return from Feverſham, he was ſent, together with the earl of Shrewſbury and lord Delamere, from the prince of Orange, to order his majeſty to quit the palace at Whitehall. In the convention of parliament he was choſen ſpeaker of the houſe of lords, and ſtrenuouſly

supported the motion for the vacancy of the throne, and the conjunctive sovereignty of the prince and princess; upon whose accession he was again made privy seal. Yet, in 1689, he quitted the court, and became a zealous opposer of the measures of government till his death, which happened in April 1695. The Rev. Mr. Grainger observes, that "he was a person of unsettled principles, and of a lively imagination, which sometimes got the better of his judgment. He would never lose his jest, though it spoiled his argument, or brought his sincerity or even his religion in question. He was deservedly celebrated for his parliamentary talents; and in the famous contest relating to the bill of exclusion was thought to be a match for his uncle Shaftsbury. The pieces he has left us show him to have been an ingenious, if not a masterly writer; and his *Advice to a Daughter* contains more good sense in fewer words than is, perhaps, to be found in any of his contemporary authors." His lordship also wrote The Anatomy of an Equivalent; a Letter to a Dissenter; a Rough Draught of a New Model at Sea; and Maxims of State; all which were printed together in one volume 8vo.—Since these were also published under his name, The Character of King Charles II. 8vo. The Character of Bishop Burnet, and Historical Observations on the Reigns of Ed. I. II. III. and Richard II. with Remarks upon their faithful Counsellors and false Favourites.

SAVIN, in botany. See Juniperus.

SAVIOUR, an appellation peculiarly given to Jesus Christ, as being the Messiah and Saviour of the world. See Jesus.

Order of St. Saviour, a religious order of the Romish Church, founded by St. Bridget about the year 1345, and so called from its being pretended that our Saviour himself declared its constitution and rules to the foundress. According to the constitutions, this is principally founded for religious women who pay a particular honour to the holy virgin; but there are some monks of the order, to administer the sacrament and spiritual assistance to the nuns.

SAUL, the son of Kish, of the tribe of Benjamin, was the first king of the Israelites. On account of his disobedient conduct, the kingdom was taken from his family, and given to David. See the First Book of Samuel.

Saul, otherwise called Paul. See Paul.

SAUMUR, a considerable town of France, in the department of Maine and Loire, and late province of Anjou, with an antient castle. Here is a famous bridge over the Loire, consisting of 12 elliptic arches, each 60 feet in diameter. It is 22 miles S. E. of Angers, and 160 S. W. of Paris. W. lon. 0. 4. N. lat. 47. 15.

SAUNDERS, a kind of wood brought from the East Indies, of which there are three kinds; white, yellow, and red. See Pterocarpus and Santalum.

SAUNDERSON (Dr. Robert), an eminent casuist, was born at Rotherham in Yorkshire on the 19th September 1587, and was descended of an antient family. He attended the grammar-school at Rotherham, where he made such wonderful proficiency in the languages, that at 13 it was judged proper to send him to Lincoln college, Oxford. In 1608 he was appointed logic-reader in the same college. He took orders in 1611, and was promoted successively to several benefices. Archbishop Laud recommended him to king Charles I. as a profound casuist; and that monarch, who seems to have been a great admirer of casuistical learning, appointed him one of his chaplains in 1631. In 1642 Charles created him regius professor of divinity at Oxford, with the canonry of Christ-church annexed: but the civil wars prevented him till 1646 from entering on the office; and in 1648 he was ejected by the visitors which the parliament had commissioned. He must have stood high in the public opinion; for, in the same year in which he was appointed professor of divinity, both houses of parliament recommended him to the king as one of their trustees for settling the affairs of the church. He was taken prisoner by the parliament's troops and conveyed to Lincoln, in order to procure in exchange a Puritan divine named *Clark*, whom the king's army had taken. The exchange was agreed to, on condition that Dr. Saunderson's living should be restored, and his person and property remain unmolested. The first of these demands was readily complied with: and a stipulation was made, that the second should be observed; but it was impossible to restrain the licentiousness of the soldiers They entered his church in the time of divine service, interrupted him when reading prayers, and even had the audacity to take the common prayer book from him, and to tear it to pieces. When Charles II. was reinstated in the throne, Dr. Saunderson recovered his professorship and canonry, and soon after was promoted to the bishopric of Lincoln. During the two years and a half in which he possessed this new office, he spent a considerable sum in augmenting poor vicarages, in repairing the palace at Bugden, &c. He died January 29, 1662-3, in his 76th year.

He was a man of great acuteness and solid judgment. "That staid and well-weighed man Dr. Saunderson (says Dr. Hammond) conceives all things deliberately, dwells upon them discreetly, discerns things that differ exactly, passeth his judgment rationally, and expresses it aptly, clearly, and honestly." It will now be proper to give a short account of his works. 1. In 1615 he published *Logicæ Artis Compendium*, which was the system of lectures he had delivered in the University when he was logic-reader. 2. Sermons, amounting in number to 36, printed in 1681, folio, with the author's life by Walton. 3. Nine Cases of Conscience resolved; first collected in one volume, in 1678, 8vo. 4. *De juramenti obligatione.* This book was translated into English by Charles I. while a prisoner in the Isle of Wight, and printed at London in 1665, 8vo. 5. *De Obligatione conscientiæ.* 6. Censure of Mr. Antony Ascham his book of the confusions and revolutions of government. 7. *Pax Ecclesiæ* concerning Predestination, or the five points. 8. Episcopacy, as established by law in England, not prejudicial to the regal power, in 1661. Besides these, he wrote two Discourses in defence of Usher's writings.

Saunderson (Dr. Nicolas), was born at Thurlstone in Yorkshire in 1682, and may be considered as a prodigy for his application and success in mathematical literature in circumstances apparently the most unfavourable. He lost his sight by the small-pox before he was a year old. But this disaster did not prevent him from searching after that knowledge for which nature had given him so ardent a desire. He was initiated into the Greek and Roman authors at a free-school at Penniston. After spending some years in the study of the languages, his father (who had a place in the excise) began to teach him the common rules of arithmetic. He soon surpassed his father; and could make long and difficult calculations, without having any sensible marks to assist his memory. At 18 he was taught the principles of algebra and geometry by Richard West of Undoorbank, Esq. who, though a gentleman of fortune, yet, being strongly attached to mathematical learning, readily undertook the education of so uncommon a genius. Saunderson was also assisted in his mathematical studies by Dr. Nettleton. These two gentlemen read books to him and explained them. He was next sent to a private academy at Attercliff near Sheffield, where logic and metaphysics were chiefly taught. But these sciences not suiting his turn of mind, he soon left the academy. He lived for some time in the country without any instructor; but such was the vigour of his own mind, that few instructions were necessary: he only required books and a reader.

His father, besides the place he had in the excise, possessed also a small estate; but having a numerous family to support, he was unable to give him a liberal education at one of the universities. Some of his friends, who had remarked his perspicu-

ous and interesting manner of communicating his ideas, proposed that he should attend the university of Cambridge as a teacher of mathematics. This proposal was immediately put in execution; and he was accordingly conducted to Cambridge in his 25th year by Mr. Joshua Dunn, a fellow commoner of Christ's college. Though he was not received as a member of the college, he was treated with great attention and respect. He was allowed a chamber, and had free access to the library. Mr. Whiston was at that time professor of mathematics; and as he read lectures in the way that Saunderson intended, it was naturally to be supposed he would view his project as an invasion of his office. But, instead of meditating any opposition, the plan was no sooner mentioned to him than he gave his consent. Saunderson's reputation was soon spread through the university. When his lectures were announced, a general curiosity was excited to hear such intricate mathematical subjects explained by a man who had been blind from his infancy. The subject of his lectures was the *Principia Mathematica*, the Optics, and *Arithmetica Universalis* of Sir Isaac Newton. He was accordingly attended by a very numerous audience. It will appear at first incredible to many that a blind man should be capable of explaining optics, which requires an accurate knowledge of the nature of light and colours; but we must recollect, that the theory of vision is taught entirely by lines, and is subject to the rules of geometry.

While thus employed in explaining the principles of the Newtonian philosophy, he became known to its illustrious author. He was also intimately acquainted with Halley, Cotes, De Moivre, and other eminent mathematicians. When Whiston was removed from his professorship, Saunderson was universally allowed to be the man best qualified for the succession. But to enjoy this office, it was necessary, as the statutes direct, that he should be promoted to a degree. To obtain this privilege the heads of the university applied to their chancellor the duke of Somerset, who procured the royal mandate to confer upon him the degree of master of arts. He was then elected Lucasian professor of mathematics in November 1711. His inauguration speech was composed in classical Latin, and in the style of Cicero, with whose works he had been much conversant. He now devoted his whole time to his lectures, and the instruction of his pupils. When George II. in 1728, visited the university of Cambridge, he expressed a desire to see professor Saunderson. In compliance with this desire, he waited upon his majesty in the senate-house, and was there, by the king's command, created doctor of laws. He was admitted a member of the Royal Society in 1736.

Saunderson was naturally of a vigorous constitution; but having confined himself to a sedentary life, he at length became scorbutic. For several years he felt a numbness in his limbs, which, in the spring of 1739, brought on a mortification in his foot; and, unfortunately, his blood was so vitiated by the scurvy, that assistance from medicine was not to be expected. When he was informed that his death was near, he remained for a little space calm and silent; but he soon recovered his former vivacity, and conversed with his usual ease. He died on the 19th of April 1739, in the 57th year of his age, and was buried at his own request in the chancel at Boxworth. He married the daughter of the reverned Mr. Dickens, rector of Boxworth, in Cambridgeshire, and by her had a son and daughter.

Dr. Saunderson was rather to be admired as a man of wonderful genius and assiduity, than to be loved for amiable qualities. He spoke his sentiments freely of characters, and praised or condemned his friends as well as his enemies without reserve. This has been ascribed by some to a love of defamation; but perhaps with more propriety it has been attributed by others to an inflexible love of truth, which urged him upon all occasions to speak the sentiments of his mind without disguise, and without considering whether this conduct would please or give offence. His sentiments were supposed unfavourable to revealed religion. It is said, that he alleged he could not know God, because he was blind, and could not see his works; and that, upon this, Dr. Holmes replied, "Lay your hand upon yourself, and the organization which you will feel in your own body will dissipate so gross an error." On the other hand, we are informed, that he had desired the sacrament to be given him on the evening before his death. He was, however, seized with a delirium, which rendered this impossible.

He wrote a system of algebra, which was published, in 2 volumes 4to, at London, after his death, in the year 1740, at the expense of the University of Cambridge.

Dr. Saunderson invented for his own use a Palpable Arithmetic; that is, a method of performing operations in arithmetic solely by the sense of touch. It consisted of a table raised upon a small frame, so that he could apply his hands with equal ease above and below. On this table were drawn a great number of parallel lines which were crossed by others at right angles; the edges of the table were divided by notches half an inch distant from one another, and between each notch there were five parallels; so that every square inch was divided into a hundred little squares. At each angle of the squares where the parallels intersected one another, a hole was made quite through the table. In each hole he placed two pins, a big and a small one. It was by the various arrangements of the pins that Saunderson performed his operations. A description of this method of making calculations by his table is given under the article BLIND, though it is there by mistake said that it was not of his own invention.

His sense of touch was so perfect, that he could discover with the greatest exactness the slightest inequality of surface, and could distinguish in the most finished works the smallest oversight in the polish. In the cabinet of medals at Cambridge he could single out the Roman medals with the utmost correctness; he could also perceive the slightest variation in the atmosphere. One day, while some gentlemen were making observations on the sun, he took notice of every little cloud that passed over the sun which could interrupt their labours. When any object passed before his face, even though at some distance, he discovered it, and could guess its size with considerable accuracy. When he walked, he knew when he passed by a tree, a wall, or a house. He made these distinctions from the different ways his face was affected by the motion of the air.

His musical ear was remarkably acute; he could distinguish accurately to the fifth of a note. In his youth he had been a performer on the flute; and he had made such proficiency, that, if he had cultivated his talents in this way, he would probably have been as eminent in music as he was in mathematics. He recognized not only his friends, but even those with whom he was slightly acquainted, by the tone of their voice; and he could judge with wonderful exactness of the size of any apartment into which he was conducted.

SAVONA, a large handsome, populous, and strong town of Italy, in the territory of Genoa, with two castles, and a bishop's see. It contains several handsome churches and well-built structures. It was taken by the king of Sardinia in 1746, at which time it had a capacious harbour; but the people of Genoa, being afraid that it would hurt their own trade, choked it up. It is seated on the Mediterranean sea, in a well cultivated country, abounding in silk and all kinds of good fruit. E. lon. 8. 14. N. lat. 44. 21.

SAVORY, in botany. See SATUREIA.

SAVOUR. See TASTE.

SAVOY, a duchy of Europe, between France and Italy, 83 miles long, and 67 broad; bounded on the N. by the lake of Geneva, which separates it from Switzerland; on the E. by the Alps

which divides it from Piedmont and Vallais; on the W. by the Rhone, which parts it from Bresse; and on the S. by Dauphiny and Piedmont. The air is cold on account of high mountains, which are almost always covered with snow; but the soil is pretty fertile. The mountains which are not covered with snow in winter, abound with pastures that feed a vast number of cattle. There are also stags, fallow deer, roe-bucks, wild boars, bears, marmots, white hares, red and gray partridges, woodcocks, and pheasants. The lakes are full of fish, and the principal rivers are the Isere, Arc, and Arve. The French invaded this country in 1792, and the same year the National Convention decreed that it should be an 84th department of France, by the name of Mont Blanc. Chamberry is the capital.

SAURIN (James), the son of an eminent Protestant lawyer, was born at Nismes in 16,7. His father retired, after the repeal of the edict of Nantz, to Geneva, at which place he died. Saurin made no small progress in his studies, but abandoned them for some time, that he might follow arms. In 1694, he made a campaign as a cadet in lord Galloway's company, and soon afterwards procured a pair of colours. But as soon as the duke of Savoy had concluded a peace with France, Saurin quitted a profession for which he never was designed; and, on his return to Geneva again, applied himself to philosophy and divinity, under Turretin and other professors. In 1700 he visited both Holland and England. In this last country he made a long stay: and in 1703 marrying, returned to the Hague in 1705. He was possessed of great talents, to which were added a fine address, a harmonious voice, and a most eloquent unaffected style. He published five volumes of sermons at different times; and since his death, which happend at the Hague Dec. 30, 1730, two other volumes appeared. He also drew up, by the advice of a friend, who was preceptor to the children of George II. when prince of Wales, a "Treatise on Education," to which he prefixed a dedication to the young princes. This, though never printed, was followed by a handsome present from the princess of Wales. He obtained also a pension from the king, to whom he had inscribed the third volume of his sermons. In 1727, he published "The State of Christianity in France." But his most considerable work, and which occasioned much controversy, was, "Discourses historical, critical, and moral, on the most memorable Events of the Old and New Testament."

SAURURUS, in botany: A genus of the tetragynia order, belonging to the heptandria class of plants; and in the natural method ranking under the second order, *Piperitæ*. The calyx is a catkin, with uniflorous scales: there is no corolla; there are four germina, and four monospermous berries.

SAUVAGESIA, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is pentapetalous and fringed; the calyx pentaphyllous; the nectarium the same, having its leaves placed alternately with the petals; the capsule unilocular.

SAUVEUR (Joseph), an eminent French mathematician, born at La Flêche in 1653. He was absolutely dumb until he was seven years of age; and even then his organs of speech did not disengage themselves so freely, but that he was ever after obliged to speak with great deliberation. Mathematics were the only studies he had any relish for, and these he cultivated with extraordinary success; so that he commenced teacher at 20 years of age, and was so soon in vogue, that he had prince Eugene for his scholar. He was made mathematical professor in the royal college in 1686; and ten years after was admitted a member of the Academy of Sciences. He died in 1716; and his writings, which consist rather of detached papers than of connected treatises, are all inserted in the Memoirs of the Academy of Sciences. He was twice married; and by the last wife had a son, who, like himself, was dumb for the first seven years of his life.

SAW, an instrument which serves to cut into pieces several solid matters; as wood, stone, ivory, &c. The best saws are of tempered steel ground bright and smooth: those of iron are only hammer-hardened: hence the first, besides their being stiffer, are likewise found smoother than the last. They are known to be well hammered by the stiff bending of the blade; and to be well and evenly ground, by their bending equally in a bow.

Saw-*fish*. See Pristis.

SAXE (Maurice, Comte de), natural son of Frederic Augustus II. elector of Saxony, king of Poland, and grand-duke of Lithuania, by Aurora countess Konigsmarc, youngest sister of Philip count Konigsmarc, (who was descended from an illustrious family in Sweden, and who fell a sacrifice for an alleged intrigue with the princess of Zell), was born at Dresden in 1696. He discovered an early genius for warlike exercises, neglecting every study but that of war. He accompanied the king his father in all his Polish campaigns, and began to serve in the allied army in the Netherlands in 1708, when, young as he was, he gave pregnant proof of an enterprising genius. He afterwards served in the war against the Swedes in Pomerania, and was made colonel of a regiment of horse. He entered into the Imperial service in 1717, and made several campaigns in Hungary against the Turks; in which he behaved with the greatest bravery, and thereby attracted the regard of prince Eugene of Savoy. In 1720, he visited the court of France, where he obtained a brevet of camp-marshal from the duke of Orleans, then regent of that kingdom. Two years after, he purchased the coloneley of the regiment of Spar; and gradually rose in military honours, from the rank of colonel to that of marshal-general.

While Saxe was residing in France, the States of Courland, foreseeing that their duchy would one day be without a head, duke Ferdinand, the last male of the family of Ketler, being valetudinary, and likely to die without issue, were prevailed on, by foreign influence, to choose him for their sovereign. The minute of election was signed by the States of Mittaw, the capital of Courland, July 5, 1726: but this election having been vigorously opposed by the court of Russia, and also by the republic of Poland, upon both of which the duchy was dependent, he could never make good his pretensions; so that, upon the death of duke Ferdinand in 1736, count Biron, a gentleman of Danish extraction, in the service of Russia, was preferred to him. When a war broke out in Germany, upon the death of the late king of Poland, our count's father, he attended the duke of Berwick, commander in chief of the French army sent into that country, and behaved with unparalleled bravery.—When troubles broke out in the same quarter, upon the death of the emperor Charles VI. he was employed in the French army sent into the empire, to support the pretensions of the elector of Bavaria, and had no inconsiderable hand in storming Prague: by which he acquired the confidence and esteem of that unfortunate prince. When an invasion of Great Britain was projected by the court of France, in 1744, in favour of Charles-Edward, the pretender's eldest son, he was appointed to command the French troops to be employed on that occasion. Both the young pretender and the count had come to Dunkirk, in order to proceed upon the intended expedition; but the design was frustrated by a furious storm, and the vigilance of the British fleet. France having, soon after that event, declared war against Great-Britain, he was appointed commander in chief of the French army in the Netherlands, and promoted to the rank of marshal of France. During the course of the war, he beat the allies in several battles, and made himself master

of the whole Auftrian-Netherlands, with a good part of Dutch Brabant. Such eminent fervices procured him an act of naturalization by the king of France in April 1746. January following, he was raifed to the rank of marfhal-general, an office which had been vacant for many years; and, Jan. 1748, he was conftituted governor-general of the Netherlands, with a large revenue annexed.

After the treaty of peace at Aix-la-Chapelle in 1748, marfhal Saxe, covered with glory, and loaded with the king's bounties, retired to Chambaud in France, where he fpent his time in various employments and amufements: but, being feized with a fever, died Nov. 30, 1750. His corpfe was interred, with great funeral pomp, at the king's expenfe, in the church of St. Thomas at Strafburgh. He was bred a Proteftant, of the Lutheran perfuafion, under the eye of the countefs his mother: and no worldly confideration could ever induce him to change his religion. He had unhappily, like his royal father, early engaged in a feries of amorous adventures; and feveral natural children were the fruits of his rambling amours. Though he had been prevailed on by his mother to marry Victoria, countefs of Lobin, a lady of diftinguifhed birth and beauty, by whom he had a child or two, who died in their infancy; yet, a coldnefs having arifen between them, the marriage was diffolved, on account of adultery committed by the count, with a defign to procure a divorce; and he never afterwards married. His "Reveries, or Memoirs concerning the Art of War," together with other fmall pieces, were tranflated into Englifh, and publifhed at London in 1757, 4to; and republifhed at Edinburgh in 1759, 8vo.

SAXIFRAGA, Saxifrage, in botany. A genus of the digynia order, belonging to the decandria clafs of plants; and in the natural method ranking under the 13th order, *Succulentæ*. The calyx is quinquepartite; the corolla pentapetalous; the capfule biroftrated, unilocular, and polyfpermous.

There are 38 *fpecies*; of which the moft remarkable are, 1. The *granulata*, or white faxifrage, which grows naturally in the meadows in many parts of England. The roots of this plant are like grains of corn, of a reddifh colour without; from which arife kidney-fhaped hairy leaves, ftanding upon pretty long footftalks. The ftalks are thick, a foot high, hairy, and furrowed: thefe branch out from the bottom, and have a few fmall leaves like thofe below, which fit clofe to the ftalk: the flowers terminate the ftalk, growing in fmall clufters; they have five white petals, inclofing ten ftamina and the two ftyles. There is a variety of this with double flowers, which is very ornamental. 2. The *pyramidata*, with a pyramidal ftalk, grows naturally on the mountains of Italy. The leaves are tongue-fhaped, gathered into heads, rounded at their points, and have cartilaginous and fawed borders. The ftalk rifes two feet and a half high, branching out near the ground, forming a natural pyramid to the top. The flowers have five white wedge-fhaped petals and ten ftamina, placed circularly the length of the tube, terminated by roundifh purple fummits. When thefe plants are ftrong, they produce very large pyramids of flowers, which make a fine appearance. 3. The *punctata*, commonly called *London pride* or *none-fo pretty*, grows naturally on the Alps, and alfo in great plenty on a mountain of Ireland called *Mangerton*, in the county of Kerry in that ifland. The roots of this are perennial; the leaves are oblong, oval, and placed circularly at bottom. They have broad, flat, furrowed foot-ftalks, and are deeply crenated at their edges, which are white. The ftalk rifes a foot high, is of a purple colour, ftiff, flender, and hairy. It fends out from the fide on the upper part feveral fhort foot-ftalks, which are terminated by white flowers fpotted with red. 4. The *oppofitifolia*, grows naturally on the Alps, Pyrenees, and Helvetian mountains: it is alfo found pretty plentifully growing upon Ingleborough hill in Yorkfhire, Snowdon in Wales, and fome other places. It is a perennial plant, with ftalks trailing upon the ground, which are feldom more than two inches long, garnifhed with fmall oval leaves ftanding oppofite, which lie over one another like the fcales of fifh: they are of a brown green colour, and have a refemblance of heath. The flowers are produced at the end of the branches, of a deep blue; and thus make a pretty appearance during their continuance, which is great part of March and the beginning of April. All thefe fpecies are eafily propagated by offsets, or by parting their roots.

SAXO-GRAMMATICUS, defcended from an illuftrious Danifh family, was born about the middle of the 12th century.—Stephens, in his edition of Saxo Grammaticus, printed at Soroe, indubitably proves that he muft have been alive in 1156, but cannot afcertain the exact place and time of his birth. See Stephens's *Prolegomena* to the Notes on Saxo-Grammaticus, p. 8, to 24; alfo Holberg, vol. i. p. 269; and Mallet's North. Antiq. vol. i. p. 4. On account of his uncommon learning Saxo was diftinguifhed by the name of *Grammaticus*. He was provoft of the cathedral church of Rofkild, and warmly patronized by the learned and warlike Abfalon, the celebrated archbifhop of Lunden, at whofe inftigation he wrote the Hiftory of Denmark. His epitaph, a dry panegyric in bad Latin verfes, gives no account of the era of his death, which happened, according to Stephens, in 1204. His hiftory, confifting of 16 books, begins from the earlieft account of the Danifh annals, and concludes with the year 1186. According to the opinion of an accurate writer, the firft part, which relates to the origin of the Danes, and the reigns of the antient kings, is full of fables; but the eight laft books, and particularly thofe which regard the events of his own times, deferve the utmoft credit.—He wrote in Latin: the ftyle, if we confider the barbarous age in which he flourifhed, is in general extremely elegant, but rather too poetical for hiftory. Mallet, in his *Hiftoire de Dannemarc*, vol. i. p. 182, fays, "that Sperling, a writer of great erudition, has proved, in contradiction to the affertions of Stephens and others, that Saxo-Grammaticus was fecretary to Abfalon; and that the Saxo provoft of Rofkild was another perfon, and lived earlier."

SAXONY, *Upper*, one of the nine circles of the German empire; bounded on the eaft by Pruffia, Poland, and Silefia; on the fouth by Bavaria, Bohemia, and Franconia; on the weft by the circles of the Upper Rhine and Lower Saxony; and on the north by the Baltic and Lower Saxony. The elector of Saxony is the director. It comprehends the electorate of Saxony, or Saxony Proper, the principality of Anhalt, the landgravate of Thuringia, the marche of Brandenburgh, and the duchy of Pomerania; and thefe are fubdivided into many diftricts, taken notice of in their proper places.

Saxony, *Lower*, one of the nine circles of the German empire; bounded on the north by the Baltic and the duchy of Slefwic, on the weft by the German Ocean and Weftphalia, and on the fouth and eaft by the circles of the Upper Rhine and Upper Saxony. The directors of this circle are the dukes of Magdeburgh, Bremen, and Brunfwick-Lunenburgh. It comprehends the archbifhopric of Magdeburgh, the bifhopric of Hildefheim, the archbifhopric of Bremen, the bifhoprics of Halberftadt, Schwerin, Ratzburgh, Lubec, and Slefwic; the duchies of Brunfwick-Lunenburgh, Lawenburgh, and Mecklenburgh; the principality of Verden, the counties of Reinftein and Blauburg, and the free cities of Hamburgh, Lubec, Goflar, Mulhaufen, and Northaufen.

Saxony, *Proper*, or the electorate of Saxony, in the circle of Upper Saxony, is bounded on the north by the marche of Brandenburgh, on the eaft by Lower Lufatia, on the fouth by Mifnia, and on the weft by the principality of Anhalt. It is 75 miles long and 62 broad, and is a very fertile and trading

country, abounding in mines. It is cut into two unequal parts by the river Elbe; and divided into three principal parts; namely, the duchy of Saxony, of which Wittemberg is the capital; Lusatia, of which Bautzen is the capital; and Misnia, the capital of which (and of the whole electorate) is Dresden.

SAY, or Saye, in commerce, a kind of serge much used abroad for linings, and by the religious for shirts; with us it is used for aprons by several sorts of artificers, being usually dyed green.

SCAB. See Itch.

Scab *in Sheep*. See Sheep.

SCABIOSA, Scabious, in botany: A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 48th order *Aggregatæ*.—The common calyx is polyphyllous; the proper one is double superior; the receptacle is paleaceous or naked. The most remarkable species are, 1. The *arvensis*, or meadow-scabious, grows naturally in many places of Britain. It hath a strong, thick, fibrous root, sending out many branching stalks, which rise to the height of three feet; the lower leaves are sometimes almost entire, and at others they are cut into many segments almost to the midrib. The flowers are produced upon naked footstalks at the end of the branches; they are of a purple colour, and have a faint odour. 2. The *succisa*, or devil's bit, grows naturally in woods and moist places. This has a short tap-root, the end of which appears as if it were bitten or cut off, whence the plant has taken its name. The leaves are oval and spear-shaped, and smooth; the stalks are single, about two feet high, garnished with two leaves at each joint; they generally send out two short foot-stalks from their upper joint, standing opposite, which are terminated by purple flowers.—Both these have been recommended as aperient, sudorific, and expectorant; but the present practice has no dependence on them.

SCABRITA, in botany: A genus of the monogynia order, belonging to the tetrandria class of plants. The corolla is monopetalous, and salver-shaped; there are two seeds emarginated superior; the calyx is truncated.

SCÆVOLA (C. Mucius), a young Roman of illustrious birth, is particularly celebrated in the Roman history for a brave but unsuccessful attempt upon the life of Porsena king of Hetruria, about the year before Christ 504.

Scævola, in botany; a genus of the monogynia order, belonging to the pentandria class of plants. The corolla is monopetalous; the tube slit longitudinally; the border quinquefid and lateral. The fruit is a plum inferior and monospermous; the nucleus bilocular.

SCAFFOLD, among builders, an assemblage of planks and boards, sustained by tressels and pieces of wood fixed in the wall; whereon masons, bricklayers, &c. stand to work, in building high walls, and plasterers in plastering ceilings, &c.

Scaffold, also denotes a timber-work raised in the manner of an amphitheatre, for the more commodious viewing any show or ceremony: it is also used for a little stage raised in some public place, whereon to behead criminals.

SCALA-nova (antiently Neapolis), called by the Turks *Kousbadase*, is situated in a bay, on the slope of a hill, the houses rising one above another, intermixed with minarets and tall slender cypresses. "A street, through which we rode (says Dr. Chandler), was hung with goat-skins exposed to dry, dyed of a most lively red. At one of the fountains is an antient cossin used as a cistern. The port was filled with small craft.—Before it is an old fortress on a rock or islet frequented by gulls and sea-mews. By the water-side is a large and good khan, at which we passed a night on our return. This place belonged once to the Ephesians, who exchanged it with the Samians for a town in Caria."

SCALADO, or Scallade, in the art of war, a furious assault made on the wall or rampart of a city, or other fortified place, by means of ladders, without carrying on works in form, to secure the men.

SCALD-cream, sometimes also called *Clouted-cream*: a curious method of preparing cream for butter, almost peculiar to Devonshire. Dr. Hales, in Philosophical Transactions, volume xlix. p. 342, 1755, part 1st, gives some account of the method of preparing this delicate and luxurious article: other writers also speak of it. With an elucidation or two, we shall nearly quote Mr. Feltham's account from the Gentleman's Magazine, volume lxi. part 2. It is there observed, that the purpose of making scald-cream is for superior butter than can be procured from the usual raw cream, being preferable for flavour and keeping; to which those accustomed are so partial, as seldom to eat any other. As leaden cisterns would not answer for scalding cream, the dairies mostly adopt brass pans, which hold from three to five gallons, for the milk; and that which is put into those pans one morning, stands till the next, when, without disturbing it, it is set over (on a trivet) a steady brisk wood fire devoid of smoke, where it is to remain from seven to fifteen minutes, according to the size of the pan, or the quantity in it: the precise time of removing it from the fire must be particularly attended to, and is when the surface begins to wrinkle or to gather in a little, showing signs of being near the agitation of boiling, which it must by no means do; it is then instantly to be taken off, and placed in the dairy until the next morning, when the fine cream is thrown up, and may be taken for the table, or for butter, into which it is now soon converted by stirring it with the hand. Some know when to remove it from the fire by sounding the pan with the finger, it being then less sonorous; but this is only acquired by experience. Dr. Hales observes, that this method of preparing milk will take off the ill taste it sometimes acquires from the cows feeding on turnips, cabbage, &c.

SCALDS, in the history of literature, a name given by the antient inhabitants of the northern countries to their poets; in whose writings their history is recorded.

SCALE, a mathematical instrument consisting of several lines drawn on wood, brass, silver, &c. and variously divided, according to the purposes it is intended to serve; whence it acquires various denominations, as the *plain scale*, *diagonal scale*, *plotting scale*, &c. See Geometry.

Scale, in music, sometimes denominated a *gamut*, a *diagram*, a *series*, an *order*, a *diapason*. It consists of the regular gradations of sound, by which a composer or performer, whether in rising or descending, may pass from any given tune to another. These gradations are seven. When this order is repeated, the first note of the second is consentaneous with the lowest note of the first; the second of the former with the second of the latter; and so through the whole octave. The second order, therefore, is justly esteemed only a repetition of the first. For this reason the scale, among the moderns, is sometimes limited to an octave; at other times extended to the compass of any particular voice or instrument. It likewise frequently includes all the practical gradations of musical sound, or the whole number of octaves employed in composition or execution, arranged in their natural order.

SCALENE, or Scalenous Triangle, *scalenum*, in geometry, a triangle whose sides and angles are unequal. See Geometry.

SCALENUS, in anatomy. See Anatomy, *Table of the Muscles*.

SCALIGER (Julius Cæsar), a learned critic, poet, physician, and philosopher; was born at the castle of Ripa, in the territories of Verona, in 1484; and is said to have been descended from the antient princes of Verona, though this is not mentioned in the letters of naturalization he obtained in France

in 1528. He learned the firſt rudiments of the Latin tongue in his own country; and in his 12th year was preſented to the emperor Maximilian, who made him one of his pages. He ſerved that emperor 17 years, and gave ſignal proofs of his valour and conduct in ſeveral expeditions. He was preſent at the battle of Ravenna in April 1512, in which he had the misfortune to loſe his father Benedict Scaliger, and his brother Titus; on which his mother died with grief: when being reduced to neceſſitous circumſtances, he entered into the order of the Franciſcans, and applied himſelf to ſtudy at Bologna; but ſoon after changing his mind with reſpect to his becoming a monk, he took arms again, and ſerved in Piedmont. At which time a phyſician perſuaded him to ſtudy phyſic, which he did at his leiſure-hours, and alſo learned Greek; and at laſt the gout determined him, at 40 years of age, to abandon a military life. He ſoon after ſettled at Agen, where he married, and began to apply himſelf ſeriouſly to his ſtudies. He learned firſt the French tongue, which he ſpoke perfectly in three months; and then made himſelf maſter of the Gaſcon, Italian, Spaniſh, German, Hungarian, and Sclavonian: but the chief object of his ſtudies was polite literature. Meanwhile, he ſupported his family by the practice of phyſic. He did not publiſh any of his works till he was 47 years of age; when he ſoon gained a great name in the republic of letters. He had a graceful perſon, and ſo ſtrong a memory, even in his old age, that he dictated to his ſon 200 verſes which he had compoſed the day before, and retained without writing them down. He was ſo charitable, that his houſe was as it were a hoſpital for the poor and ſick; and he had ſuch an averſion to lying, that he would have no correſpondence with thoſe who were given to that vice; but, on the other hand, he had much vanity, and a ſatirical ſpirit, which created him many enemies. He died of a retention of urine in 1551. He wrote in Latin, 1. A Treatiſe on the Art of Poetry. 2. Exercitations againſt Carden: which works are much eſteemed. 3. Commentaries on Ariſtotle's Hiſtory of Animals, and on Theophraſtus on Plants. 4. Some Treatiſes on Phyſic. 5. Letters, Orations, Poems, and other works, in Latin.

Scaliger (Joſeph Juſtus), one of the moſt learned critics and writers of his time; he was the ſon of the former, and was born at Agen in France in 1540. He ſtudied in the college of Bourdeaux; after which his father took him under his own care, and employed him in tranſcribing his poems; by which means he obtained ſuch a taſte for poetry, that before he was 17 years old he wrote a tragedy upon the ſubject of Oedipus, in which he introduced all the poetical ornaments of ſtyle and ſentiment. His father dying in 1558, he went to Paris the year following, with a deſign to apply himſelf to the Greek tongue. For this purpoſe he for two months attended the lectures of Turnebus; but finding that in the uſual courſe he ſhould be a long time in gaining his point, he ſhut himſelf up in his cloſet, and by conſtant application for two years gained a perfect knowledge of that language. After which he applied to the Hebrew, which he learned by himſelf with great facility. He made no leſs progreſs in the ſciences; and his writings procured him the reputation of one of the greateſt men of that or any other age. He embraced the reformed religion at 22 years of age. In 1563, he attached himſelf to Lewis Caſteignier de la Roch Pozay, whom he attended in ſeveral journeys; and in 1593, was invited to accept of the place of honorary profeſſor of the univerſity of Leyden; which he complied with. He died of a dropſy in that city in 1609. He was a man of great temperance; was never married; and was ſo cloſe a ſtudent, that he often ſpent whole days in his ſtudy without eating; and though his circumſtances were always very narrow, he conſtantly refuſed the preſents that were offered him. He publiſhed many works; the principal of which are, 1. Notes on Seneca's Tragedies, on Varro, Auſonius, Pompeius Feſtus, &c. 2. His Latin Poems. 3. A Treatiſe *de Emendatione Temporum*. 4. Euſebius's Chronicle, with notes. 5. *Canones Iſagogici*; and many other works. The collections entitled *Scaligeriana* were collected from his converſations by one of his friends; and, being ranged into alphabetical order, were publiſhed by Iſaac Voſſius.

SCALLOP, in ichthyology. See Pecten. In the Highlands of Scotland, the great ſcallop ſhell is made uſe of for the ſkimming of milk. In old times, it had a more honourable place; being admitted into the halls of heroes, and was the cup of their feſtivity when the tribe aſſembled in the hall of their chieftain.

SCALPEL, in ſurgery, a kind of knife uſed in anatomical diſſections and operations in ſurgery.

SCALPER, or Scalping-Iron, a ſurgeon's inſtrument uſed for ſcraping foul carious bones.

SCALPING, in military hiſtory, a barbarous cuſtom, in practice among the Indian warriors, of taking off the tops of the ſcalps of the enemies' ſkulls with their hair on. They preſerve them as trophies of their victories, and are rewarded by their chiefs according to the number of ſcalps they bring in.

SCALPRA Dentalia, inſtruments uſed by the ſurgeons to take off thoſe black, livid, or yellow cruſts which infeſt the teeth, and not only looſen and deſtroy them, but taint the breath. See Surgery.

SCAMMONY, a concreted vegetable juice of a ſpecies of convolvulus, partly of the reſin and partly of the gum kind. See Convolvulus. The beſt ſcammony comes from Aleppo, in light ſpongy maſſes, eaſily friable, of a ſhining aſh-colour verging to black; when powdered, of a light gray or whitiſh colour: an inferior ſort is brought from Smyrna, in more compact ponderous pieces, of a darker colour, and full of ſand and other impurities. This juice is chiefly of the reſinous kind; rectified ſpirit diſſolves five ounces out of ſix, the remainder is a mucilaginous ſubſtance mixed with droſs: proof-ſpirit totally diſſolves it, the impurities only being left. It has a faint unpleaſant ſmell, and a bitteriſh, ſomewhat acrimonious, taſte.

Scammony is an efficacious and ſtrong purgative. Some have condemned it as unſafe, and laid ſundry ill qualities to its charge; the principal of which is, that its operation is uncertain, a full doſe proving ſometimes ineffectual, whilſt at others a much ſmaller one occaſions dangerous hypercatharſes. This difference, however, is owing entirely to the different circumſtances of the patient, and not to any ill quality or irregularity of operation of the medicine: where the inteſtines are lined with an exceſſive load of mucus, the ſcammony paſſes through without exerting itſelf upon them; where the natural mucus is deficient, a ſmall doſe of this or any other reſinous cathartic irritates and inflames. Many have endeavoured to abate the force of this drug; and if triturated with ſugar or with almonds, it becomes ſufficiently ſafe and mild in operation. It may likewiſe be conveniently diſſolved by trituration in a ſtrong decoction of liquorice, and then poured off from the fæces; the college of Wirtemberg aſſures us, that by this treatment it becomes mildly purgative, without being attended with gripes, or other inconveniences; and that it likewiſe proves inoffenſive to the palate. The common doſe of ſcammony is from three to twelve grains.

SCANDALUM Magnatum, in law, is a defamatory ſpeech or writing to the injury of a perſon of dignity; for which a writ that bears the ſame name is granted for the recovery of damages.

SCANDERBEG, the ſurname of George Caſtriot king of Albania, a province of Turkey in Europe, dependent on the Ottoman empire. He was delivered up with his three elder brothers as hoſtages, by their father, to Amurath II. ſultan of the Turks, who poiſoned his brothers, but ſpared him on ac-

count of his youth, being likewise pleased with his juvenile wit and amiable person. In a short time he became one of the most renowned generals of the age; and revolting from Amurath, he joined Hunniade Corvin, a most formidable enemy to the Ottoman power. He defeated the sultan's army, took Amurath's secretary prisoner, and obliged him to sign and seal an order to the governor of Croia, the capital of Albania, to deliver up the citadel and city to the bearer of that order, in the name of the sultan. With this forged order he repaired to Croia; and thus recovered the throne of his ancestors, and maintained the independency of his country against the numerous armies of Amurath and his successor Mohammed II. who was obliged to make peace with this hero in 1461. He then went to the assistance of Ferdinand of Arragon, at the request of Pope Pius II. and by his assistance Ferdinand gained a complete victory over his enemy the count of Anjou. Scanderbeg died in 1467.

SCANDEROON. See Alexandretta.

SCANDINAVIA, a general name for the countries of Norway, Sweden, and Denmark, antiently under the dominion of one prince. The inhabitants of these countries, in former times, were excessively addicted to war. From their earliest years they applied themselves to the military art, and accustomed themselves to cold, fatigue, and hunger. Even the very sports of youth and childhood were dangerous. They consisted in taking frightful leaps, climbing up the steepest rocks, fighting naked with offensive weapons, wrestling with the utmost fury; so that it was usual to see them grown up to be robust men, and terrible in the combat, at the age of 15. At this early age the young men became their own masters; which they did by receiving a sword, a buckler, and a lance. This ceremony was performed at some public meeting. One of the principal men of the assembly named the youth in public; after which he was obliged to provide for his own subsistence, and was either now to live by hunting, or by joining in some incursion against the enemy. Great care was taken to prevent the young men from too early connections with the female sex; and indeed they could have no hope to gain the affection of the fair, but in proportion to the courage and address they had shown in their military exercises. Accordingly, in an antient song, we find Bartholin, king of Norway, extremely surprised that his mistress should prove unkind, as he could perform eight different exercises.—The children were generally born in camps; and being inured from their infancy to behold nothing but arms, effusion of blood, and slaughter, they imbibed the cruel disposition of their fathers, and, when they broke forth upon other nations, behaved rather like furies than like human creatures. The laws of this people, in some measure, resembled those of the antient Lacedemonians.

SCANDIX, Shepherds Needle, or *Venus Comb*, in botany: A genus of the digynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The corolla is radiating; the fruit subulated; the petals emarginated; the florets of the disc frequently male. The most remarkable species is the *odorata*, with angular furrowed seeds. It is a native of Germany; and has a very thick perennial root, composed of many fibres, of a sweet aromatic taste like aniseed, from which come forth many large leaves that branch out somewhat like those of fern, from whence it is named *sweet fern*. The stalks grow four or five feet high, are fistulous and hairy; the flowers are disposed in an umbel at the top of the stalk, are of a white colour, and have a sweet aromatic scent. This species is easily propagated by seeds, which, if permitted to scatter, will supply an abundance of young plants, that may be put into any part of the garden, and require no care.

SCANNING, in poetry, the measuring of verse by feet, in order to see whether or not the quantities be duly observed.—The term is chiefly used in Greek and Latin verses. Thus, an hexameter verse is scanned by resolving it into six feet; a pentameter, by resolving it into five feet, &c.

SCANTO, or Spavento, a sudden impression of horror upon the mind and body. It is extremely dreaded by the inhabitants of Sicily; and the wild ideas of the vulgar part of the inhabitants respecting it are almost incredible, and their dread of a sudden shock is no less surprising. There is scarce a symptom, disorder, or accident, they do not think may befall the human frame in consequence of the scanto. They are persuaded that a man who has been frightened only by a dog, a viper, scorpion, or any other creature, which he has an antipathy to, will soon be seized with the same pains he would really feel, had he been torn with their teeth, or wounded with their venemous sting; and that nothing can remove these nervous imaginary pangs but a strong dose of dilena, a species of cantharides found in Sicily.

SCAPE goat, in the Jewish antiquities, the goat which was set at liberty on the day of solemn expiation. For the ceremonies on this occasion, see Levit. xvi. 5, 6, &c. Some say, that a piece of scarlet cloth, in form of a tongue, was tied on the forehead of the scape-goat. *Hoff. Lex. Univ. in voc. Lingua.*

Many have been the disputes among the interpreters concerning the meaning of the word *scape-goat*; or rather of *azazel*, for which *scape-goat* is put in our version of the Bible. Spencer is of opinion, that azazel is a proper name, signifying the devil or evil dæmon. See his reasons in his book *De leg. Hebr. ritual.* dissert. viii. Among other things, he observes, that the antient Jews used to substitute the name *Samaël* for *Azazel*; and many of them have ventured to affirm, that at the feast of expiation they were obliged to offer a gift to Samaël to obtain his favour. Thus also the goat, sent into the wilderness to Azazel, was understood to be a gift or oblation. Some Christians have been of the same opinion. But Spencer thinks that the genuine reasons of the ceremony were, 1. That the goat, loaded with the sins of the people, and sent to Azazel, might be a symbolical representation of the miserable condition of sinners. 2. God sent the goat thus loaded to the evil dæmons, to show that they were impure, thereby to deter the people from any conversation or familiarity with them. 3. That the goat sent to Azazel sufficiently expiating all evils, the Israelites might the more willingly abstain from the expiatory sacrifices of the Gentiles.

SCAPULA, in anatomy, the shoulder, or shoulder bone. See Anatomy.

Scapula (John), the reputed author of a Greek lexicon, studied at Lausanne. His name is recorded in the annals of literature, neither on account of his talents nor learning, nor virtuous industry, but for a gross act of disingenuity and fraud which he committed against an eminent literary character of the 16th century. Being employed by Henry Stephens as a corrector to his press while he was publishing his *Thesaurus linguæ Græcæ*, Scapula extracted those words and explications which he reckoned most useful, comprised them in one volume, and published them as an original work, with his own name. The compilation and printing of the Thesaurus had cost Stephens immense labour and expense; but it was so much admired by those learned men to whom he had shown it, and seemed to be of such essential importance to the acquisition of the Greek language, that he reasonably hoped his labour would be crowned with honour, and the money he had expended would be repaid by a rapid and extensive sale. But before his work came abroad, Scapula's abridgment appeared; which, from its size and price, was quickly purchased, while the Thesaurus itself lay neglected in the author's hands. The consequence was, a bankruptcy on the part of Stephens, while he who had occasioned it was enjoying the fruits of his treachery. Scapula's Lexicon was first printed in 1579, in 4to. It was afterwards enlarged, and published in folio. It has gone through several editions, while the valuable work of Stephens

has never been reprinted. Its succefs is, however, not owing to its fuperior merit, but to its price and more commodious fize. Stephens charges the author with omitting a great many important articles. He accufes him of mifunderftanding and perverting his meaning; and of tracing out abfurd and trifling etymologies which he himfelf had been careful to avoid. He compofed the following epigram on Scapula:

Quidam επιτεμνων *me* capulo *tenus abdidit enfem*
Æger eram a Scapulis, *fanus et huc redeo.*

Doctor Bufby, fo much celebrated for his knowledge of the Greek language, and his fuccefs in teaching it, would never permit his fcholars at Weftminfter fchool to make ufe of Scapula.

SCAPULAR, in anatomy, the name of two pair of arteries, and as many veins.

Scapular, or *Scapulary*, a part of the habit of feveral religious orders in the church of Rome, worn over the gown as a badge of peculiar veneration for the bleffed Virgin. It confifts of two narrow flips or breadths of cloth covering the back and the breaft, and hanging down to the feet. The devotees of the fcapulary celebrate its feftival on the 10th of July.

SCARABÆUS, the Beetle, in zoology, a genus of infects in the coleoptera order: the antennæ of the beetles are of a clavated figure, and fiffile longitudinally; and their legs are frequently dentated. There are 87 fpecies; all, however, concurring in one common formation of having cafes to their wings, which are the more neceffary to thofe infects, as they often live under the furface of the earth, in holes, which they dig out by their own induftry. The cafes prevent the various injuries their real wings might fuftain by rubbing or crufhing againft the fides of their abode. Thefe, though they do not affift flight, yet keep the internal wings clean and even, and produce a loud buzzing noife when the animal rifes in the air.

If we examine the formation of all animals of the beetle kind, we fhall find, as in fhell fifh, that their bones are placed externally, and their mufcles within. Thefe mufcles are formed very much like thofe of quadrupeds; and are formed with fuch furprifing ftrength, that, bulk for bulk, they are a thoufand times ftronger than thofe of a man. The ftrength of thefe mufcles is of ufe in digging the animal's fubterraneous abode, whither it moft frequently returns, even after it becomes a winged infect capable of flying.

Befides the difference which refults from the fhape and colour of thefe animals, the fize alfo makes a confiderable one; fome beetles being not larger than the head of a pin; while others, fuch as the elephant beetle, are as big as one's fift. But the greateft difference among them is, that fome are produced in a month, and in a fingle feafon go through all the ftages of their exiftence; while others take near four years to their production, and live as winged infects a year more.

The may-bug, dorr-beetle, or cock-chaffer, has, like all the reft, a pair of cafes to its wings, which are of a reddifh brown colour, fprinkled with a whitifh duft, which eafily comes off. In fome years their necks are feen covered with a red plate, and in others with a black; thefe, however, are diftinct forts, and their difference is by no means accidental. The forelegs are very fhort, and the better calculated for burrowing in the ground, where this infect makes its retreat. It is well known, for its evening buzz, to children; but ftill more formidably introduced to the acquaintance of the hufbandman and gardener, for in fome feafons it has been found to fwarm in fuch numbers as to eat up every vegetable production.

The two fexes in the may-bug are eafily diftinguifhed from each other, by the fuperior length of the tufts, at the end of the horns, in the male. They begin to copulate in fummer; and at that feafon they are feen joined together for a confiderable time. They fly about in this ftate, the one hanging pendant from the tail of the other. It has been fuppofed, that, like fnails, they are hermaphrodites, as there feems to be a mutual infertion.

The female being impregnated, quickly falls to boring a hole into the ground, wherein to depofit her burden. This is generally about half a foot deep; and in it fhe places her eggs, which are of an oblong fhape, with great regularity, one by the other. They are of a bright yellow colour, and no way wrapped up in a common covering, as fome have imagined. When the female is lightened of her burthen, fhe again afcends from her hole, to live, as before, upon leaves and vegetables, to buzz in the fummer evening, and lie hid among the branches of trees in the heat of the day.

In about three months after thefe eggs have been thus depofited in the earth, the contained infect begins to break its fhell, and a fmall grub or maggot crawls forth, and feeds upon the roots of whatever vegetable it happens to be neareft. All fubftances, of this kind, feem equally grateful; yet it is probable the mother infect has a choice among what kind of vegetables fhe fhall depofit her young. In this manner thefe voracious creatures continue in the worm ftate for more than three years, devouring the roots of every plant they approach, and making their way under ground in queft of food with great difpatch and facility. At length they grow to above the fize of a walnut, being a great white thick maggot with a red head, which is feen moft frequently in new turned earth, and which is fo eagerly fought after by birds of every fpecies. When largeft, they are found an inch and a half long, of a whitifh yellow colour; with a body confifting of twelve fegments or joints, on each fide of which there are nine breathing holes, and three red feet. The head is larger in proportion to the body, of a reddifh colour, with a pincer before, and a femicircular lip, with which it cuts the roots of plants, and fucks out their moifture. As this infect lives entirely under ground, it has no occafion for eyes, and accordingly it is found to have none; but is furnifhed with two feelers, which, like the crutch of a blind man, ferve to direct its motions. Such is the form of this animal, that lives for years in the worm ftate under ground, ftill voracious, and every year changing its fkin.

It is not till the end of the fourth year that this extraordinary infect prepares to emerge from its fubterraneous abode, and even this is not effected but by a tedious preparation. About the latter end of autumn, the grub begins to perceive the approaches of its transformation: it then buries itfelf deeper and deeper in the earth, fometimes fix feet beneath the furface; and there forms itfelf a capacious apartment, the walls of which it renders very fmooth and fhining by the excretions of its body. Its abode being thus formed, it begins foon after to fhorten itfelf, to fwell, and to burft its laft fkin in order to affume the form of a chryfalis. This, in the beginning, appears of a yellowifh colour, which heightens by degrees, till at laft it is feen nearly red. Its exterior form plainly difcovers all the veftiges of the future winged infect, all the fore parts being diftinctly feen; while, behind, the animal feems as if wrapped in fwaddling clothes.

The young may-bug continues in this ftate for about three months longer; and it is not till the beginning of January that the aurelia divefts itfelf of all its impediments, and becomes a winged infect completely formed. Yet ftill the animal is far from attaining its natural ftrength, health, and appetite. It undergoes a kind of infant imbecility: and unlike moft other infects, that the inftant they become flies are arrived at their ftate of full perfection, the may-bug continues feeble and fickly. Its colour is much brighter than in the perfect animal; all its parts are foft; and its voracious nature feems for a while to have entirely forfaken it. As the animal is very often found in this ftate, it is fuppofed, by thofe unacquainted with its real hiftory that the old ones, of the former feafon, have buried themfelves for the winter, in order to revifit the fun the enfuing fummer. But the fact is, the old one never furvives the feafon; but

dies, like all the other winged tribe of infects, from the feverity of cold in winter.

About the latter end of May, thefe infects, after having lived for four years under ground, burft from the earth when the firft mild evening invites them abroad. They are at that time feen rifing from their long imprifonment, from living only upon roots, and imbibing only the moifture of the earth, to vifit the mildnefs of the fummer air, to choofe the fweeteft vegetables for their banquet, and to drink the dew of the evening. Wherever an attentive obferver then walks abroad, he will fee them burfting up before him in his pathway, like ghofts on a theatre. He will fee every part of the earth, that had its furface beaten into hardnefs, perforated by their egreffion. When the feafon is favourable for them, they are feen by myriads buzzing along, hitting againft every object that intercepts their flight. The mid-day fun, however, feems too powerful for their conftitutions: they then lurk under the leaves and branches of fome fhady tree; but the willow feems particularly their moft favourite food; there they lurk in clufters, and feldom quit the tree till they have devoured all its verdure. In thofe feafons which are favourable to their propagation, they are feen in an evening as thick as flakes of fnow, and hitting againft every object with a fort of capricious blindnefs. Their duration, however, is but fhort, as they never furvive the feafon. They begin to join fhortly after they have been let loofe from their prifon; and when the female is impregnated, fhe cautioufly bores a hole in the ground, with an inftrument fitted for that purpofe with which fhe is furnifhed at the tail; and there depofits her eggs, generally to the number of threefcore. If the feafon and the foil be adapted to their propagation, thefe foon multiply as already defcribed, and go through the various ftages of their contemptible exiftence. This infect, however, in its worm ftate, though prejudical to man, makes one of the chief repafts of the feathered tribe, and it is generally the firft nourifhment with which they fupply their young. Hogs will root up the land for them, and at firft eat them greedily; but feldom meddle with them a fecond time. Rooks are particularly fond of thefe worms, and devour them in great numbers. The inhabitants of the county of Norfolk, fome time fince, went into the practice of deftroying their rookeries, but in proportion as they deftroyed one plague, they were peftered with a greater; and thefe infects multiplied in fuch an amazing abundance, as to deftroy not only the verdure of the fields, but even the roots of vegetables not yet fhot forth. One farm in particular was fo injured by them in the year 1751, that the occupier was not able to pay his rent; and the landlord was not only content to lofe his income for that year, but alfo gave money for the fupport of the farmer and his family. In Ireland they fuffered fo much by thefe infects, that they came to a refolution of fetting fire to a wood, of fome extent, to prevent their mifchievous propagation.

"Neither the fevereft frofts in our climate (fays Mr. Rack), nor even keeping them in water, will kill them. I have kept fome in water near a week; they appeared motionlefs; but on expofing them to the fun and air a few hours, they recovered, and were as lively as ever. Hence it is evident they can live without air. On examining them with a microfcope, I could never difcover any organs for refpiration, or perceive any pulfation. When numerous, they are not deftroyed without great difficulty; the beft method is, to plough up the land in thin furrows, and employ children to pick them up in bafkets; and then ftrew falt and quick lime, and harrow in. About 30 years fince I remember many farmers crops in Norfolk were almoft ruined by them in their grub ftate; and in the next feafon, when they took wing, the trees and hedges in many parifhes were ftripped bare of their leaves as in winter. At firft the people ufed to brufh them down with poles, and then fweep them up and burn them. One farmer made oath that he gathered 80 bufhels; but their number feemed not much leffened, except in his own fields."

The fcarabæus carnifex, which the Americans call the *tumble-dung*, particularly demands our attention. It is all over of a dufky black, rounder than thofe animals are generally found to be, and fo ftrong, though not much larger than the common black beetle, that if one of them be put under a brafs candleftick, it will caufe it to move backwards and forwards, as if it were by an invifible hand, to the admiration of thofe who are not accuftomed to the fight: but this ftrength is given it for much more ufeful purpofes than thofe of exciting human curiofity; for there is no creature more laborious, either in feeking fubfiftence, or providing a proper retreat for its young. They are endowed with fagacity to difcover fubfiftence by their excellent fmelling, which directs them in flights to excrements juft fallen from man or beafts, on which they inftantly drop, and fall unanimoufly to work in forming round balls or pellets thereof, in the middle of which they lay an egg. Thefe pellets, in September, they convey three feet deep in the earth, where they lie till the approach of fpring, when the eggs are hatched and burft their nefts, and the infects find their way out of the earth. They affift each other with indefatigable induftry in rolling thefe globular pellets to the place where they are to be buried. This they are to perform with the tail foremoft, by raifing up their hinder part, and fhoving along the ball with their hind feet. They are always accompanied with other beetles of a larger fize, and of a more elegant ftructure and colour. The breaft of this is covered with a fhield of a crimfon colour, and fhining like metal; the head is of the like colour, mixed with green; and on the crown of the head ftands a fhining black horn, bending backwards. Thefe are called the *kings of the beetles*; but for what reafon is uncertain, fince they partake of the fame dirty drudgery with the reft.

The *elephant-beetle* is the largeft of this kind hitherto known, and is found in South America, particularly in Guiana and Surinam, as well as about the river Oroonoko. It is of a black colour: and the whole body is covered with a very hard fhell, full as thick and as ftrong as that of a fmall crab. Its length, from the hinder part to the eyes, is almoft four inches; and from the fame part to the end of the probofcis or trunk, four inches and three quarters. The tranfverfe diameter of the body is two inches and a quarter; and the breadth of each elytron, or cafe for the wings, is an inch and three-tenths. The antennæ or feelers are quite horny; for which reafon the probofcis or trunk is moveable at its infertion into the head, and feems to fupply the place of feelers; the horns are eight-tenths of an inch long, and terminate in points. The probofcis is an inch and a quarter long, and turns upwards; making a crooked line, terminating in two horns, each of which is near a quarter of an inch long; but they are not perforated at the end like the probofcis of other infects. About four tenths of an inch above the head, or that fide next the body, is a prominence or fmall horn; which, if the reft of the trunk were away, would caufe this part to refemble the horn of a rhinoceros. There is indeed a beetle fo called; but then the horn or trunk has no fork at the end, though the lower horn refembles this. The feet are all forked at the end, but not like lobfters' claws. See 2d plate 1.

SCARBOROUGH, a feaport and borough in the N. riding of Yorkfhire, with a market on Thurfday. It is feated on a fteep rock, near which are fuch craggy cliffs that it is almoft inacceffible on every fide. On the top of this rock is a large green plain, with a little well of frefh water fpringing out of the rock. It is greatly frequented on account of its mineral waters, called the Scarborough Spa, and alfo for fea-bathing; on which account it is much improved in the number and beauty of its buildings. The fpring was under the cliff, part of which fell down in 1737, and the water was loft; but in clearing away the ruins, in order to rebuild the wharf, it was recovered, to the great joy of the town. Scarbororgh fends two members to parliament,

has a good harbour, possesses a considerable trade, and is much enlarged in the fisheries. It is 36 miles north-east of York, and 237 N. of London. W. lon. 0. 15. N. lat. 54. 18.

SCARDONA, a town of Turkish Dalmatia, seated on the Cherca, with a bishop's see. It has been often taken and retaken by the Turks and Venetians, and these last ruined the fortifications, and its principal buildings, in 1537; but the Turks have since put it in a state of defence. It is 35 miles north-east of Spalatto. E. lon. 17. 1. N. lat. 44. 29.

SCARIFICATION, in surgery, the operation of making several incisions in the skin by means of lancets or other instruments, particularly the cupping instrument. See SURGERY.

SCARLET, a beautiful bright redcolour. In paintingin water colours, minium mixed with a little vermilion produces a good scarlet: but if a flower in a print is to be painted a scarlet colour, the lights as well as the shades should be covered with minium, and the shaded parts finished with carmine, which will produce an admirable scarlet.

SCARLET-Fever. See MEDICINE.

SCARP, in fortification, is the interior talus or slope of the ditch next the place, at the foot of the rampart.

SCARP, in heraldry, the scarf which military commanders wear for ornament. It is borne somewhat like a battoon sinister, but is broader than it, and is continued out to the edges of the field, whereas the battoon is cut off at each end.

SCARPANTO, an island of the Archipelago, and one of the Sporades, lying to the south-west of the isle of Rhodes, and to the north-east of that of Candia. It is about 22 miles in length and 8 in breadth; and there are several high mountains. It abounds in cattle and game; and there are mines of iron, quarries of marble, with several good harbours. The Turks are masters of it, but the inhabitants are Greeks.

SCARPE, a river of the Netherlands, which has its source near Aubigny in Artois, where it washes Arras and Douay; after which it runs on the confines of Flanders and Hainault, pn; by St. Amand, and a little after falls into the Scheldt.

SCARRON (PAUL), a famous burlesque writer, was the son of a counsellor in parliament, and was born at Paris about the year 1710, or in the beginning of the succeeding year. His father marrying a second time, he was compelled to assume the ecclesiastical profession. At the age of 24 he visited Italy, where he freely indulged in licentious pleasures. After his return to Paris he persisted in a life of dissipation till a long and painful disease convinced him that his constitution was almost worn out. At length when engaged in a party of pleasure at the age of 27, he lost *the use of those legs which danced so gracefully, and of those hands which could paint and play on the lute with so much elegance.* In the year 1638 he was attending the carnival at Mens, of which he was a canon. Having dressed himself one day as a savage, his singular appearance excited the curiosity of the children of the town. They followed him in multitudes, and he was obliged to take shelter in a marsh. This wet and cold situation produced a numbness which totally deprived him of the use of his limbs; but notwithstanding this misfortune he continued gay and cheerful. He took up his residence at Paris, and by his pleasant humour soon attracted to his house all the men of wit about the city. The loss of his health was followed by the loss of his fortune. On the death of his father he entered into a process with his mother-in-law. He pleaded the cause in a ludicrous manner, though his whole fortune depended on the decision. He accordingly lost the cause. Mademoiselle de Hautefort, compassionating his misfortunes, procured for him an audience of the queen. The poet requested to have the title of *Valetudinarian* to her majesty. The queen smiled, and Scarron considered the smile as the commission to his new office. He therefore assumed the title of *Scarron, by the grace of God, unworthy valetudinarian to the queen.*

Cardinal Mazarine gave him a pension of 500 crowns; but that minister having received disdainfully the dedication of his *Typhon*, the poet immediately wrote a *Mazarinade*, and the pension was withdrawn. He then attached himself to the prince of Condé, and celebrated his victories. He at length formed the extraordinary resolution of marrying, and was accordingly, in 1651, married to Mademoiselle d'Aubigné (afterwards the famous Madam de Maintenon), who was then only 16 years of age. "At that time (says Voltaire) it was considered as a great acquisition for her to gain for a husband a man who was disfigured by nature, impotent, and very little enriched by fortune." When Scarron was questioned about the contract of marriage, he said he acknowledged to the bride two large invincible eyes, a very beautiful shape, two fine hands, and a large portion of wit. The notary demanded what dowry he would give her? Immediately replied Scarron, "The names of the wives of kings die with them, but the name of Scarron's wife shall live for ever." She restrained by her modesty his indecent buffooneries, and the good company which had formerly resorted to his house were not less frequent in their visits. Scarron now became a new man. He became more decent in his manners and conversation: and his gaiety, when tempered with moderation, was still more agreeable. But, in the mean time, he lived with so little œconomy, that his income was soon reduced to a small annuity, and his marquisate of Quinet. By the marquisate of Quinet, he meant the revenue he derived from his publications, which were printed by one Quinet. He was accustomed to talk to his superiors with great freedom in his jocular style. In the dedication to his *Don Japhet d'Armenie*, he thus addresses the king: "I shall endeavour to persuade your majesty, that you would do yourself no injury were you to do me a small favour; for in that case I should become more gay: if I should become more gay, I should write sprightly comedies: and if I should write sprightly comedies, your majesty would be amused, and thus your money would not be lost. All this appears so evident, that I should certainly be convinced of it if I were as great a king as I am now a poor unfortunate man."

Though Scarron wrote comedies, he had neither time nor patience to study the rules and models of dramatic poetry. Aristotle and Horace, Plautus and Terence, would have frightened him; and perhaps he did not know that there was ever such a person as Aristophanes. He saw an open path before him, and he followed it. It was the fashion of the times to pillage the Spanish writers. Scarron was acquainted with that language, and he found it easier to use the materials which were already prepared, than to rack his brain in inventing a subject; a restraint to which a genius like his could not easily submit. As he borrowed liberally from the Spanish writers, a dramatic piece did not cost him much labour. His labour consisted not in making his comic characters talk humorously, but in keeping up serious characters: for the serious was a foreign language to him. The great success of his *Jodelet Maitre* was a vast allurement to him. The comedians who acted it eagerly requested more of his productions. They were written without much toil, and they procured him large sums. They served to amuse him. If it be necessary to give more reasons for Scarron's readiness to engage in these works, abundance may be had. He dedicated his books to his sister's greyhound bitch; and when she failed him, he dedicated them to a certain Monseigneur, whom he praised higher, but did not much esteem. When the office of historiographer became vacant, he solicited for it without success. At length Fouquet gave him a pension of 1600 livres. Christina queen of Sweden having come to Paris, was anxious to see Scarron. "I permit you (said she to Scarron) to fall in love with me. The queen of France has made you her valetudinarian, and I create you my *Roland*."

Scarron did not long enjoy that title: he was ſeized with ſo violent a hiccough, that every perſon thought he would have expired. "If I recover (he ſaid), I will make a fine ſatire on the hiccough." His gaiety did not forſake him to the laſt. Within a few minutes of his death, when his domeſtics were ſhedding tears about him, "My good friends (ſaid he), I ſhall never make you weep ſo much for me as I have made you laugh." Juſt before expiring, he ſaid, "I could never believe before that it is ſo eaſy to laugh at death." He died on the 14th of October 1660, in the 51ſt year of his age.

His works have been collected and publiſhed by Bruzen de la Martiniere, in 10 vols. 12mo, 1737. There are, 1. The Eneid traveſtied, in 8 books. It was afterwards continued by Moreau de Braſey. 2. Typhon, or the Gigantomachia, 3. Many comedies; as, Jodelet, or the Maſter Valet; Jodelet cuffed; Don Japhet d'Armenie; The Ridiculous Heir; Every Man his own Guardian; The Fooliſh Marquis; The Scholar of Salamanca; The Falſe Appearance; The Prince Corſaire, a tragi-comedy. Beſides theſe, he wrote other pieces in verſe. 4. His Comic Romance in proſe, which is the only one of his works that deſerves attention. It is written with much purity and gaiety, and has contributed not a little to the improvement of the French language. Scarron had great pleaſure in reading his works to his friends as he compoſed them: he called it trying his works. Segrais and another of his friends coming to him one day, "Take a chair (ſays Scarron to them) and ſit down, that I may examine my Comic Romance." When he obſerved the company laugh, "Very well (ſaid he), my book will be well received ſince it makes perſons of ſuch delicate taſte laugh." Nor was he deceived. His Romance had a prodigious run. It was the only one of his works that Boileau could ſubmit to read. 5. Spaniſh Novels tranſlated into French. 6. A volume of Letters. 7. Poems; conſiſting of Songs, Epiſtles, Stanzas, Odes, and Epigrams. The whole collection abounds with ſprightlineſs and gaiety. Scarron can raiſe a laugh in the moſt ſerious ſubjects; but his ſallies are rather thoſe of a buffoon than the effuſions of ingenuity and taſte. He is continually falling into the mean and the obſcene. If we ſhould make any exception in favour of ſome of his comedies, of ſome paſſages in his Eneid traveſtied, and his Comic Romance, we muſt acknowledge that all the reſt of his works are only fit to be read by footmen and buffoons. It has been ſaid that he was the moſt eminent man in his age for burleſque. This might make him an agreeable companion to thoſe who choſe to laugh away their time; but as he has left nothing that can inſtruct poſterity, he has but little title to poſthumous fame.

SCENE, in its primary ſenſe, denoted a theatre, or the place where dramatic pieces and other public ſhows were exhibited; for it does not appear that the antient poets were at all acquainted with the modern way of changing the ſcenes in the different parts of the play, in order to raiſe the idea of the perſons repreſented by the actors being in different places.

The original ſcene for acting of plays was as ſimple as the repreſentations themſelves: it conſiſted only of a plain plot of ground proper for the occaſion, which was in ſome degree ſhaded by the neighbouring trees, whoſe branches were made to meet together, and their vacancies ſupplied with boards, ſticks, and the like; and to complete the ſhelter, theſe were ſometimes covered with ſkins, and ſometimes with only the branches of other trees newly cut down, and full of leaves. Afterwards more artificial ſcenes, or ſcenical repreſentations, were introduced, and paintings uſed inſtead of the objects themſelves. Scenes were then of three ſorts; tragic, comic, and ſatyric. The tragic ſcene repreſented ſtately magnificent edifices, with decorations of pillars, ſtatues, and other things ſuitable to the palaces of kings: the comic exhibited private houſes with balconies and windows, in imitation of common buildings: and the ſatyric was the repreſentation of groves, mountains, dens, and other rural appearances; and theſe decorations either turned on pivots, or ſlid along grooves, as thoſe in our theatres.

To keep cloſe to nature and probability, the ſcene ſhould never be ſhifted from place to place in the courſe of the play: the antients were pretty ſevere in this reſpect, particularly Terence, in ſome of whoſe plays the ſcene never ſhifts at all, but the whole is tranſacted at the door of ſome old man's houſe, whither with inimitable art he occaſionally brings the actors. The French are pretty ſtrict with reſpect to this rule; but the Engliſh pay very little regard to it.

Scene is alſo a part or diviſion of a dramatic poem. Thus plays are divided into acts, and acts are again ſubdivided into ſcenes; in which ſenſe the ſcene is properly the perſons preſent at or concerned in the action on the ſtage at ſuch a time: whenever, therefore, a new actor appears, or an old one diſappears, the action is changed into other hands; and therefore a new ſcene then commences. It is one of the laws of the ſtage, that the ſcenes be well connected; that is, that one ſucceed another in ſuch a manner as that the ſtage be never quite empty till the end of the act. See POETRY.

SCENOGRAPHY, (from the Greek, σκηνη *ſcene*, and γραφη *deſcription*), in perſpective, a repreſentation of a body on a perſpective plane; or a deſcription thereof in all its dimenſions, ſuch as it appears to the eye. See PERSPECTIVE.

SCEPTIC, σκεπτικος, from σκεπτομαι, "I conſider, look about, or deliberate," properly ſignifies *conſiderative* and *inquiſitive*, or one who is always weighing reaſons on one ſide, and the other without ever deciding between them. It is chiefly applied to an antient ſect of philoſophers founded by Pyrrho (ſee PYRRHO), who, according to Laertius, had various other denominations. From their maſter they were called *Pyrrhonians*; from the diſtinguiſhing tenets or characteriſtic of their philoſophy they derived the name of *Aporetici*, from απορειν, "to doubt;" from their ſuſpenſion and heſitation they were called *ephectici*, from επεχειν, "to ſtay or keep back;" and laſtly, they were called *zetetici* or *ſeekers*, from their never getting beyond the ſearch of truth.

That the ſceptical philoſophy is abſurd, can admit of no diſpute in the preſent age; and that many of the followers of Pyrrho carried it to the moſt ridiculous height, is no leſs true. But we cannot believe that he himſelf was ſo extravagantly ſceptical as has ſometimes been aſſerted, when we reflect on the particulars of his life, which are ſtill preſerved, and the reſpectful manner in which we find him mentioned by his contemporaries and writers of the firſt name who flouriſhed ſoon after him. The truth, as far as at this diſtance of time it can be diſcovered, ſeems to be, that he learned from Democritus to deny the real exiſtence of all qualities in bodies, except thoſe which are eſſential to primary atoms, and that he referred every thing elſe to the perceptions of the mind produced by external objects, in other words, to appearance and opinion. All knowledge of courſe appeared to him to depend on the fallacious report of the ſenſes, and conſequently to be uncertain; and in this notion he was confirmed by the general ſpirit of the Eleatic ſchool in which he was educated. He was further confirmed in his ſcepticiſm by the ſubtilties of the Dialectic ſchools, in which he had been inſtructed by the ſon of Stilpo; chooſing to overturn the cavils of ſophiſtry by recurring to the doctrine of univerſal uncertainty, and thus breaking the knot which he could not unlooſe. For being naturally and habitually inclined to conſider immoveable tranquillity as the great end of all philoſophy, he was eaſily led to deſpiſe the diſſenſions of the dogmatiſts, and to infer from their endleſs diſputes, the uncertainty of the queſtions on which they debated; controverſy, as it has often happened to others, becoming alſo with reſpect to him the parent of ſcepticiſm.

Pyrrho's doctrines, however new and extraordinary, were not totally disregarded. He was attended by several scholars, and succeeded by several followers, who preserved the memory of his notions. The most eminent of his followers was TIMON, in whom the public succession of professors in the Pyrrhonic school terminated. In the time of Cicero it was almost extinct, having suffered much from the jealousy of the dogmatists, and from a natural aversion in the human mind to acknowledge total ignorance, or to be left in absolute darkness. The disciples of Timon, however, still continued to profess scepticism, and their notions were embraced privately at least by many others. The school itself was afterwards revived by Ptolemæus a Cyrenian, and was continued by Ænesidemus a contemporary of Cicero, who wrote a treatise on the principles of the Pyrrhonic philosophy, the heads of which are preserved by Photius. From this time it was continued through a series of preceptors of little note to Sextus Empiricus, who also gave a summary of the sceptical doctrine.

A system of philosophy thus founded on doubt, and clouded with uncertainty, could neither teach tenets of any importance, nor prescribe a certain rule of conduct; and accordingly we find that the followers of scepticism were guided entirely by chance. As they could form no certain judgment respecting good and evil, they accidentally learned the folly of eagerly pursuing any apparent good, or of avoiding any apparent evil; and their minds of course settled into a state of undisturbed tranquillity, the grand postulatum of their system.

In the schools of the sceptics we find ten distinct topics of argument urged in support of the doctrine of uncertainty, with this precaution, however, that nothing could be positively asserted either concerning their number or their force. These arguments chiefly respect objects of sense: they place all knowledge in appearance; and, as the same things appear very different to different people, it is impossible to say which appearance most truly expresses their real nature. They likewise say, that our judgment is liable to uncertainty from the circumstance of frequent or rare occurrence, and that mankind are continually led into different conceptions concerning the same thing by means of custom, law, fabulous tales, and established opinions. On all these accounts they think every human judgment is liable to uncertainty; and concerning any thing they can only assert, that it seems to be, not that it is what it seems.

This doubtful reasoning, if reasoning it may be called, the sceptics extended to all the sciences; in which they discovered nothing true, or which could be absolutely asserted. In all nature, in physics, morals, and theology, they found contradictory opinions, and inexplicable or incomprehensible phænomena. In physics, the appearances they thought might be deceitful; and respecting the nature of God and the duties of morality, men were, in their opinion, equally ignorant and uncertain. To overturn the sophistical arguments of these sceptical reasoners would be no difficult matter, if their reasoning were worthy of confutation. Indeed, their great principle is sufficiently, though shortly, refuted by Plato, in these words. "When you say all things are incomprehensible (says he), do you comprehend or conceive that they are thus incomprehensible, or do you not? If you do, then something is comprehensible; if you do not, there is no reason we should believe you, since you do not comprehend your own assertion."

But scepticism has not been confined entirely to the antients and to the followers of Pyrrho. Numerous sceptics have arisen also in modern times, varying in their principles, manners, and character, as chance, prejudice, vanity, weakness, or indolence, prompted them. The great object, however, which they seem to have in view, is to overturn, or at least to weaken, the evidence of analogy, experience, and testimony; though some of them have even attempted to show, that the axioms of geometry are uncertain, and its demonstrations inconclusive. This last attempt has not indeed been often made; but the chief aim of Mr. Hume's philosophical writings is to introduce doubts into every branch of *physics*, *metaphysics*, *history*, *ethics*, and *theology*. It is needless to give a specimen of his reasonings in support of modern scepticism. The most important of them have been noticed elsewhere (see MIRACLE, METAPHYSICS, and PHILOSOPHY); and such of our readers as have any relish for speculations of that nature can be no strangers to his Essays, or to the able refutations of them by the Doctors Reid, Campbell, Gregory, and Beattie, who have likewise exposed the weakness of the sceptical reasonings of Des Cartes, Malbranche, and other philosophers of great fame in the same school.

SCEPTICISM, the doctrines and opinions of the sceptics. See the preceding article.

SCEPTRE, a kind of royal staff, or batoon, borne on solemn occasions by kings, as a badge of their command and authority. Nicod derives the word from the Greek σκηπτρον, which he says originally signified "a javelin," which the antient kings usually bore as a badge of their authority; that instrument being in very great veneration among the heathens. But σκηπτρον does not properly signify a javelin, but *a staff to rest upon*, from σκηπτω, *innitor*, "I lean upon." Accordingly, in the simplicity of the earlier ages of the world, the sceptres of kings were no other than long walking staves: and Ovid, in speaking of Jupiter, describes him as resting on his sceptre (Met. i. ver. 178). The sceptre is an ensign of royalty of greater antiquity than the crown. The Greek tragic and other poets put sceptres in the hands of the most antient kings they ever introduce. Justin observes, that the sceptre, in its original, was an *hasta*, or spear. He adds, that, in the most remote antiquity, men adored the *hastæ* or sceptres as immortal gods; and that it was upon this account, that, even in his time, they still furnished the gods with sceptres.—Neptune's sceptre is his trident. Tarquin the Elder was the first who assumed the sceptre among the Romans. Le Gendre tells us, that, in the first race of the French kings, the sceptre was a golden rod, almost always of the same height with the king who bore it, and crooked at one end like a crozier. Frequently instead of a sceptre, kings are seen on medals with a palm in their hand. See REGALIA.

SCHÆFFERA, in botany: A genus of the tetrandria order, belonging to the diœcia class of plants; and in the natural method ranking with those that are doubtful. The calyx is quadripetalous; the corolla is quadripetalous, quinquepetalous, and often wanting; the fruit is a bilocular berry with one seed. Of this there are two species, both natives of Jamaica; and grow in the lowlands near the sea: viz. 1. The *Completa*. 2. *Lateriflora*.

SCHAFFHAUSEN, a large, handsome, and strong town of Swisserland, capital of a canton of the same name, with a castle in the form of a citadel. It is well built, with fine large streets, and adorned with several fountains; and the greatest part of the houses are painted on the outside. It is well fortified, and the cathedral is the largest church in Swisserland; besides which, the minster, with the monastery adjoining thereto, the arsenal, the town house, the great clock (which shows the course of the sun and moon with their eclipses), and the stone bridge over the Rhine, are well worth the observation of a traveller. That river is of great consequence to the inhabitants with regard to trade. E. lon. 8. 51. N. lat. 47. 39.

The Canton of SCHAFFHAUSEN, in Swisserland, is bounded on the north and west by Suabia; on the east by the canton of Zurich, and the bishoprick of Constance; and on the south by the same, and by Thurgaw. It is 22 miles in length, and 10

in breadth; but produces all the neceſſaries of life, as wine, fiſh, wood, flax, horſes, ſheep, wool, black cattle, and deer. The principal town is of the ſame name.

SCHEDULE, a ſcroll of paper or parchment, annexed to a will, leaſe, or other deed; containing an inventory of goods, or ſome other matter omitted in the body of the deed.—The word is a diminutive of the Latin *ſcheda*, or Greek σχεδη, a leaf or piece of paper.

SCHEELE (Charles-William), was born on the 19th of December, 1742, at Stralſund, where his father kept a ſhop. When he was very young, he received the uſual inſtructions of a private ſchool; and was afterwards advanced to an academy. At a very early age he ſhowed a ſtrong deſire to follow the profeſſion of an apothecary, and his father ſuffered him to gratify his inclination. With Mr. Bauch, an apothecary at Gottenburg, he paſſed his apprenticeſhip, which was completed in ſix years. He remained, however, ſome time longer at that place, and it was there that he ſo excellently laid the firſt foundations of his knowledge. Among the various books which he read, that treated of chemical ſubjects, Kunckel's Laboratory ſeems to have been his favourite. He uſed to repeat many of the experiments contained in that work privately in the night, when the reſt of the family had retired to reſt. A friend of Scheele's had remarked the progreſs which he had made in chemiſtry, and had aſked him by what inducements he had been at firſt led to ſtudy a ſcience in which he had gained ſuch knowledge? Scheele returned the following anſwer: "The firſt cauſe, my friend, aroſe from yourſelf. Nearly at the beginning of my apprenticeſhip you adviſed me to read Neumann's Chemiſtry; from the peruſal of which I became eager to make experiments myſelf; and I remember very well how I mixed together, in a conſerve-glaſs, oil of cloves and fuming acid of nitre, which immediately took fire. I ſee alſo ſtill before my eyes an unlucky experiment which I made with pyrophorus. Circumſtances of this kind did but the more inflame my deſire to repeat experiments." After Scheele's departure from Gottenburg, in the year 1765, he obtained a place with Kalſtrom, an apothecary at Malmo. Two years afterwards he went from thence to Stockholm, and managed there the ſhop of Mr. Scharenberg. In 1773, he changed this appointment for another at Upſal, under Mr. Loock. Here he was fortunately ſituated; as, from his acquaintance with learned men, and from having free acceſs to the Univerſity Laboratory, he had opportunities of increaſing his knowledge. At this place alſo he happily commenced the friendſhip which ſubſiſted between him and Bergman. During his reſidence at this place, his royal highneſs prince Henry of Pruſſia, accompanied by the duke of Sudermania, viſited Upſal, and choſe this opportunity to ſee the Academical Laboratory. Scheele was accordingly appointed by the Univerſity to exhibit ſome chemical experiments to them. This office he undertook, and ſhowed ſome of the moſt curious proceſſes in chemiſtry. The two princes aſked him many queſtions, and expreſſed their approbation of the anſwers which he returned to them. The duke aſked him what countryman he was, and ſeemed to be much pleaſed when Scheele informed him that he was born at Stralſund. At their departure they told the profeſſor, who was preſent, that they ſhould eſteem it a favour if he would permit the young man to have free acceſs to the Laboratory, as often as he choſe, to make experiments.

In the year 1777 Scheele was appointed by the Medical College to be apothecary at Koping. It was at that place that he ſoon ſhowed the world how great a man he was, and that no place or ſituation could confine his abilities. When he was at Stockholm he ſhowed his acuteneſs as a chemiſt, as he diſcovered there the new and wonderful acid contained in the ſparry fluor. It has been confidently aſſerted, that Scheele was the firſt who diſcovered the nature of the aerial acid; and that whilſt he was at Upſal he made many experiments to prove its properties. This circumſtance might probably have furniſhed Bergman with the means of handling this ſubject more fully. At the ſame place he began the ſeries of excellent experiments on that remarkable mineral ſubſtance, mangeneſe; from which inveſtigation he was led to make the very valuable and intereſting diſcovery of the dephlogiſticated marine acid. At the ſame time he firſt obſerved the ponderous earth.

At Koping he finiſhed his diſſertation on Air and Fire; a work which the celebrated Bergman moſt warmly recommended in the friendly preface which he wrote for it. The theory which Scheele endeavours to prove in this treatiſe is, that fire conſiſts of pure air and phlogiſton. According to more recent opinions (if inflammable air be phlogiſton), water is compoſed of theſe two principles. Of theſe opinions we may ſay, in the words of Cicero, "*Opiniones tam variæ ſunt, tamque inter ſe diſſidentes, ut alterum profecto fieri poteſt, ut earum nulla, alterum certe non poteſt ut plus una, vera ſit.*" The author's merit in this work, excluſive of the encomiums of Bergman, was ſufficient to obtain the approbation of the public; as the ingenuity diſplayed in handling ſo delicate a ſubject, and the many new and valuable obſervations* which are diſperſed through the treatiſe, juſtly entitled the author to that fame which his book procured him. It was ſpread abroad through every country, became ſoon out of print, was reprinted, and tranſlated into many languages.—The Engliſh tranſlation is enriched with the notes of that accurate and truly philoſophic genius Richard Kirwan, Eſq.

Scheele now diligently employed himſelf in contributing to the Tranſactions of the Academy at Stockholm. He firſt pointed out a new way to prepare the ſalt of benzoin. In the ſame year he diſcovered that arſenic, freed in a particular manner from phlogiſton, partakes of all the properties of an acid, and has its peculiar affinities to other ſubſtances.

In a Diſſertation on Flint, Clay, and Alum, he clearly overturned Beaumé's opinion of the identity of the ſiliceous and argillaceous earths. He publiſhed an Analyſis of the Human Calculus. He ſhowed alſo a mode of preparing mercurius dulcis in the humid way, and improved the proceſs of making the powder of algaroth. He analyſed the mineral ſubſtance called *molybdæna*, or flexible black lead. He diſcovered a beautiful green pigment. He ſhowed us how to decompoſe the air of the atmoſphere. He diſcovered that ſome neutral ſalts are decompoſed by lime and iron. He decompoſed plumbago, or the common black lead. He obſerved, with peculiar ingenuity, an acid in milk, which decompoſes acetated alkali; and in his experiments on the ſugar of milk, he diſcovered another acid, different in ſome reſpects from the above-mentioned acid and the common acid of ſugar. He accompliſhed the decompoſition of tungſtein, the component parts of which were before unknown, and found in it a peculiar acid earth united to lime. He publiſhed an excellent diſſertation on the different ſorts of æther.—He found out an eaſy way to preſerve vinegar for many years. His inveſtigation of the colouring matter in Pruſſian blue, the means he employed to ſeparate it, and his diſcovery that alkali, ſal ammoniac, and charcoal, mixed together, will produce it, are

* Scheele mentions in this work, in a curſory way, the decompoſition of common ſalt by the calx of lead. Mr. Turner, a gentleman who happily unites the ſkill of the manufacturer with the knowledge of the philoſophic chemiſt, has alſo all the merit of this diſcovery, as he obſerved the ſame fact, without having been indebted to Scheele's hint on this ſubject. Mr. Turner has done more; he has converted this diſcovery to ſome uſe in the arts; he produces mineral alkali for ſale, ariſing from this decompoſition; and from the lead which is united to the marine acid he forms the beautiful pigment called the *patent yellow*.

ſtrong marks of his penetration and genius. He found out a peculiar ſweet matter in expreſſed oils, after they have been boiled with litharge and water. He ſhewed how the acid of lemons may be obtained in cryſtals. He found the white powder in rhubarb, which Model thought to be ſelenite, and which amounts to one-ſeventh of the weight of the root, to be calcareous earth, united to the acid of ſorrel. This ſuggeſted to him the examination of the acid of ſorrel. He precipitated acetated lead with it, and decompoſed the precipitate thus obtained by the vitriolic acid, and by this proceſs he obtained the common acid of ſugar; and by ſlowly dropping a ſolution of fixed alkali into a ſolution of the acid of ſugar, he regenerated the acid of ſorrel. From his examination of the acids contained in fruits and berries, he found not one ſpecies of acid alone, viz. the acid of lemon, but another alſo, which he denominated the malaceous acid, from its being found in the greateſt quantity in apples.

By the decompoſition of Bergman's new metal (ſiderite) he ſhowed the truth of Meyer's and Klaproth's conjecture concerning it. He boiled the calx of ſiderite with alkali of tartar, and precipitated nitrated mercury by the middle ſalt which he obtained by this operation; the calx of mercury which was precipitated was found to be united to the acid of phoſphorus; ſo that he demonſtrates that this calx was phoſphorated iron.—He found alſo, that the native Pruſſian blue contained the ſame acid. He diſcovered by the ſame means, that the perlate acid, as it was called, was not an acid *ſui generis*, but the phoſphoric united to a ſmall quantity of the mineral alkali. He ſuggeſted an improvement in the proceſs for obtaining magneſia from Epſom ſalt; he adviſes the adding of an equal weight of common ſalt to the Epſom ſalt, ſo that an equal weight of Glauber's ſalt may be obtained; but this will not ſucceed unleſs in the cold of winter. Theſe are the valuable diſcoveries of this great philoſopher, which are to be found in the Tranſactions of the Royal Society at Stockholm. Moſt of his eſſays have been publiſhed in French by Madame Picardet, and Monſ. Morveau of Dijon. Dr. Beddoes alſo has made a very valuable preſent to his countrymen of an Engliſh tranſlation of a greater part of Scheele's diſſertations, to which he has added ſome uſeful and ingenious notes. The following diſcoveries of Scheele are not, we believe, publiſhed with the reſt. He ſhowed what that ſubſtance is, which has been generally called 'the earth of the fluor ſpar.' It is not produced unleſs the fluor acid meet with ſiliceous earth. It appears from Scheele's experiments to be a triple ſalt, conſiſting of flint, acid of fluor, and fixed alkali. Scheele proved alſo, that the fluor acid may be produced without any addition of the vitriolic or any mineral acid: the fluor is melted with fixed alkali, and the fluorated alkali is decompoſed by acetated lead. If the precipitate be mixed with charcoal duſt, and expoſed in a retort to a ſtrong heat, the lead will be revived, and the acid of fluor, which was united to it, will paſs into the receiver poſſeſſed of all its uſual properties. This ſeems to be an ingenious and unanſwerable proof of its exiſtence.

He obſerved, that no pyrophorus can be made unleſs an alkali be preſent; and the reaſon why it can be prepared from alum and coal is, that the common alum always contains a little alkali, which is added in order to make it cryſtallize; for if this be ſeparated from it, no pyrophorus can be procured from it. His laſt diſſertation was his very valuable obſervations on the acid of the gallnut. Ehrhart, one of Scheele's moſt intimate friends, aſſerts, that he was the diſcoverer of both of the acids of ſugar and tartar. We are alſo indebted to him for that maſterpiece of chemical decompoſition, the ſeparation of the acid of phoſphorus from bones. This appears from a letter which Scheele wrote to Gahn, who has generally had the reputation of this great diſcovery. This acid, which is ſo curious in the eye of the chemiſt, begins to draw the attention of the phyſician. It was firſt uſed in medicine, united to the mineral alkali, by the ingenious Dr. Pearſon. The value of this addition to the materia medica cannot be better evinced than from the increaſe of the demand for it, and the quantity of it which is now prepared and ſold in London.

We may ſtamp the character of Scheele as a philoſopher from his many and important diſcoveries. What concerns him as a man we are informed of by his friends, who affirm that his moral character was irreproachable. From his outward appearance, you would not at firſt ſight have judged him to be a man of extraordinary abilities; but there was a quickneſs in his eye, which, to an accurate obſerver, would point out the penetration of his mind. He mixed but little with the crowd of common acquaintance; for this he had neither time nor inclination, as, when his profeſſion permitted him, he was for the moſt part employed in his experimental inquiries. But he had a ſoul for friendſhip; nor could even his philoſophical purſuits withhold him from truly enjoying the ſociety of thoſe whom he could eſteem and love. Before he adopted any opinion, or a particular theory, he conſidered it with the greateſt attention; but when once his ſentiments were fixed, he adhered to them, and defended them with reſolution. Not but that he was ingenuous enough to ſuffer himſelf to be convinced by weighty objections; as he has ſhown that he was open to conviction.

His chemical apparatus was neither neat nor convenient; his laboratory was ſmall and confined; nor was he particular in regard to the veſſels which he employed in his experiments, as often the firſt phial which came to hand was placed in his ſand-heat: ſo that we may juſtly wonder how ſuch diſcoveries, and ſuch elegant experiments, could have been made under ſuch unfavourable circumſtances. He underſtood none of the modern languages except the German and Swediſh; ſo that he had not the advantage of being benefited by the early intelligence of diſcoveries made by foreigners, but was forced to wait till the intelligence was conveyed to him in the ſlow and uncertain channel of tranſlation. The important ſervices which Scheele did to natural philoſophy entitled him to univerſal reputation; and he obtained it: his name was well known by all Europe, and he was member of ſeveral learned academies and philoſophical ſocieties.

It was often wiſhed that he would quit his retirement at Koping, and move in a larger ſphere. It was ſuggeſted to him, that a place might be procured in England, which might afford him a good income and more leiſure; and, indeed, latterly an offer was made to him of an annuity of 300l. if he would ſettle in this country. But death, alas! put an end to this project. For half a year before this melancholy event, his health had been declining, and he himſelf was ſenſible that he ſhould not recover. On the 19th of May, 1786, he was confined to his bed; on the 21ſt he bequeathed all of which he was poſſeſſed to his wife (who was the widow of his predeceſſor at Koping, and whom he had lately married); and on the ſame day he departed this life. So the world loſt, in leſs than two years, Bergman and Scheele, of whom Sweden may juſtly boaſt; two philoſophers, who were beloved and lamented by all their cotemporaries, and whoſe memory poſterity will never ceaſe moſt gratefully to revere.

SCHEINER (Christopher), a German mathematician, aſtronomer, and Jeſuit, eminent for being the firſt who diſcovered ſpots on the ſun, was born at Schwaben in the territory of Middleheim in 1575. He firſt diſcovered ſpots on the ſun's diſk in 1611, and made obſervations on theſe phænomena at Rome, until at length reducing them to order, he publiſhed them in one volume folio in 1630. He wrote alſo ſome ſmaller things relating to mathematics and philoſophy; and died in 1650.

SCHELD, a river which riſes on the confines of Picardy, and runs north-eaſt by Cambray, Valenciennes, Tournay, Oude-

narde, &c. and, receiving the Lis at Ghent, runs eaft by Dendermond, and then north to Antwerp: below which city it divides into two branches, one called *the Wefter-Scheld*, which feparates Flanders from Zealand, and difcharges itfelf into the fea near Flufhing; and the other called *the Ofter-Scheld*, which runs by Bergen-op-zoom, and afterwards between the iflands Beveland and Schowen, and a little below falls into the fea.

SCHEMNITZ, a town of Upper Hungary, with three caftles. It is famous for mines of filver and other metals, as alfo for hot baths. Near it is a rock of a fhining blue colour mixed with green, and with fome fpots of yellow. E. lon. 19. 0. N. lat. 48. 40.

SCHERARDIA, in botany; a genus of the monogynia order, belonging to the tetrandria clafs of plants. The corolla is monopetalous and funnel-fhaped; there are two three-toothed feeds.

SCHETLAND. See SHETLAND.

SCHEUCHZERIA, in botany: A genus of the trigynia order, belonging to the hexandria clafs of plants; and in the natural method ranking under the fifth order, *Tripetaloideæ*.—The calyx is fexpartite; there is no corolla, nor are there any ftyles; there are three inflated and monofpermous capfules.

SCHIECHS, or SCHECH, among the Arabs, is a name applied to their nobles. "Among the Bedouins," fays Niebuhr, "it belongs to every noble, whether of the higheft or the loweft order. Their nobles are very numerous, and compofe in a manner the whole nation; the plebeians are invariably actuated and guided by the fchiechs, who fuperintend and direct in every tranfaction. The fchiechs and their fubjects are born to the life of fhepherds and foldiers. The greater tribes rear many camels, which they either fell to their neighbours, or employ them in the carriage of goods, or in military expeditions. The petty tribes keep flocks of fheep. Among thofe tribes which apply to agriculture, the fchiechs live always in tents, and leave the culture of their grounds to their fubjects, whofe dwellings are wretched huts. Schiechs always ride on horfes or dromedaries, infpecting the conduct of their fubjects, vifiting their friends, or hunting. Traverfing the defert, where the horizon is wide as on the ocean, they perceive travellers at a diftance.—As travellers are feldom to be met with in thofe wild tracts, they eafily difcover fuch as pafs that way, and are tempted to pillage them when they find their own party the ftrongeft."

SCHINUS, in botany: A genus of the decandria order, belonging to the diœcia clafs of plants; and in the natural method ranking under the 43d order, *Dumofæ*. The male calyx is quinquefid; the petals five. The female flower is the fame as in the male; the berry tricoccous.

SCHIRAS, or SCHIRAUZ, a large and famous town of Perfia, capital of Farfiftan, is three miles in length from eaft to weft, but not fo much in breadth. It is feated at the north-weft end of a fpacious plain furrounded with very high hills, under one of which the town ftands. The houfes are built of bricks dried in the fun; the roofs are flat and terraced. There are 15 handfome mofques, tiled with ftones of a blueifh green colour, and lined within with black polifhed marble. There are many large and beautiful gardens, furrounded with walls fourteen feet high, and four thick. They contain various kinds of very fine trees, with fruits almoft of every kind, befides various beautiful flowers. The wines of Schiras are not only the beft in Perfia, but, as fome think, in the whole world. The women are much addicted to gallantry, and Schiras is called *an earthly paradife* by fome. The ruins of the famous Perfepolis are 30 miles to the north-eaft of this place. E. lon. 56. 0. N. lat. 29. 36.

SCHISM, (from the Greek, σχισμα, *cleft, fiffure*), in its general acceptation fignifies *divifion* or *feparation*; but is chiefly ufed in fpeaking of feparations happening from diverfity of opinions among people of the fame religion and faith. Thus we fay the *fchifm* of the ten tribes of Judah and Benjamin, the *fchifm* of the Perfians from the Turks and other Mahometans, &c. Among ecclefiaftical authors, the great fchifm of the Weft is that which happened in the times of Clement VII. and Urban VI. which divided the church for 40 or 50 years, and was at length ended by the election of Martin V. at the council of Conftance. The Romanifts number 34 fchifms in their church.—They beftow the name *Englifh fchifm* on the reformation of religion in this kingdom. Thofe of the church of England apply the term *fchifm* to the feparation of the nonconformifts, viz. the prefbyterians, independents, and anabaptifts, for a further reformation.

SCHISTUS, in mineralogy, a name given to feveral different kinds of ftones, but more efpecially to fome of the argillaceous kind; as, 1. The blueifh purple fchiftus, *fchiftus tegularis*, or common roof-flate. This is fo foft that it may be flightly fcraped with the nail, and is of a very brittle lamellated texture, of the fpecific gravity of 2,876. It is fufible *per fe* in a ftrong heat, and runs into a black fcoria. By a chemical analyfis it is found to confift of 26 parts of argillaceous earth, 46 of filiceous earth, 8 of magnefia, 4 of calcareous earth, and 14 of iron. The dark-blue flate, or fchiftus fcriptorius, contains more magnefia and lefs iron than the common purple fchiftus, and effervefces more brifkly with acids. Its fpecific gravity is 2,701. 2. The *pyritaceous fchiftus* is of a gray colour, brown, blue, or black; and capable of more or lefs decompofition by expofure to the air, according to the quantity of pyritous matter it contains and the ftate of the iron in it. When this laft is in a femi-phlogifticated ftate it is eafily decompofed; but very flowly, or not at all, if the calx is much dephlogifticated. The aluminous fchiftus belongs to this fpecies. 3. The *bituminous fchiftus* is generally black, and of a lamellated texture, of various degrees of hardnefs, not giving fire with fteel, but emitting a ftrong fmell when heated, and fometimes without being heated. M. Magellan mentions a fpecimen which burns like coal, with a ftrong fmell of mineral bitumen, but of a yellowifh brown, or rather dark afh-colour, found in Yorkfhire. This kind of fchiftus does not fhow any white mark when fcratched like the other fchiftus.

SCHMIEDELIA, in botany: A genus of the digynia order, belonging to the octandria clafs of plants. The calyx is diphyllous; the corolla tetrapetalous; the germina pediceliated, and longer than the flower.

SCHOENOBATES (from the Greek, σχοινος, *a rope*; and βαινω, *I walk*), a name which the Greeks gave to their rope-dancers: by the Romans called *funambuli*. See ROPE-DANCER and FUNAMBULUS. The *fchœnobates* were flaves whofe mafters made money of them, by entertaining the people with their feats of activity. *Mercurialis de arte gymnaftica, lib.* iii. gives us five figures of *fchœnobates* engraven after antient ftones.

SCHOENUS, in botany: A genus of the monogynia order, belonging to the triandria clafs of plants; and in the natural method ranking under the 3d order, *Calamariæ*. The glumes are paleaceous, univalved, and thickfet; there is no corolla, and only one roundifh feed between the glumes.

SCHOLASTIC, fomething belonging to the fchools. See SCHOOL.

SCHOLASTIC *Divinity*, is that part or fpecies of divinity which clears and difcuffes queftions by reafon and arguments; in which fenfe it ftands, in fome meafure, oppofed to *pofitive divinity*, which is founded on the authority of fathers, councils, &c. The fchool divinity is now fallen into contempt; and is fcarce regarded anywhere but in fome of the univerfities, where they are ftill by their charters obliged to teach it.

SCHOLIAST, or COMMENTATOR, a grammarian who writes *fcholia*, that is, notes, gloffes, &c. upon antient authors who have written in the learned languages. See the next article.

SCHOLIUM, a note, annotation, or remark, occasionally made on some passage, proposition, or the like. This term is much used in geometry and other parts of the mathematics, where, after demonstrating a proposition, it is customary to point out how it might be done some other way, or to give some advice or precaution in order to prevent mistakes, or add some particular use or application thereof.

SCHOOL, a public place, wherein the languages, the arts, or sciences, are taught. Thus we say, a grammar *school*, a writing *school*, a *school* of natural philosophy, &c.—The word is formed from the Latin *schola*, which, according to Du Cange, signifies *discipline* and *correction*; he adds, that it was antiently used, in general, for all places where several persons met together, either to study, to converse, or do any other matter. Accordingly, there were *scholæ palatinæ*, being the several posts wherein the emperor's guards were placed; *schola scutariorum*, *schola gentilium*, &c. At length the term passed also to civil magistrates; and accordingly in the code we meet with *schola chartulariorum*, *schola agentium*, &c.; and even to ecclesiastics, as *schola cantorum*, *schola sacerdotum*, &c.

The Hebrews were always very diligent to teach and study the laws that they had received from Moses. The father of the family studied and taught them in his own family. The Rabbin taught them in the temple, in the synagogues, and in the academies. They pretend that even before the deluge there were schools for knowledge and piety, of which the patriarchs had the direction. They place Adam at their head, then Enoch, and lastly Noah. Melchisedec, as they say, kept a school in the city of Kajrath-sepher, otherwise Hebron, in Palestine. Abraham, who had been instructed by Heber, taught in Chaldæa and in Egypt. From him the Egyptians learned astronomy and arithmetic. Jacob succeeded Abraham in the office of teaching. The scripture says he was "a plain man dwelling in tents;" which, according to the Chaldee paraphrast, is, "that he was a perfect man, and a minister of the house of doctrine."

All this, indeed, must be very precarious and uncertain. It cannot be doubted but that Moses, Aaron, and the elders of Israel, instructed the people in the wilderness, and that many good Israelites were very industrious to instruct their families in the fear of God. But all this does not prove to us that there were any such schools as we are now inquiring after. Under Joshua we see a kind of academy of the prophets, where the children of the prophets, that is, their disciples, lived in the exercise of a retired and austere life, in study, in the meditation and reading of the law of God. There were schools of the prophets at Naioth in Ramah; 1 Sam. xix. 12. 20. &c. See the article PROPHET.—These schools, or societies of the prophets, were succeeded by the synagogues. See the article SYNAGOGUE.

Charity SCHOOLS are those schools which are set apart by public contributions or private donations for the instruction of poor children, who could not otherwise enjoy the benefits of education. In no country are these more numerous than in Great Britain, where charity and benevolence are characteristic of the nation at large. The following is a summary view of the number of charity-schools in Great Britain and Ireland in 1795, since which time their number has considerably increased:

	Schools.	Boys.	Girls.
At London	182	4442	2870
In other parts of South Britain	1329	19506	3915
In North Britain, by the account published in 1786	135	5187	2618
In Ireland, for teaching to read and write only	168	2406	600
In Ireland, erected pursuant to his majesty's charter, and encouraged by his bounty of £1000 *per annum*, for instructing, employing, and wholly maintaining the children, exclusive of the Dublin work-house school,	42	1935	—

Total of schools, 1856; of boys, 33476; of girls, 10003.

Sunday-SCHOOLS are another species of charity-schools lately instituted, and now pretty common in Great Britain. The institution is evidently of the first importance; and if properly encouraged must have a very favourable effect on the morals of the people, as it tends not only to preserve the children of the poor from spending the Sunday in idleness, and of consequence in dissipation and vice, but enables them to lay in for the conduct and comfort of their future life a stock of useful knowledge and virtuous principles, which, if neglected in early life, will seldom be sought for or obtained amidst the hurry of business and the cares and temptations of the world. The excellent founder of Sunday-schools was Mr. Raikes, a printer in Gloucester, who, together with Mr. Stock, a clergyman in the same place, and who, we believe, was equally instrumental in the business with Mr. Raikes, showed the example, and convinced many of the utility of the plan. From Gloucestershire the institution was quickly adopted in every county and almost every town and parish of the kingdom; and we have only further to remark on a plan so generally known, so much approved, and so evidently proper, that we hope men of eminence and weight will always be found sufficiently numerous and willing to bestow their time and countenance in promoting it to the utmost of their power.

SCHOONER, in sea language, a small vessel with two masts, whose main sail and fore-sail are suspended from gaffs, reaching from the mast towards the stern, and stretched out below by booms, whose foremast ends are hooked to an iron, which clasps the mast so as to turn therein as upon an axis, when the after-ends are swung from one side of the vessel to the other.

SCHORL, a precious stone of the second order, of which the varieties are, *Siberian*, ruby-coloured, reddish, green, brown, blue, and black; *mother of emerald*, dark green; *lapis crucifer*, or the *cross stone*; bar schorl: horn blend, black, green, or blue; *Cianite*, blue schorl; *Thumstein*; *Laxman's quadrangular schorl*. Transparent schorl is crystallised in polygonal prisms, generally with four, six, or nine sides; some of them are so fine as to pass for gems of the first order, especially for the emerald. In the semitransparent schorls there are likewise some of great beauty, as the ruby-coloured, lately discovered in Siberia by counsellor Herman, in a bed of reddish argilla, mixed with fragments of felt spath, quartz, and mica, on a low granite mountain. The bed of argilla is evidently produced by the decomposition of granite; which operation Herman supposes must have set at liberty the ruby schorl formerly pent up in the chinks or fissures of the decomposed part of the mountain. The discovery is quite new, no such species being before known, as it is as hard as the first order of precious stones, the diamond excepted, takes a fine polish, and equals in colour the oriental ruby, though not in transparency.

Its structure is made up of fine cylindric columns, like needles collected into bundles or tresses, lying one on another in different directions, whilst each individual column is made up of fine plates or laminæ, like the gems. It is fusible *per se* into a white transparent glass, and melts imperfectly with borax when calcined, as it does with microcosmic salt and mineral alkali, into a small

vitreous globe, with little ſpots of a white enamel colour. Acids have no effect upon it, even when calcined. Laſtly, it loſes its colour in the fire, after having firſt turned blue. The mother of emeralds is likewiſe a ſemitranſparent ſchorl, in the opinion of ſome able naturaliſts, although Mr. Born aſſerts it to be a jade, we know not upon what authority.

The ſtructure of the ſemitranſparent ſchorls, and ſome of the tranſparent that are not ſo perfectly diaphanous as to conceal their texture, is obſcurely ſparry; but that of the opaque is either filamentous, like aſbeſtos, or hard and brittle like threads of glaſs, or it is compoſed of ſcales. Of this laſt kind is that called *born blend*, which is generally green or black; but there is a beautiful variety of it found on the mount St. Gothard, in Switzerland, of a fine ſky-blue colour covered with ſilver talc. Bar ſchorl has been found on the Carpathian mountains cryſtalliſed in priſms. Lapis crucifer, or the croſs ſtone, is found ſometimes near Brazil in Switzerland, and there named tauffſtein, or chriſtening ſtone; but oftener at Thum in Saxony, and therefore named there Thumſtein. It is a ſchorl in form of a croſs: that of Brazil conſiſts of two hexagonal cryſtals. The exact cryſtalliſation of the other is not known to us.

Moſt countries produce ſchorl. Ruſſia is particularly rich in ſchorls. It is even difficult to point out all the different places of the empire which produce them; but we ſhall take notice of thoſe moſt remarkable, particularly new diſcoveries. The ruby-coloured ſchorl mentioned above was found by Mr. Herman at Sarapoulſky, a village in the government of Perm, ten verſts from Mourſinſky Slabode, in Siberia. The Siberian inſpector, Mr. Laxman, has lately diſcovered in the mountain Alpeſtria, on the river Sleudenka near the lake Baikal, the following new ſchorls. Firſt, a green tranſparent ſchorl, of ſo brittle a nature as not to bear carriage without breaking into ſmall pieces truncated. Pallas is poſitive in declaring this dark green ſchorl a hyacinth. This laſt has often ſome of the ſmall yellowiſh white garnets ſticking in it, deſcribed in the article Garnet, where an account will be found of the ſpecies of matrix that contains them all. Schorls are likewiſe found in the mountains and mines of Niſelga, Kraſnavolok, and Sondala, as likewiſe between the Onega Lake and White Sea. Black ſchorl is likewiſe found near the White Sea, and in the Altai, Ural, and Daurian mountains.

None of the tranſparent ſchorls have been found in Scotland, as far as we have heard; but many varieties of the opake kinds have been found in various places, particularly in the iſland of Arran, where there is a bed of greeniſh horn-like ſchorl of immenſe extent near the harbour of Lamlaſh.

Fine ſpecimens of ſchorl are dear; the ruby ſchorl from Siberia, 25 to 50 rubles a ring ſtone; the green, when fine, from 15 to 30. The high price of the ruby ſchorl is owing to its novelty and rarity; and of the green, is owing to its paſſing for an emerald. The ſpecific gravity of ſchorl is 3,6.

SCHOTIA, in botany: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 33d order, *Lomentaceæ*. The calyx is ſemiquinquefid; the corolla has five petals, which are equal; the tube is turbinated, carnous, and perſiſtent. The legumen pedicellated, and contains two ſeeds; there is only one ſpecies, viz. the ſpecioſa, or African lignum vitæ.

SCHREBERA, in botany: A genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The calyx is quinquepartite; the corolla funnel-ſhaped, with the filaments in the throat, and having each a ſcale at the baſe.

SCHREVELIUS (Cornelius), a laborious Dutch critic and writer, who has given the public ſome editions of the antient authors more elegant than correct: his Greek Lexicon is eſteemed the beſt of all his works. He died in 1667.

SCHULTENS (Albert), profeſſor of Hebrew and of the eaſtern languages at Leyden, and one of the moſt learned men of the 18th century, was born at Groningen, where he ſtudied till the year 1706, and from thence continued his ſtudies at Leyden and Utrecht. Schultens at length applied himſelf to the ſtudy of Arabic books, both printed and in manuſcript; in which he made great progreſs. A ſhort time after he became miniſter of Waſſenar, and two years after profeſſor of the eaſtern tongues at Franeker. At length he was invited to Leyden, where he taught Hebrew and the eaſtern languages with extraordinary reputation till his death, which happened in 1750.—He wrote many learned works; the principal of which are, 1. A Commentary on Job, 2 vols. 4to. 2. A Commentary on the Proverbs. 3. *Vetus & regia via Hebraizandi.* 4. *Animadverſiones philologicæ & criticæ ad varia loca Veteris Teſtamenti.* 5. An excellent Hebrew grammar, &c. Schultens diſcovered in all his works ſound criticiſm and much learning. He maintained againſt Gouſſet and Drieſſen, that in order to have a perfect knowledge of Hebrew, it is neceſſary to join with it, not only the Chaldee and Syriac, but more particularly the Arabic.

SCHURMAN (Anna Maria), a moſt extraordinary German lady. Her natural genius diſcovered itſelf at ſix years of age, when ſhe cut all ſorts of figures in paper with her ſciſſars without a pattern. At eight ſhe learned, in a few days, to draw flowers in a very agreeable manner. At ten, ſhe took but three hours to learn embroidery. Afterwards ſhe was taught muſic, vocal and inſtrumental; painting, ſculpture, and engraving; in all of which ſhe ſucceeded admirably. She excelled in miniature-painting, and in cutting portraits upon glaſs with a diamond. Hebrew, Greek, and Latin, were ſo familiar to her, that the moſt learned men were aſtoniſhed at it. She ſpoke French, Italian, and Engliſh, fluently. Her hand-writing, in almoſt all languages, was ſo inimitable, that the curious preſerved ſpecimens of it in their cabinets. But all this extent of learning and uncommon penetration could not protect her from falling into the errors of Labadie, the famous French enthuſiaſt, who had been baniſhed France for his extravagant tenets and conduct. To this man ſhe entirely attached herſelf, and accompanied him wherever he went; and even attended him in his laſt illneſs at Altena in Holſtein. Her works, conſiſting of *De vitæ humanæ termino*, and *Diſſertatio de ingenii muliebris ad doctrinam et meliores literas aptitudine*, and her Letters to her learned correſpondents, were printed at Leyden in 1648; but enlarged in the edition of Utrecht, 1662, in 12mo, under the following title: *A. M. Schurman Opuſcula Hebræa, Græca, Latina, Gallica, Proſaica, et Metrica.* She publiſhed likewiſe at Altena, in Latin, A Defence of her attachment to Labadie, while ſhe was with him in 1673; not worth reading. She was born at Cologne in 1607, but reſided chiefly in Holland, and died in Frieſland in 1678.

SCHALBEA, in botany; a genus of the angioſpermia order, belonging to the didynamia claſs of plants. The calyx is quadrifid, with a ſuperior lobe; the lowermoſt longeſt, and emarginated.

SCHWARTS (Christopher), an eminent hiſtory-painter, born at Ingolſtadt in 1550, who was diſtinguiſhed by the appellation of the *German Raphael*. He learned the firſt principles of the art in his own country, but finiſhed his ſtudies at Venice; when he not only made the works of Titian his models, but had the advantage of receiving ſome perſonal inſtructions from that illuſtrious maſter. His performances were ſoon in the higheſt eſteem, as his manner of painting was very different from what the Germans had been accuſtomed to before that time:

he was, therefore, invited by the elector of Bavaria to his court, and appointed his principal painter. He died in 1594; and his most capital works, as well in fresco as in oil, are in the palace at Munich, and in the churches and convents.

SCHWARTENBURG, a town and castle of Germany, and circle of Upper Saxony, in the landgravate of Thuringia, and capital of a county of the same name helonging to a prince of the house of Saxony. It is seated on the river Schwartz, 20 miles south-east of Erford, and 35 miles north of Cullembach. E. lon. 11. 27. N. lat. 50. 45.

SCHWARTZEMBERG, a town of Germany, in the circle of Franconia, and capital of a principality of the same name.—The castle is seated on the river Lec, 5 miles north-west of Nuremberg, and 20 east of Wertzburg, subject to its own prince. E. lon. 10. 27. N. lat. 49. 43.

SCHWEIDNITZ, a strong town in Germany, in Silesia, and capital of a province of the same name, with a castle. It is the handsomest town of Silesia, next to Breslaw. The streets are large, the church fine, and the houses well built. The fortifications are not very considerable, and the royal palace is turned into a convent. All the magistrates are Roman Catholics; but most of the inhabitants are Protestants, who have a church without the town, as also a public school and bells. It is seated on an eminence on the river Weistritz, 27 miles south-east of Lignitz, and 22 south-west of Breslaw. E. lon. 16. 48. N. lat. 50. 46.

SCHWEINFURT, a very strong, free, and imperial town of Germany, in Franconia, with a magnificent palace, where the senators meet, who are 12 in number. The environs are rich in cattle, corn, and wine; the inhabitants are Protestants, and not very rich. However, they carry on a large trade in woollen and linen cloth, goose-quills, and feathers. It is seated on the river Main, 27 miles north-east of Wirtzburg, and 22 west of Bamberg. E. lon. 10. 25. N. lat. 50. 4.

SCHWENKFELDIA, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking with those that are doubtful. The calyx is quinquefid; the corolla funnel-shaped; the stigma parted into five; the berry quinquelocular, with a number of seeds. Of this there are three species, viz. 1. Cinerea; 2. Aspera; 3. Hirta. The two first are natives of Guiana, the other of Jamaica. The leaves of all of them are remarkably rough, and stick to the fingers or clothes.

SCHWENKIA, in botany: A genus of the monogynia order, belonging to the diandria class of plants. The corolla is almost equal, plaited at the throat, and glandulous; there are three barren stamina; the capsule bilocular and polyspermous.

SCHWINBURG, a town of Denmark, on the eastern coast of the island of Fionia, over-against the islands of Arroa and Langeland. E. lon. 10. 55. N. lat. 55. 8.

SCHWITZ, or SWITZ, a canton of Swisserland, which gives name to them all. It is bounded on the west by the lake of the four cantons, on the south by the canton of Uri, on the east by that of Glaris, and on the north by those of Zurich and Zug. Its principal riches consist in cattle, and the capital town is of the same name. This is a large, handsome place, seated near the lake of the four cantons, in a pleasant country among the mountains. E. lon. 8. 41. N. lat. 47. 2.

SCIACCA, antiently called *Thermæ Selinuntiæ*, in Sicily, derives its present denomination from the Arabic word *Scheich*. It is a very antient place, being mentioned in the account of the wars between the Greeks and Carthaginians, to the latter of whom it belonged. It is defended by antient walls and the castle of Luna. It stands upon a very steep rock, hanging over the sea, and excavated in every direction into prodigious magazines, where the corn of the neighbouring territory is deposited for exportation; there is no hardour, but a small bay formed by a wooden pier, where lighters lie to load the corn which they carry out about a mile to ships at anchor. The town is irregularly but substantially built, and contains 13,000 inhabiants, though Amico's *Lexicon Topographicum* says the last enumeration found only 9484. His accounts do not take in ecclesiastics, and several denominations of lay persons.

SCIÆNA, in ichthyology, a genus belonging to the order of thoracici. The membrane of the gills has six rays; the opercula and whole head are scaly. There are five species.

SCIATICA, the HIP-GOUT. See MEDICINE.

SCIENCE, in philosophy, denotes any doctrines deduced from self-evident principles. Sciences may be properly divided as follows, 1. The knowledge of things, their constitutions, properties, and operations: this, in a little more enlarged sense of the word, may be called φυσικη, or *natural philosophy*; the end of which is speculative truth. See PHILOSOPHY and PHYSICS. 2. The skill of rightly applying these powers, πρακτικη. The most considerable under this head is ethics, which is the seeking out those rules and measures of human actions that lead to happiness, and the means to practise them (see MORAL PHILOSOPHY); and the next is mechanics, or the application of the powers of natural agents to the uses of life (see MECHANICS).—3. The doctrine of signs, σημειωτικη; the most usual of which being words, it is aptly enough termed *logic*. See LOGIC. This, says Mr. Locke, seems to be the most general as well as natural division of the objects of our understanding.—For a man can employ his thoughts about nothing but either the contemplation of things themselves for the discovery of truth; or about the things in his own power, which are his actions, for the attainment of his own ends; or the signs the mind makes use of both in the one and the other, and the right ordering of them for its clearer information. All which three, *viz.* things as they are in themselves knowahle, actions as they depend on us in order to happiness, and the right use of signs in order to knowledge, being *toto cœlo* different, they seem to be the three great provinces of the intellectual world, wholly separate and distinct one from another.

SCILLA, the SQUILL, in botany: A genus of the monogynia order, belonging to the hexandria class of plants; and ni the natural method ranking under the 10th order, *Coronariæ*. The corolla is hexapetalous and deciduous; the filaments filiform. The most remarkable species is the *maritima*, or sea-onion, whose roots are used in medicine. Of this there are two sorts, one with a red, and the other with a white root; which are supposed to be accidental varieties, but the white are generally preferred for medicinal use. The roots are large, somewhat oval-shaped, composed of many coats lying over each other like onions; and at the bottom come out several fibres. From the middle of the root rise several shining leaves, which continue green all the winter, and decay in the spring. Then the flower-stalk comes out, which rises two feet high, and is naked half-way, terminating in a pyramidal thyrse of flowers, which are white, composed of six petals, which spread open like the points of a star. This grows naturally on the sea-shores, and in the ditches, where the salt-water naturally flows with the tide, in most of the warm parts of Europe, so cannot be propagated in gardens; the frost in winter always destroying the roots, and for want of salt-water they do not thrive in summer. Sometimes the roots which are bought for use put forth their stems and produce flowers, as they lie in the druggists' shops. The root is very nauseous to the taste, intensely bitter, and so acrimonious that it ulcerates the skin if much handled. Taken internally, it powerfully stimulates the solids, and promotes urine, sweat, and expectoration. If the dose is considerable, it proves emetic, and sometimes purgative. The principal use of this medicine is where the primæ viæ abound with mucous matter, and the lungs are oppressed by tenacious phlegm. It has been recom-

mended in hydropic cafes, taken in a recent ftate or in powder, from four to ten grains in a dofe. The moft commodious mode of exhibiting this root is as a bolus or pill. Liquid forms are too difagreeable to moft people; though this may be remedied in fome degree by the addition of fome aromatic diftilled waters. It yields the whole of its virtues to aqueous and vinous menftrua, and likewife to vegetable acids.

SCILLY, a clufter of iflands and rocks, almoft 10 leagues, lying weft of the Land's End in Cornwall, and are eafily difcerned from it. Of thefe only five or fix are inhabited. They are fuppofed formerly to have produced much tin, but are now chiefly known as a refort for feafowl, and a place of fhelter for fhips in bad weather. The inhabitants principally fubfift by fifhing, burning kelp, and acting as pilots. The chief of the iflands is St. Mary's, which has a good port, is the beft cultivated, and contains more inhabitants than all the reft put together. In this ifland, and in two or three others, are various antiquities, particularly the remains of a temple of the Druids, and antient fepulchres; but the greateft ornament is the lighthoufe, which with the gallery is 51 feet high, and a very fine column. The Scilly rocks have been fatal to numbers of fhips entering the Englifh Channel. One of the moft difaftrous events of this kind happened in 1707, when Admiral Sir Cloudefley Shovel, with three men of war, perifhed with all their crews. W. lon. 6. 46. N. lat. 49. 56.

SCIO, antiently called Chios, a celebrated ifland of the Archipelago, near the coaft of Natolia, north-weft of Samos. It is 32 miles long and 15 broad, and a mountainous country; yet fruits of various kinds grow in the fields, fuch as oranges, citrons, olives, mulberries, and pomegranates, interfperfed with myrtles and jafmines. The wine of Scio, fo celebrated by the antients, is ftill in great efteem; but the ifland is now principally diftinguifhed by the profitable culture of the maftich; it has alfo fome trade in filk, wool, cheefe, and figs. The partridges are tame, being fent every day into the fields to feed, and in the evening are called back with a whiftle. It is computed that there are 10,000 Turks, 10,000 Greeks, and 10,000 Latins, on this ifland. The Turks became mafters of it in 1566.

SCIOPPIUS (Gaspar), a moft learned German writer of the 17th century, is reprefented as one of the greateft favages thefe latter ages have produced. He attacked with the utmoft brutality and fury every man of reputation, and had the impudence to boaft of fparing neither quality nor merit. This extraordinary perfon was born about 1576; and ftudied firft at Amburg, then at Heidelburg, afterwards at Altdorf, at the charges of the elector palatine. Having made a confiderable ftay at Ingolftadt, he returned to Altdorf, where he began to publifh books highly efteemed, when he was but fixteen. One of his early productions was a commentary upon the "Priapeia:" Ingolftadt 1595. For this he was afterwards very feverely handled: not fo much becaufe he had commented upon obfcene verfes, as becaufe he had ftuffed his commentary with many obfcenities; and had complained in particular, that nature had not provided fo well for men as for fparrows. In the mean time, notwithftanding the railleries his commentary expofed him to, it has never been infifted on that he was a debauched man.

He made a journey into Italy, and, after he had been fome time at Verona, returned into Germany; whence he went again into Italy, and publifhed at Ferrara a panegyric upon the king of Spain, and pope Clement VIII. He turned Roman Catholic in 1599, and, whatever was the reafon of it, was very angry with the Jefuits; againft whom he wrote above thirty treatifes under fictitious names, the very titles whereof are enough to ftrike one with horror. On the other fide, he inveighed with the utmoft fury againft the Proteftants, and folicited the princes to extirpate them by the moft bloody means. He attacked the king of England in two books, 1611, without the leaft regard to his quality, and in a very abufive way. He abufed Henry IV. of France in a moft outrageous manner; which occafioned his book to be burnt at Paris. He gloried in this difgrace; and added, that himfelf was hanged in effigy in a farce, which was acted before the king of England. His behaviour, however, procured him fome correction; for, in 1614, the fervants of the Englifh ambaffador fet upon him at Madrid, and mauled him moft heartily. He boafted of the wounds he received in this conflict; for he was mighty apt to boaft of what he ought to be afhamed of, as he did, when he boafted of having been the principal contriver of the Catholic league, which proved fo ruinous to the Proteftants in Germany. Going through Venice in 1607, he had a conference with father Paul, whom he endeavoured by promifes and threats to bring over to the pope's party; which perhaps, with other circumftances, occafioned his being imprifoned there three or four days. After he had fpent many years in cenfuring, biting, and defaming every body, he applied himfelf to the prophecies of Holy-Scripture. He looked for the key of them; and flattered himfelf, as he was apt to do upon all occafions, that he had found that very key which St. Peter had left, and which nobody had found before him. He fent fome of his apocalyptical chimeras to cardinal Mazarine, but the cardinal had fomething elfe to do than to examine them. He died in 1649.

SCIPIO (Publius Cornelius), a renowned Roman general, furnamed *Africanus* for his conquefts in that country. His other fignal military exploits were, his taking the city of New Carthage in a fingle day; his complete victory over Hannibal, the famous Carthaginian general; the defeat of Syphax king of Numidia, and of Antiochus in Afia. He was as eminent for his chaftity, and his generous behaviour to his prifoners, as for his valour. He died 180 B. C. aged about 51.

Scipio (Lucius Cornelius), his brother, furnamed *Afiaticus*, for his complete victory over Antiochus at the battle of Magnefia, in which Antiochus loft 50,000 infantry and 4000 cavalry. A triumph, and the furname of *Afiaticus*, were the rewards of his valour. Yet his ungrateful countrymen accufed him, as well as his brother, of peculation; for which he was fined: but the public fale of his effects proved the falfehood of the charge; for they did not produce the amount of the fine.—He flourifhed about 190 B. C.

Scipio (Publius Emilianus), was the fon of Paulus Emilius; but being adopted by Scipio Africanus, he was called *Scipio Africanus junior*. He fhowed himfelf worthy of adoption, following the footfteps of Scipio Africanus, whom he equalled in military fame and public virtues. His chief victories were the conqueft of Carthage and Numantia: yet thefe fignal fervices to his country could not protect him from an untimely fate. He was ftrangled in his bed by order of the Decemviri, who dreaded his popularity, 129 B. C. aged 56.

SCIRO, an ifland of the Archipelago, to the weft of Mytilene, to the north-eaft of Negropont, and to the fouth-eaft of Sciati. It is 15 miles in length, and 8 in breadth. It is a mountainous country, but has no mines. The vines make the beauty of the ifland, and the wine is excellent; nor do the natives want wood. There is but one village; and that is built on a rock, which runs up like a fugar-loaf, and is 10 miles from the harbour of St. George. The inhabitants are all Greeks, the cadi being the only Turk among them.

SCIROCHO, or Sirocho, a name generally given in Italy to every unfavourable wind. In the fouth-weft it is applied to the hot fuffocating blafts from Africa, and in the north eaft it means the cold bleak winds from the Alps.

SCIRPUS, in botany: A genus of the monogynia order, belonging to the triandria clafs of plants; and in the natural method ranking under the 3d order, *Calamariæ*. The glumes

are paleaceous, and imbricated all round. There is no corolla; and only one beardleſs ſeed.

SCIRRHUS, in ſurgery and medicine, a hard tumor of any part of the body, void of pain, ariſing, as is ſuppoſed, from the inſpiſſation and induration of the fluids contained in a gland, though it may alſo appear in any other part of the body, eſpecially in the fat; being one of the ways in which an inflammation terminates. Theſe tumors are exceedingly apt to degenerate into cancers.

SCITAMINEÆ. See Botany.

SCIURUS, the SQUIRREL; a genus of quadrupeds belonging to the order of glires. It has two fore-teeth in each jaw, the ſuperior ones ſhaped like wedges, and the inferior ones compreſſed. There are 11 ſpecies; of which the moſt remarkable are,

1. The *vulgaris*, or common ſquirrel, with ears terminated with long tufts of hair; large, lively black eyes; head, body, legs, and tail, of a bright reddiſh brown; breaſt and belly white; hair on each ſide the tail lies flat. In Sweden and Lapland, it changes in winter into gray. In Ruſſia it is ſometimes found black. In many parts of England there is a beautiful variety with milk white tails.—This ſpecies inhabits Europe and North America, the northern and the temperate parts of Aſia: and a variety is even found as far ſouth as the iſle of Ceylon. It is a neat, lively, active animal; lives always in woods: in the ſpring, the female is ſeen purſued from tree to tree by the males, feigning an eſcape from their embraces; makes its neſt of moſs and dried leaves between the fork of two branches; brings three or four young at a time; has two holes to its neſt; ſtops up that on the ſide the wind blows, as Pliny juſtly remarks; lays in a hoard of winter proviſion, ſuch as nuts, acorns, &c.; in ſummer, feeds on buds and young ſhoots; is particularly fond of thoſe of fir, and the young cones; ſits up to eat, and uſes its fore-feet as hands; covers itſelf with its tail; leaps to a ſurpriſing diſtance; when diſpoſed to croſs a river, a piece of bark is its boat, its tail the ſail; is in great plenty in Dunmallet, and there called *Conn*. Boys frequently nurſe this beautiful and active animal under cats. "There are three creatures, the ſquirrel, the field-mouſe, and the bird called the *nuthatch*, which live much on hazel nuts; and yet they open them each in a different way. The firſt, after raſping off the ſmall end, ſplits the ſhell in two with his long fore-teeth, as a man does with his knife; the ſecond nibbles a hole with his teeth, ſo regular as if drilled with a wimble, and yet ſo ſmall, that one would wonder how the kernel can be extracted through it; while the laſt pecks an irregular ragged hole with its bill: but as this artiſt has no paws to hold the nut firm while he pierces it, like an adroit workman, he fixes it, as it were in a vice, in ſome cleft of a tree, or in ſome crevice; when, ſtanding over it, he perforates the ſtubborn ſhell. While at work, they make a rapping noiſe, that may be heard at a conſiderable diſtance."—*White's Selborne*.

2. The *cinereus*, or gray ſquirrel, with plain ears; hair of a dull gray colour, mixed with black, and often tinged with dirty yellow; belly and inſides of the legs white; tail long, buſhy, gray, and ſtriped with black: ſize of a half grown rabbit.—Inhabits the woods of Northern Aſia, North America, Peru, and Chili. See plate 5. fig. 1. They are very numerous in North America, do incredible damage to the plantations of maize, run up the ſtalks and eat the young ears. Deſcend in vaſt flocks from the mountains, and join thoſe that inhabit the lower parts; are proſcribed by the provinces, and a reward of three-pence per head given for every one that is killed. Such a number was deſtroyed one year, that Pennſylvania alone paid in rewards 8000l. of its currency. Make their neſts in hollow trees, with moſs, ſtraw, wool, &c. Feed on maize in the ſeaſon, and on pine cones, acorns, and maſts of all kinds: form holes under ground, and there depoſit a large ſtock of winter proviſion. Deſcend from the trees, and viſit their magazines when in want of meat; are particularly buſy at the approach of bad weather; during the cold ſeaſon keep in their neſt for ſeveral days together; ſeldom leap from tree to tree, only run up and down the bodies; their hoards often deſtroyed by ſwine; when their magazines are covered with deep ſnow, the ſquirrels often periſh for want of food; are not eaſily ſhot, nimbly changing their place when they ſee the gun levelled; have the actions of the common ſquirrel; are eaſily tamed; and their fleſh is eſteemed very delicate. Their furs, which are imported under the name of *petit gris*, are valuable, and uſed as linings to cloaks.

3. The *niger*, or black ſquirrel, with plain ears; ſometimes wholly black, but often marked with white on the noſe, the neck, or end of the tail; the tail ſhorter than that of the former; the body equal. It inhabits the north of Aſia, North America, and Mexico; breeds and aſſociates in ſeparate troops; is equally numerous with the former; commits as great ravages among the maize; makes its neſt in the ſame manner, and forms, like them, magazines for winter food. The fineſt are taken near the lake Baikal, and about Barguzinſkoi-oſtrog, upon the Upper Angara, in the diſtrict of Nertſchinſk, which are the beſt in all Siberia; theſe continue black the whole year, the others grow ruſty in ſummer.—There is a variety with plain ears; coarſe fur mixed with dirty white and black; throat and inſide of the legs and thighs black; tail much ſhorter than thoſe of ſquirrels uſually are; of a dull yellow colour, mixed with black; body of the ſize of the gray ſquirrel. It inhabits Virginia; the planters call it the *cat ſquirrel*.

4. The *flavus*, or fair ſquirrel, with the body and tail of a flaxen colour; of a very ſmall ſize, with plain round ears, and rounded tail. Inhabits the woods near Amadabad, the capital of Guzurat, in great abundance, leaping from tree to tree. Linnæus ſays it is an inhabitant of South America.

5. The *ſtriatus*, or ground ſquirrel, with plain ears; ridge of the back marked with a black ſtreak; each ſide with a pale yellow ſtripe, bounded above and below with a line of black; head, body, and tail, of a reddiſh brown; the tail the darkeſt; breaſt and belly white; noſe and feet pale-red; eyes full.—Inhabits the north of Aſia, but found in the greateſt abundance in the foreſts of North America. They never run up trees except they are purſued, and find no other means of eſcaping: they burrow, and form their habitations under ground, with two entrances, that they may get acceſs to the one in caſe the other is ſtopped up. Their retreats are formed with great ſkill, in form of a long gallery, with branches on each ſide, each of which terminates in an enlarged chamber, as a magazine to ſtore their winter proviſion in; in one they lodge the acorns, in another the maize, in a third the hickery nuts, and in the laſt their favourite food the chinquapin cheſnut. They very ſeldom ſtir out during winter, at leaſt as long as their proviſion laſts; but if that fails, they will dig into cellars where apples are kept, or barns where maize is ſtored, and do a great deal of miſchief; but at that time the cat deſtroys great numbers, and is as great an enemy to them as to mice. During the maize harveſt theſe ſquirrels are very buſy in biting off the ears, and filling their mouths ſo full with the corn, that their cheeks are quite diſtended. It is obſervable that they give great preference to certain food; for if, after filling their mouths with rye, they happen to meet with wheat, they fling away the firſt, that they may indulge in the laſt. They are very wild, bite ſeverely, and are ſcarcely ever tamed; the ſkins are of little uſe, but are ſometimes brought over to line cloaks.

6. The *glis*, or fat ſquirrel, with thin naked ears; body covered with ſoft aſh-coloured hair; belly whitiſh; tail full of long hair: from noſe to tail, near ſix inches; tail, four and a half: thicker in the body than the common ſquirrel.—Inhabits

France and the ſouth of Europe; lives in trees, and leaps from bough to bough; feeds on fruits and acorns; lodges in the hollows of trees; remains in a torpid ſtate during winter, and grows very fat. It was eſteemed a great delicacy by the Romans, who had their gliraria, places conſtructed to keep and feed them in.

7. The *ſagitta*, or arrow ſquirrel, (fig. 2.) with a ſmall round head, cloven upper lip: ſmall blunt ears, two ſmall warts at the utmoſt corner of each eye, with hairs growing out of them: neck ſhort: four toes on the fore feet; and inſtead of a thumb, a ſlender bone two inches and a half long, lodged under the lateral membrane, ſerving to ſtretch it out: from thence to the hind legs extends the membrane, which is broad, and a continuation of the ſkin of the ſides and belly: there are five toes on the hind feet; and on all the toes, ſharp compreſſed bent claws: the tail is covered with long hairs diſpoſed horizontally: colour of the head, body, and tail, a bright bay; in ſome parts inclining to orange: breaſt and belly of a yellowiſh white: length from noſe to tail, eighteen inches; tail, fifteen.—Inhabits Java, and others of the Indian iſlands: leaps from tree to tree as if it flew: will catch hold of the boughs with its tail. Niewhoff, p. 354. deſcribes this under the name of the flying cat, and ſays the back is black.

8. The *volans*, or flying ſquirrel, with round naked ears, full black eyes, and a lateral membrane from the fore to the hind legs: tail with long hairs diſpoſed horizontally, longeſt in the middle: its colour above, a browniſh aſh; beneath, white tinged with yellow: much leſs than the common ſquirrel. Inhabits Finland, Lapland, Poland, Ruſſia, North America, and New Spain: lives in hollow trees: ſleeps in the day: during the night is very lively: is gregarious, numbers being found in one tree: leaps from bough to bough ſometimes at the diſtance of ten yards: this action has improperly been called flying, for the animal cannot go in any other direction than forward; and even then cannot keep an even line, but ſinks conſiderably before it can reach the place it aims at: ſenſible of this, the ſquirrel mounts the higher in proportion to the diſtance it wiſhes to reach: when it would leap, it ſtretches out the fore-legs, and extending the membranes becomes ſpecifically lighter than it would otherwiſe be, and thus is enabled to ſpring further than other ſquirrels that have not this apparatus. When numbers leap at a time, they ſeem like leaves blown off by the wind. Their food the ſame as that of the other ſquirrels. They are eaſily tamed: bring three or four young at a time. See fig. 3 & 4, the one repreſenting the animal in what is called a *flying*, the other in a *ſitting*, poſture.

SCIURUS, in botany: A genus of the monogynia order, belonging to the diandria claſs of plants; and in the natural method ranking with thoſe that are doubtful. The calyx is quinquedentate; the corolla bilabiated; the filaments are barren; the capſules five, and joined together; bivalved, unilocular, with one ſeed. Of this there is one ſpecies, viz. *aromatica*, a native of Guiana.

SCLAVONIA, a country of Europe, between the rivers Save, the Drave, and the Danube. It is divided into ſix counties, viz. Poſegra, Zabrab, Creis, Waraſden, Zreim, and Walpon, and belongs to the houſe of Auſtria. It was formerly called a *kingdom*; and is very narrow, not being above 75 miles in breadth; but it is 300 in length, from the frontiers of Auſtria to Belgrade. The eaſtern part is called *Ratzia*, and the inhabitants *Ratzians*. Theſe, from a particular notion, are of the Greek church. The language of Sclavonia is the mother of four others, namely, thoſe of Hungary, Bohemia, Poland, and Ruſſia.

SCLERANTHUS, in botany: A genus of the digynia order, belonging to the dodecandria claſs of plants, and in the natural method ranking under the 22d order, *Caryophyllei*. The calyx is monophyllous; there is no corolla; there are two ſeeds contained in the calyx.

SCLERIA, in botany: A genus of the tetrandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 4th order, *Gramina*. The calyx has a gluma, with from two to ſix valves; the flowers numerous; the ſeed a ſort of nut, ſmall, oblong, and ſhining. There are ſix ſpecies, all of them natives of the Weſt Indies.

SCLEROTICS, medicines proper to harden and conſolidate the fleſh of the parts to which they are applied; as purſlain, houſe-leek, flea-wort, garden night-ſhade, &c.

SCOLOPAX, in ornithology, a genus belonging to the order of grallæ. The back is cylindrical, obtuſe, and longer than the head; the noſtrils are linear; the face is covered; and the feet have four toes. There are 18 ſpecies; of which the following are the principal. (See plate 5.)

1. The *arquata*, or curlew, frequents our ſea-coaſts and marſhes in the winter time in large flocks, walking on the open ſands; feeding on ſhells, frogs, crabs, and marine inſects. In ſummer they retire to the mountainous and unfrequented parts of the country, where they pair and breed. Their eggs are of a pale olive colour, marked with irregular but diſtinct ſpots of pale brown. Their fleſh is very rank and fiſhy, notwithſtanding an old Engliſh proverb in its favour. Curlews differ much in weight and ſize; ſome weighing 37 ounces, others not 22: the length of the largeſt to the tip of the tail, 25 inches; the breadth, three feet five inches: the bill is ſeven inches long: the head, neck, and coverts of the wings are of a pale brown; the middle of each feather, black; the breaſt and belly white, marked with narrow oblong black lines: the back is white, ſpotted with a few black ſtrokes: the quill-feathers are black, but the inner webs ſpotted with white; the tail is white, tinged with red, and beautifully barred with black; the legs are long, ſtrong, and of a bluiſh gray colour; the bottoms of the toes flat and broad, to enable it to walk on the ſoft mud, in ſearch of food.

2. The *phæopus*, or whimbrel, is much leſs frequent on our ſhores than the curlew; but its haunts, food, and general appearance, are much the ſame. It is obſerved to viſit the neighbourhood of Spalding (where it is called the *curlew knot*) in vaſt flocks in April, but continues there no longer than May; nor is it ſeen there any other time of the year: it ſeems at that ſeaſon to be on its paſſage to its breeding place, which Mr. Pennant ſuſpects to be among the Highlands of Scotland. The ſpecific difference is the ſize; this never exceeding the weight of 12 ounces.

3. The *ruſticola*, or woodcock, during ſummer inhabits the Alps of Norway, Sweden, Poliſh Pruſſia, the march of Brandenburg, and the northern parts of Europe: they all retire from thoſe countries in the beginning of winter, as ſoon as the froſts commence; which force them into milder climates, where the ground is open, and adapted to their manner of feeding. They live on worms and inſects, which they ſearch for with their long bills in ſoft grounds and moiſt woods. Woodcocks generally arrive here in flocks, taking advantage of the night or a miſt: they ſoon ſeparate; but, before they return to their native haunts, pair. They feed and fly by night; beginning their flight in the evening, and return the ſame way or through the ſame glades to their day retreat. They leave England the latter end of February, or beginning of March; not but they have been known to continue here accidentally. Theſe birds appear in Scotland firſt on the eaſtern coaſts, and make their progreſs from eaſt to weſt. They do not arrive in Breadalbane, a central part of the kingdom, till the beginning or middle of November; nor the coaſts of Nether Lorn, or of Roſsſhire, till December or January: they are very rare in the remote Hebrides, and in the Orkneys. A few ſtragglers now and then arrive there. They are equally ſcarce in Caithneſs. Our ſpecies of woodcock is unknown in North America: but a kind is found that

has the general appearance of it; but is fcarce half the fize, and wants the bars on the breaft and belly. The weight of the woodcock is ufually about 12 ounces: the length near 14 inches; and the breadth, 26; the bill is three inches long, dufky towards the end, reddifh at the bafe; tongue flender, long, fharp, and hard at the point; the eyes large, and placed near the top of the head, that they may not be injured when the bird thrufts its bill into the ground; from the bill to the eyes is a black line; the fore-head is a reddifh afh colour; the crown of the head, the hind part of the neck, the back, the coverts of the wings, and the fcapulars, are prettily barred with a ferruginous red, black, and gray; but on the head the black predominates: the quill-feathers are dufky, indented with red marks. The chin is of a pale yellow; the whole under fide of the body is of a dirty white, marked with numerous tranfverfe lines of a dufky colour. The tail confifts of 12 feathers, dufky or black on the one web, and marked with red on the other; the tips above are afh-coloured, below white; which, when fhooting on the ground was in vogue, was the fign the fowler difcovered the birds by. The legs and toes are livid; the latter divided almoft to their very origin, having only a very fmall web between the middle and interior toes; as thofe of the two fpecies of fnipes found in England.

4. The *ægocephala*, or godwit, weighs 12 ounces and a half; the length is 16 inches; the breadth 27; the bill is four inches long, turns up a little, black at the end, the reft a pale purple; from the bill to the eye is a broad white ftroke; the feathers of the head, neck, and back, are of a light reddifh brown, marked in the middle with a dufky fpot; the belly and vent feathers white, the tail regularly barred with black and white. The fix firft quill-feathers are black; their interior edges of a reddifh brown; the legs in fome are dufky, in others of a grayifh blue, which perhaps may be owing to different ages; the exterior toe is connected as far as the firft joint of the middle toe with a ftrong ferrated membrane. The male is diftinguifhed from the female by fome black lines on the breaft and throat; which in the female are wanting. Thefe birds are taken in the fens, in the fame feafon and in the fame manner with the ruffs and reeves; (fee TRINGA) and when fattened are efteemed a great delicacy, and fell for half a crown or five fhillings a piece. A ftale of the fame fpecies is placed in the net. They appear in fmall flocks on our coafts in September, and continue with us the whole winter; they walk on the open fands like the curlew, and feed on infects.

5. The *glottis*, or greenfhank, is in length to the end of the tail, 14 inches; to that of the toes, 20; its breadth, 25. The bill is two inches and a half long; the upper mandible black, ftraight, and very flender; the lower reflects a little upwards; the head and upper part of the neck are afh-coloured, marked with fmall dufky lines pointing down; over each paffes a white line; the coverts, the fcapulars, and upper part of the back, are of a brownifh afh-colour; the quill-feathers dufky, but the inner webs fpeckled with white; the breaft, belly, thighs, and lower part of the back, are white; the tail is white, marked with undulated dufky bars: the inner coverts of the wings finely croffed with double and treble rows of a dufky colour. It is a bird of an elegant fhape, and fmall weight in proportion to its dimenfions, weighing only fix ounces. The legs are very long and flender, and bare above two inches higher than the knees. The exterior toe is united to the middle toe, as far as the fecond joint, by a ftrong membrane which borders their fides to the very end.—Thefe birds appear on the Englifh coafts and wet grounds in the winter-time in but fmall numbers.

6. The *calidris*, or red-fhank, is found on moft of our fhores; in the winter time it conceals itfelf in the gutters, and is generally found fingle, or at moft in pairs. It breeds in the fens and marfhes; and flies round its neft when difturbed, making a noife like a lapwing. It lays four eggs, whitifh tinged with olive, marked with irregular fpots of black chiefly on the thicker end. It weighs five ounces and a half: the length is 12 inches, the breadth 21; the bill near two inches long, red at the bafe, black towards the point. The head, hind part of the neck, and fcapulars, are of a dufky afh-colour, obfcurely fpotted with black; the back is white, fprinkled with black fpots; the tail elegantly barred with black and white; the cheeks, under fide of the neck, and upper part of the breaft, are white, ftreaked downward with dufky lines; the belly white; the exterior webs of the quill-feathers are dufky; the legs long, and of a fine bright orange colour; the utmoft toe connected to the middle toe by a fmall membrane; the inmoft by another ftill fmaller.

7. The *gallinago*, or common fnipe, weighs four ounces; the length, to the end of the tail, is near 12 inches; the breadth about 14; the bill is three inches long, of a dufky colour, flat at the end, and often rough like fhagrin above and below. The head is divided lengthwife with two black lines, and three of red, one of the laft paffing over the middle of the head, and one above each eye; between the bill and the eyes is a dufky line; the chin is white; the neck is varied with brown and red. The fcapulars are beautifully ftriped lengthwife with black and yellow; the quill-feathers are dufky; but the edge of the firft is white, as are the tips of the fecondary feathers: the quill-feathers next the back are barred with black and pale red; the breaft and belly are white; the coverts of the tail are long, and almoft cover it; they are of a reddifh brown colour. The tail confifts of 14 feathers, black on their lower part, then croffed with a broad bar of deep orange, another narrow one of black; and the ends white, or pale orange. The vent feathers are of a dull yellow; the legs pale green; the toes divided to their origin. In the winter-time fnipes are very frequent in all our marfhes and wet grounds, where they lie concealed in the rufhes, &c. In fummer they difperfe to different parts, and are found in the midft of our higheft mountains as well as of our low moors; their neft is made of dried grafs; they lay four eggs of a dirty olive colour, marked with dufky fpots; their young are fo often found in England, that we doubt whether they ever entirely leave this ifland. When they are difturbed much, particularly in the breeding feafon, they foar to a vaft height, making a fingular bleating noife; and, when they defcend, dart down with vaft rapidity; it is alfo amufing to obferve the cock, while his mate fits on her eggs, poife himfelf on her wings, making fometimes a whiftling and fometimes a drumming noife. Their food is the fame with that of the woodcock; their flight very irregular and fwift, and attended with a fhrill fcream. They are moft univerfal birds, found in every quarter of the globe, and in all climates.

SCOLOPENDRA, in zoology, a genus of infects belonging to the order of aptera. The feet are very numerous, being as many on each fide as there are joints in the body; the antennæ are fetaceous: there are two jointed pappi, and the body is depreffed.—Thefe infects are very formidable and noxious in the warm countries, where they grow to the length of a quarter of a yard or more, though in this climate they feldom grow above an inch long. The fcolopendra is alfo called the *centipes* from its number of feet. In the Eaft Indies it grows to fix inches in length, and as thick as a man's finger: it confifts of many joints; and from each joint proceeds a leg on each fide; they are covered with hair, and feem to have no eyes; but there are two feelers on the head, with which they find out the way they are to pafs: the head is very round, with two fmall fharp teeth, with which they inflict wounds that are very painful and dangerous. A failor that was bit by one on board a fhip felt exceffive pain, and his life was fuppofed to be in danger; but by the application of roafted onions to the part he recovered. The bite of the fcolopendra *morfitans* in Jamaica (See pl. 4.) is faid to be as

poisonous as the sting of a scorpion.—Some of the species live in holes in the earth: others under stones, and among rotten wood; so that the removing of these is exceedingly dangerous in the countries where the scolopendræ breed.—These insects, like the scorpion, are supposed to be produced perfect from the parent or the egg, and to undergo no changes after their first exclusion. They are found of all sizes; which is a sufficient reason for believing that they preserve their first appearance through the whole of their existence. It is probable, however, that, like most of this class, they often change their skins; but of this we have no certain information. The scolopendra forficata is the largest in this country, of a dun colour, smooth, and composed of nine scaly segments, without reckoning the head. The feet are 15 in number on each side, and the last, longer than the rest, and turned backwards, form a kind of forky tail. The antennæ are twice the length of the head, and consist of 42 short segments. The insect's progressive motion is very quick, and sometimes serpentine. It is found under stones on the ground, under flower-pots and garden boxes.

SCOLYMUS, in botany: A genus of the polygamia æqualis order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Compositæ*. The receptacle is paleaceous; the calyx imbricated and prickly, without any pappus.

SCOMBER, the MACKEREL, in ichthyology, a genus belonging to the order of thoracici. The head is smooth and compressed, and there are seven rays in the gill membrane. There are ten species;—of which the most remarkable are the following.

1. The *scomber*, or common mackerel, a summer-fish of passage that visits our shores in vast shoals. It is less useful than other species of gregarious fish, being very tender, and unfit for carriage; not but that it may be preserved by pickling and salting, a method, we believe, practised only in Cornwall, where it proves a great relief to the poor during winter. It was a fish greatly esteemed by the Romans, because it furnished the precious garum, a sort of pickle that gave a high relish to their sauces; and was besides used medicinally. It was drawn from different kinds of fish, but that made from the mackerel had the preference: the best was made at Carthagena, vast quantities of mackerel being taken near an adjacent isle, called from that circumstance *Scombraria*, and the garum, prepared by a certain company in that city, bore a high price, and was distinguished by the title of *garum sociorum*. This fish is easily taken by a bait; but the best time is during a fresh gale of wind, which is thence called a *mackerel gale*. In the spring the eyes of mackerel are almost covered with a white film; during which period they are half blind. This film grows in winter, and is cast the beginning of summer. It is not often that it exceeds two pounds in weight, yet there have been instances of some that weighed upwards of five. The nose is taper and sharp-pointed; the eyes large; the jaws of an equal length; the teeth small, but numerous. The form of this fish is very elegant. The body is a little compressed on the sides: towards the tail it grows very slender, and a little angular. It is a most beautiful fish when alive; for nothing can equal the brilliancy of its colour, which death impairs, but does not wholly obliterate.

2. The *thunnus*, or tunny, was a fish well known to the antients: it made a considerable branch of commerce: the time of its arrival in the Mediterranean from the ocean was observed, and stations for taking them were established in places it most frequented.

There are still very considerable tunny fisheries on the coast of Sicily, as well as several other parts of the Mediterranean; where they are cured, and make a great article of provision in the adjacent kingdoms.—They are caught in nets, and amazing quantities are taken; for they come in vast shoals, keeping along the shores. See *Tunny*-FISHERY.

They frequent our coasts, but not in shoals like the tunnies of the Mediterranean. They are not uncommon in the lochs on the western coast of Scotland; where they come in pursuit of herrings; and often during night strike into the nets, and do considerable damage. When the fishermen draw them up in the morning, the tunny rises at the same time towards the surface, ready to catch the fish that drop out. On perceiving it, a strong hook baited with a herring, and fastened to a rope, is instantly flung out, which the tunny seldom fails to take. As soon as hooked, it loses all spirit; and after a very little resistance submits to its fate. It is dragged to the shore and cut up, either to be sold fresh to people who carry it to the country markets, or is preserved salted in large casks. The pieces, when fresh, look exactly like raw beef; but when boiled turn pale, and have something of the flavour of salmon.

One that was taken when Mr. Pennant was at Inverary in 1769, weighed 460 pounds. The fish was seven feet ten inches long; the greatest circumference five feet seven; the least near the tail one foot six. The body was round and thick, and grew suddenly very slender towards the tail, and near that part was angular. The irides were of a plain green: the teeth very minute. The tail was in form of a crescent; and two feet seven inches between tip and tip. The skin on the back was smooth, very thick, and black. On the belly the scales were visible. The colour of the sides and belly was silvery, tinged with cærulean and pale purple: near the tail marbled with gray.

They are known on the coast of Scotland by the name of *mackrelsture: Mackrel*, from being of that genus; and *sture*, from the Danish *stor*, "great."

SCONE, or SCHOONE, a village in Perthshire, on the east side of the river Tay, north by west of Perth. Here is the antient royal palace (now a seat of the earl of Mansfield) in which the kings of Scotland were crowned, in the celebrated stone chair, now in Westminster abbey. It is 30 miles north of Edinburgh.

SCOPARIA, in botany: A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 40th order, *Personatæ*. The calyx is quadripartite; the corolla the same, and rotaceous; the capsule unilocular, bivalved, and polyspermous.

SCOPER, or SCUPPER HOLES, in a ship, are holes made through the sides, close to the deck, to carry off the water that comes from the pump.

SCOPOLIA, in botany: A genus of the octandria order, belonging to the gynandria class of plants; and in the natural method ranking under the 11th class, *Sarmentaceæ*. The calyx is diphyllous; the corolla quadrifid; the antheræ coalesce in two columns, one placed above the other. Of this there is only one species, viz. the *Composita*.

SCORBUTUS, the SCURVY. See MEDICINE.

SCORDIUM, or WATER-GERMANDER, in botany, a species of TEUCRIUM.

SCORIA, or DROSS, among metallurgists, is the recrement of metals in fusion; or, more determinately speaking, is that mass which is produced by melting metals and ores: when cold, it is brittle, and not dissoluble in water, being properly a kind of glass.

SCORIFICATION, in metallurgy, is the art of reducing a body, either entirely or in part, into scoria.

SCORPÆNA, in ichthyology, a genus belonging to the order of thoracici. The head is large and sharp; the eyes are near each other; there are teeth in the jaws, palate, and fauces; and there are seven rays in the membrane of the gill. The species are three, viz. the *porcus*, *scrofa*, and *horrida*. According to Mr. Willughby, the scorpæna is a fish of the anguilliform kind, called by the people of Cornwall *father-lasher*. *Scorpæna* is also the name of a fish caught in many parts of the Mediterranean. It seldom grows to more than a pound weight. Its body is long, but not flatted, and is moderately

thick. Its head is extremely large, and is armed with prickles, and it grows gradually lefs from thence to the tail. The prickles about the head are accounted venemous, and the fifhermen ufually cut them off as foon as the fifh is caught. Its tail is not forked, but rounded at the end. The belly and belly-fins are reddifh.

SCORPIO, in zoology, a genus of infects belonging to the order of aptera. (See pl. 4.) It has eight feet, befides two frontal claws; the eyes are eight in number, three on each fide of the thorax, and two on the back. It has two claw-fhaped palpi, a long jointed tail, with a pointed weapon at the extremity; it has likewife two combs fituated betwixt the breaft and abdomen. There are fix fpecies, all natives of fouthern climates.

In feveral parts of the continent of Europe it is but too well known, though it feldom grows above four inches long: but in the warm tropical climates, it is feen a foot in length, and in every refpect as large as a lobfter, which it fomewhat refembles in fhape. There have been enumerated nine different kinds of this dangerous infect, including fpecies and varieties, chiefly diftinguifhed by their colour; there being fcorpions yellow, brown, and afh-coloured; others that are the colour of rufty iron, green, pale yellow, black, claret colour, white, and gray. There are four principal parts diftinguifhable in this animal; the head, the breaft, the belly, and the tail. The fcorpion's head feems, as it were, jointed to the breaft; in the middle of which are feen two eyes; and a little more forward, two eyes more, placed in the fore part of the head: thofe eyes are fo fmall, that they are fcarcely perceivable; and it is probable the animal has but little occafion for feeing. The mouth is furnifhed with two jaws: the undermoft is divided into two, and the parts notched into each other, which ferves the animal as teeth, and with which it breaks its food, and thrufts it into its mouth: thefe the fcorpion can at pleafure pull back into its mouth, fo that no part of them can be feen. On each fide of the head are two arms, each compofed of four joints; the laft of which is large, with ftrong mufcles, and made in the manner of a lobfter's claw. Below the breaft are eight articulated legs, each divided into fix joints; the two hindmoft of which are each provided with two crooked claws, and here and there covered with hair. The belly is divided into feven little rings; from the loweft of which is continued a tail, compofed of fix joints, which are briftly, and formed like little globes, the laft being armed with a crooked fting. This is that fatal inftrument which renders this infect fo formidable: it is long, pointed, hard, and hollow; it is pierced near the bafe by two fmall holes, through which, when the animal ftings, it ejects a drop of poifon, which is white, cauftic, and fatal. The refervoir in which this poifon is kept, is in a fmall bladder near the tail, into which the venom is diftilled by a peculiar apparatus. If this bladder be greatly preffed, the venom will be feen iffuing out through the two holes above mentioned; fo that it appears, that when the animal ftings, the bladder is preffed, and the venom iffues through the two apertures into the wound.

We have here given the common account of the fting of thefe noxious animals; but though we cannot pretend to determine between them, we fhall lay before our readers the following obfervations from a treatife on *Tropical Difeafes*, &c. by Dr. Mofeley of Chelfea Hofpital. "Galen juftly obferves, that a perfon who had not witneffed the fact, would not fuppofe that fo fmall an injury as the fting of a fcorpion, or the bite of a poifonous fpider, could produce the violent effects which they do in the whole body. He fays, the aculeus, or fting, of a fcorpion ends in the minuteft point; and has no perforation through which any poifon can pafs into the wound. Yet, he fays, we muft fuppofe the venom to be fome fpiritual fubftance, or moifture, in which a great power is concentrated in a fmall compafs. Before I had an opportunity (fays Dr. Mofeley) of examining this fubject, my refpect for the opinion of Galen made me doubt the accuracy of Leeuwenhoek, Redi, Mead, and others, who affert that there is an aperture near the cufpis of a fcorpion's fting; and that through this aperture a liquid poifon is injected when a wound is inflicted. Repeated experiments, with the beft glaffes, have never enabled me to difcover any foramen, or opening, whatever."

The following cure may alfo be worth the reader's notice: "Mrs. Pidgeley, at Kingfton in Jamaica, in January 1781, was ftung by a fcorpion in the foot, above the little toe. The part became inftantly red and painful; and foon after livid. The pain increafed to great feverity. Some rum was applied to the wound, on which the pain immediately left the foot, and paffed up to the groin, with great agony. The pain ftill paffed upwards, and diffufed itfelf about the pit of the ftomach, neck, and throat, attended with tremors, cold fweats, and languors. As the pain paffed the abdomen, it occafioned a violent purging and fainting, which ceafed on its advancing higher." The author was called to her, and gave her the following medicines, a few dofes of which removed every fymptom. She had been extremely ill for thirty fix hours. ℞ *Sal. Succin.* ℈ij; *Camphor.* gr. xij; *Cinnabar. Antimon.* gr. x; *Confect. Card. q. f. fiant boli fex.* One of thefe was taken every hour, with four fpoonfuls of the following mixture: ℞ *Aq. Menthæ* ℥ vij; *Elix. Paregoric.* ʒ ij; *Syr. Croci* ℥ ff; *Mifce.*

There are few animals more formidable, or more truly mifchievous, than the fcorpion. As it takes refuge in a fmall place, and is generally found fheltering in houfes, it muft frequently fting thofe among whom it refides. In fome of the towns of Italy, and in France, in the province of Languedoc, it is one of the greateft pefts that torment mankind: but its malignity in Europe is trifling, when compared to what the natives of Africa and the eaft are known to experience. In Batavia, where they grow twelve inches long, there is no removing any piece of furniture without the utmoft danger of being ftung by them. Bofman affures us, that along the Gold Coaft they are often found larger than a lobfter; and that their fting is inevitably fatal. In Europe, however, they are by no means fo large, fo venemous, or fo numerous. The general fize of this animal does not exceed two or three inches; and its fting is very feldom found to be fatal. Maupertuis, who made feveral experiments on the fcorpion of Languedoc, found it by no means fo invariably dangerous as had till then been reprefented. He provoked one of them to fting a dog, in three places of the belly where the animal was without hair. In about an hour after, the poor animal feemed greatly fwollen, and became very fick: he then caft up whatever he had in his bowels; and for about three hours continued vomiting a whitifh liquid. The belly was always greatly fwollen when the animal began to vomit; but this operation always feemed to abate the fwelling; which alternately fwelled, and was thus emptied, for three hours fucceffively. The animal after this fell into convulfions, bit the ground, dragged himfelf along upon his four feet, and at laft died, five hours after being bitten. He was not partially fwollen round the place which was bitten, as is ufual after the fting of a wafp or a bee; but his whole body was inflated, and there only appeared a red fpot on the places where he had been ftung.

Some days after, however, the fame experiment was tried upon another dog, and even with more aggravated cruelty: yet the dog feemed no way affected by the wounds; but, howling a little when he received them, continued alert and well after them; and foon after was fet at liberty, without fhowing the fmalleft fymptoms of pain. So far was this poor creature from being terrified at the experiment, that he left his own mafter's houfe, to come to that of the philofopher, where he had received more plentiful entertainment. The fame experiment was tried by frefh fcorpions upon feven other dogs, and upon three hens; but not the

ſmalleſt deadly ſymptom was ſeen to enſue. From hence it appears, that many circumſtances, which are utterly unknown, muſt contribute to give efficacy to the ſcorpion's venom. Whether its food, long faſting, the ſeaſon, the nature of the veſſels it wounds, or its ſtate of maturity, contribute to or retard its malignity, is yet to be aſcertained by ſucceeding experiment. In the trials made by our philoſopher, he employed ſcorpions of both ſexes, newly caught, and ſeemingly vigorous and active. The ſucceſs of this experiment may ſerve to ſhow, that many of thoſe boaſted antidotes which are given for the cure of the ſcorpion's ſting, owe their ſucceſs rather to accident than their own efficacy. They only happened to cure when their ſting was no way dangerous; but in caſes of actual malignity they might probably be utterly unſerviceable.

The ſcorpion of the tropical climates being much larger than thoſe boaſted antidotes which are given for the cure of the former, is probably much more venemous. Helbigius, however, who reſided for many years in the eaſt, aſſures us, that he was often ſtung by the ſcorpion, and never received any material injury from the wound; a painful tumor generally enſued; but he always cured it by rubbing the part with a piece of iron or ſtone, as he had ſeen the Indians practiſe before him, until the fleſh became inſenſible. Seba, Moore, and Boſman, however, give a very different account of the ſcorpion's malignity; and aſſert, that, unleſs ſpeedily relieved, the wound becomes fatal.

It is certain, that no animal in the creation ſeems endued with ſuch an iraſcible nature. They have often been ſeen, when taken and put into a place of ſecurity, to exert all their rage againſt the ſides of the glaſs-veſſel that contained them. They will attempt to ſting a ſtick when put near them; and attack a mouſe or a frog, while thoſe animals are far from offering any injury. Maupertuis put three ſcorpions and a mouſe into the ſame veſſel together, and they ſoon ſtung the little animal in different places. The mouſe, thus aſſaulted, ſtood for ſome time upon the defenſive, and at laſt killed them all, one after another. He tried this experiment, in order to ſee whether the mouſe, after it had killed, would eat the ſcorpions; but the little quadruped ſeemed ſatiſfied with the victory, and even ſurvived the ſeverity of the wounds it had received. Wolkamer tried the courage of the ſcorpion againſt the large ſpider, and incloſed ſeveral of both kinds in glaſs veſſels for that purpoſe. The ſucceſs of this combat was very remarkable. The ſpider at firſt uſed all its efforts to intangle the ſcorpion in its web, which it immediately began ſpinning; but the ſcorpion reſcued itſelf from the danger, by ſtinging its adverſary to death; it ſoon after cut off, with its claws, all the legs of the ſpider, and then ſucked all the internal parts at its leiſure.—If the ſcorpion's ſkin had not been ſo hard, Wolkamer is of opinion that the ſpider would have obtained the victory; for he had often ſeen one of theſe ſpiders deſtroy a toad.

The fierce ſpirit of this animal is equally dangerous to its own ſpecies; for ſcorpions are the crueleſt enemies to each other. Maupertuis put about 100 of them together in the ſame glaſs; and they ſcarce came into contact when they began to exert all their rage in mutual deſtruction: there was nothing to be ſeen but one univerſal carnage, without any diſtinction of age or ſex; ſo that in a few days there remained only 14, which had killed and devoured all the reſt.

But their unnatural malignity is ſtill more apparent in their cruelty to their offspring. He incloſed a female ſcorpion, big with young, in a glaſs veſſel, and ſhe was ſeen to devour them as faſt as they were excluded: there was but one only of the number that eſcaped the general deſtruction, by taking refuge on the back of its parent; and this ſoon after revenged the cauſe of its brethren, by killing the old one in its turn.

Such is the terrible and unrelenting nature of this inſect, which neither the bonds of ſociety nor of nature can reclaim: it is even aſſerted, that, when driven to an extremity, the ſcorpion will often deſtroy itſelf. The following experiment was ineffectually tried by Maupertuis: "But," ſays Goldſmith, "I am ſo well aſſured of it by many eye-witneſſes, who have ſeen it both in Italy and America, that I have no doubt remaining of its veracity. A ſcorpion, newly caught, is placed in the midſt of a circle of burning charcoal, and thus an egreſs prevented on every ſide: the ſcorpion, as I am aſſured, runs for about a minute round the circle, in hopes of eſcaping: but finding that impoſſible, it ſtings itſelf on the back of the head; and in this manner the undaunted ſuicide inſtantly expires."

It is happy for mankind that theſe animals are thus deſtructive to each other; ſince otherwiſe they would multiply in ſo great a degree as to render ſome countries uninhabitable. The male and female of this inſect are very eaſily diſtinguiſhable: the male being ſmaller and leſs hairy. The female brings forth her young alive, and perfect in their kind. Redi having bought a quantity of ſcorpions, ſelected the females, which, by their ſize and roughneſs, were eaſily diſtinguiſhable from the reſt; and putting them in ſeparate glaſs veſſels, he kept them for ſome days without food. In about five days one of them brought forth 38 young ones, well ſhaped, and of a milk-white colour, which changed every day more and more into a dark ruſty hue. Another female, in a different veſſel, brought forth 27 of the ſame colour; and the day following the young ones ſeemed all fixed to the back and belly of the female. For near a fortnight all theſe continued alive and well: but afterwards ſome of them died daily; until, in about a month, they all died except two.

Were it worth the trouble, theſe animals might be kept living as long as curioſity ſhould think proper. Their chief food is worms and inſects; and upon a proper ſupply of theſe, their lives might be lengthened to their natural extent. How long that may be, we are not told; but if we may argue from analogy, it cannot be leſs than ſeven or eight years; and perhaps, in the larger kind, double that duration. As they have ſomewhat the form of the lobſter, ſo they reſemble that animal in caſting their ſhell, or more properly their ſkin; ſince it is ſofter by far than the covering of the lobſter, and ſet with hairs, which grow from it in great abundance, particularly at the joinings. The young lie in the womb of the parent, each covered up in its own membrane, to the number of 40 or 50, and united to each other by an oblong thread, ſo as to exhibit altogether the form of a chaplet.

Such is the manner in which the common ſcorpion produces its young: but there is a ſcorpion of America produced from the egg, in the manner of the ſpider. The eggs are no longer than pin's points; and they are depoſited in a web, which they ſpin from their bodies, and carry about with them till they are hatched. As ſoon as the young ones are excluded from the ſhell, they get upon the back of the parent, who turns her tail over them, and defends them with her ſting. It ſeems probable, therefore, that captivity produces that unnatural diſpoſition in the ſcorpion which induces it to deſtroy its young: ſince, at liberty, it is found to protect them with ſuch unceaſing aſſiduity. For the various modes of preventing the fatal conſequences of the bite of theſe and other noxious animals, we refer to Moſeley's treatiſe above quoted.

Scorpio, *Scorpion*, in aſtronomy, the eighth ſign of the zodiac denoted by the character ♏. See Astronomy.

Scorpion *Fly*. See Panorpa.

SCORPIURUS, Caterpillars, in botany: A genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The legumen is contracted by inciſions on the inſide betwixt every two ſeeds, revoluted round. There are four ſpecies; the moſt remarkable of which is the vermiculata, a native of Italy and Spain. It is an annual plant, with trailing herbaceous ſtalks, which at each joint have a ſpatular-ſhaped leaf with a long foot ſtalk. From the wings of the leaves come out the foot-

ſtalks of the flowers, which ſuſtain at the top one yellow butter- [illegible] thick twiſted pod having the ſize and ap- [illegible] caterpillar, from whence it had this title. [illegible] preſerved in the gardens of this country, more [illegible] its [illegible] ſhape than for any great beauty. It is pro- [illegible] ſowing the ſeeds on a bed of light earth; and when [illegible] come up, they muſt be kept free from weeds and th[illegible] that there may be a foot diſtance between them.

SCORZONERA, Viper grass, in botany: A genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order *Compoſitæ*. The receptacle is naked; the pappus plumy; the calyx imbricated, with ſcales membranaceous on their margins. The moſt remarkable ſpecies is the *hiſpanica*, or common ſcorzonera, which is cultivated in the gardens of this country, both for culinary and medicinal purpoſes. The root is carrot-ſhaped, about the thickneſs of a finger, covered with a dark brown ſkin, is white within, and has a milky juice. The ſtalk riſes three feet high, is ſmooth, branching at the top, and garniſhed with a few narrow leaves, whoſe baſes half embrace the ſtalk. The flowers are of a bright yellow colour, and terminate the ſtalks in ſcaly empalements compoſed of many narrow tongue ſhaped hermaphrodite florets lying imbricatim over each other like the ſcales of fiſh, and are of a bright yellow colour. After theſe are decayed, the germen, which ſits in the common empalements, turns to oblong cornered ſeeds, having a roundiſh ball of feathered down at the top. This plant is propagated by ſeeds; and muſt be carefully thinned and kept free from weeds, otherwiſe the plants will be weak. The roots of ſcorzonera have no medical virtues.

SCOT, a cuſtomary contribution laid upon all ſubjects, according to their abilities. Whoever were aſſeſſed in any ſum, though not in equal proportions, were ſaid to pay ſcot and lot.

Scot (Michael) of Balwirie, a learned Scottiſh author of the 13th century. This ſingular man made the tour of France and Germany; and was received with ſome diſtinction at the court of the emperor Frederic II. Having travelled enough to gratify his curioſity or his vanity, he returned to Scotland, and gave himſelf up to ſtudy and contemplation. He was ſkilled in languages; and, conſidering the age in which he lived, was no mean proficient in philoſophy, mathematics, and medicine. He tranſlated into Latin from the Arabic, the Hiſtory of Animals by the celebrated phyſician Avicenna. He publiſhed the whole works of Ariſtotle, with notes, and affected much to reaſon on the principles of that great philoſopher. He wrote a book concerning *The Secrets of Nature*, in which he treats of generation, phyſiognomy, and the ſigns by which we judge of the temperaments of men and women. We have alſo a tract of his *On the nature of the Sun and Moon*. He there ſpeaks of the *grand operation*, as it is termed by alchymiſts, and is exceedingly ſolicitous about the *projected powder*, or the *philoſopher's ſtone*. He likewiſe publiſhed what he calls *Menſa Philoſophica*, a treatiſe repiete with aſtrology and chiromancy. He was much admired in his day, and was even ſuſpected of magic; and had Roger Bacon and Cornelius Agrippa for his panegyriſts.

Scot (Reginald), a judicious writer in the 16th century, was the younger ſon of Sir John Scot of Scot's hall, near Smeethe in Kent. He ſtudied at Hart-hall in the univerſity of Oxford; after which he retired to Smeethe, where he lived a ſtudious life, and died in 1599. He publiſhed *The perfect Platform of a Hop-garden*; and a book entitled *The Diſcovery of Witchcraft*; in which he ſhowed that all the relations concerning magicians and witches are chimerical. This work was not only cenſured by king James I. in his *Dæmonology*, but by ſeveral eminent divines; and all the copies of it that could be found were burnt.

SCOTAL, or Scotale, is where any officer of a foreſt keeps an ale-houſe within the foreſt, by colour of his office, making people come to his houſe, and there ſpend their money for fear of his diſpleaſure. We find it mentioned in the charter of the foreſt, cap. 8. "Nullus forreſtarius faciat *Scotallas*, vel garbas colligat, vel aliquam collectam faciat," &c. *Manwood* 216. —The word is compounded of *ſcot* and *ale*, and by tranſpoſition of the words is otherwiſe called *aleſhot*.

SCOTER. See Anas.

Nova SCOTIA, or Arcadia, a country of Britiſh North Amerca, bounded on the W. by the United States, on the N. by the river St. Laurence, on the E. by the gulf of that name, and on the S. by the Atlantic and bay of Fundy; being ſo indented by the latter, that its eaſtern part forms a peninſula. It extends from Cape Sable, its moſt ſouthern point, in lat. 43. 23. to 49. 30. N. and from 60. 15. to 67. 0. W. lon. In 1784, part of this country was formed into a new province. See New Brunswick. The atmoſphere, for a greater part of the year, is clouded with a thick fog, which renders it unhealthy; and, for four or five months, it is intenſely cold. A great part of the country lies in foreſt; and the ſoil (except on the banks of the rivers) is thin and barren. Halifax is the capital.

Scotia, in architecture, a ſemicircular cavity or channel between the tores in the baſes of columns.

SCOTISTS, a ſect of ſchool-divines and philoſophers, thus called from their founder *J. Duns Scotus*, a Scottiſh cordelier, who maintained the immaculate conception of the Virgin, or that ſhe was born without original ſin, in oppoſition to Thomas Aquinas and the Thomiſts.

As to philoſophy, the Scotiſts were, like the Thomiſts, Peripatetics (ſee Peripatetics); only diſtinguiſhed by this, that in each being, as many different qualities as it had, ſo many different formalities did they diſtinguiſh; all diſtinct from the body itſelf, and making as it were ſo many different entities: only theſe were metaphyſical, and as it were ſuperadded to the being. The Scotiſts and Thomiſts likewiſe diſagreed about the nature of the divine co operation with the human will, the meaſure of divine grace that is neceſſary to ſalvation, and other abſtruſe and minute queſtions which it is needleſs to enumerate.

SCOTLAND, a country of Europe, which, united with England and Wales, forms what is known in modern hiſtory under the name of Great Britain: and, as a mark of diſtinction, frequently called *North Britain*. This country is on all ſides bounded by the ſea, except towards the ſouth-eaſt, where it is joined to England The length, from north to ſouth, is about 270 miles: the breadth is various, in ſome parts 150 miles, in others only 30: the coaſts are ſo greatly interſected by innumerable lochs and bays, that it is ſaid no part of Scotland is more than forty miles from the ſea. Taking the country in three diviſions of north, middle, and ſouth, we ſhall obſerve the firſt almoſt cut off from the other by a chain of lakes, which extend acroſs from north-eaſt to ſouth-weſt. The appearance of this part of the country is in general an aſſemblage of vaſt and dreary mountains, with ſome fertile valleys intervening, chiefly towards the north and eaſt coaſts. The middle diviſion is alſo very mountainous, the ranges of hills croſſing in various directions; but even between theſe are ſome valleys celebrated for their fertility; but the fertility of both parts conſiſts in meadow and paſture, rather than in arable land, which in theſe mountainous diſtricts bears but a ſmall proportion to the whole, and is chiefly confined to the eaſtern coaſt. The ſouthern diviſion of Scotland contains a much greater proportion of land in cultivation, and produces the varieties of corn generally found in England. The rivers of Scotland are in general remarkable for their rapidity, and abundance of excellent fiſh; the principal are the Spey, the Tay, the Clyde, the Forth, the Tweed, the Dee, the Don, the Eſk, the Annan, the Nith, &c. The lochs, or lakes, are numerous, and ſome of them extenſive. On the weſt and north

coasts are innumerable islands: the three principal ranges or clusters of which are called *Western Islands, Shetland Islands,* and *Orkney Islands*. The climate of Scotland is various in different places. The northern extremity, which is on the same parallel of latitude with some parts of Norway, is very cold; but the frosts are much less intense here than in any part of the continent equally far north; an advantage arising from an insular situation. The whole west coast is subjected to frequent summer rains, and sudden changes in the atmosphere, equally unfavourable to the ripening and gathering in of the products of the earth. The climate in many places on the eastern coast, and in the whole south division, is not inferior to that of the northern part of England. The air in Scotland is in general healthy. The produce of the soil in the northern parts of Scotland and its isles is not considerable; but lime-stone, shell-sand, and marl, those rich manures, are found in great plenty in different places; even the rocky shores produce abundance of kelp, an article of considerable importance in several manufactures. The fisheries in the surrounding seas have long been an object of national importance. When increasing commerce shall enable the inhabitants to form roads, erect towns, and open canals in those remote parts of the country, these fisheries may become a real source of wealth to the nation. The products of Scotland, in general, are however multifarious and valuable. It feeds vast herds of cattle, and its hills are covered with sheep. It produces much grain and flax. Its woods of oak and fir might furnish masts and timber for the use of the British navy. Its mines are rich in coal, in lead, and in iron. Freestone, lime-stone, and slate, are found in abundance. Neither Greece nor Italy can boast a greater store of beautiful marble; fine rock crystals, pearls, and variegated pebbles, are not uncommon. Its rivers and lakes are richly stored with salmon and trout, and a variety of other fishes. The Scottish mountains, in former times, were infested by the wolf and bear, but happily these ferocious animals have long been extirpated. The wild ox was also an inhabitant of the Caledonian forest. Herds of wild roes, to this day, range at large in the northern mountains; and the stag is often seen in the woods. There, too, the beautiful bird called capercailzie, or cock of the wood, is sometimes found. The summits are the haunt of the ptarmigan, the eagle, the falcon, and the Alpine hare. Black game and grouse swarm among the heaths: among the wild animals which Scotland possesses, in common with England, are the fox, the badger, the otter, the hedgehog, the hare, and rabbit, the weazel, the mole, and other small quadrupeds; the partridge, the quail, the snipe, the plover, and many other birds. The cattle and sheep are small, but much valued for the delicacy of their flesh; and the fleece of the Scottish sheep often equals the finest Spanish wool. Though the cattle in the high grounds be diminutive, yet in many parts of the country the horses and cows are not inferior in size and beauty to those of the English breed.

The trade and population of great towns have considerably increased of late. Some districts, however, on the western shores especially, are almost depopulated. Whole colonies have, at once, forsaken their native shores; and the country is annually drained of its inhabitants, by the emigration of individuals, tempted by the view of riches. It has thence been conjectured, that the number of inhabitants in Scotland has decreased considerably within this century. However that may be, the improvements, the industry, and the riches lately introduced into Scotland, form a striking contrast with the poverty of former times. This favourable change may be considered as the effect of those liberal principles, and enlightened views, for which many spirited friends of Scotland are at present so eminently distinguished. Scotland is divided into thirty-three shires or counties, the names of which are Aberdeen, Angus or Forfar, Argyle, Ayr, Banff, Berwick, Bute, Caithness, Clackmannan, Cromarty, Dumbarton, Dumfries, Edinburgh, Fife, Haddington, Inverness, Kincardine, Kinross, Kircudbright, Lanerk, Linlithgow, Murray or Elgin, Nairn, Orkney, Peebles, Perth, Renfrew, Ross, Roxburgh, Selkirk, Sterling, Sutherland, and Wigton. It is probable that Scotland, like the other nations of Europe, was first governed by a number of petty princes, before the whole country became subject to the dominion of one sovereign. At what time this event took place, it is impossible to ascertain with any degree of certainty; but there seems to be no doubt that the Scottish monarchy existed from a very remote period. According to historians, Fergus, commonly called the first king of Scotland, reigned 330 years before Christ, though later critics have considered the first 44 kings as imaginary, and begin the history with Fergus the second, the son of Erth, who is said to have been king of the Scots about the year 400. That Scotland was governed by a king at the time of the Romans visiting England, is certain; and it continued an independent kingdom till the death of the English queen Elizabeth, when James VI. the most immediate heir, was called to the throne of England, and constantly resided in the latter: he and his successors calling themselves kings of England and Scotland; each country having a separate parliament, till, in the reign of queen Ann, both kingdoms were united, under the general name of *Great Britain:* sixteen peers being elected to represent the nobility, and sixteen members being chosen to represent the counties and boroughs in the same general parliament with England. After the revolution, which changed the succession from the house of Stuart, this unfortunate family had many adherents in this part of the kingdom, and two attempts were made in their favour in the years 1715 and 1745, which ended in the ruin of the projectors: that family is now virtually extinct. There are five universities in Scotland, viz. St. Andrew's, Glasgow, Edinburgh, New Aberdeen, and Old Aberdeen. The religion is the Presbyterian, which was established soon after the reformation. There are few Roman Catholics, nor are the Episcopalians numerous.—Before the reformation, Scotland contained two archbishoprics, St. Andrew and Glasgow, and twelve bishoprics, Aberdeen, Argyle, Brechen, Caithness, Dumblain, Dunkeld, Edinburgh, Galloway, the isles of Murray, Orkney, and Ross.

New SCOTLAND. See *Nova* SCOTIA.

SCOTOMIA, in medicine, a vertigo, accompanied with a dimness of sight, frequently the forerunner of an apoplexy.

SCOTUS (DUNS). Se DUNS.

SCOTUS (John). See ERIGENA.

SCOUTS, in a military sense, are generally horsemen sent out before, and on the wings of an army, at the distance of a mile or two, to discover the enemy, and give the general an account of what they see.

SCRATCH-PANS, in the English salt-works, a name given to certain leaden pans, which are usually made about a foot and a half long, a foot broad, and three inches deep, with a bow or circular handle of iron, by which they may be drawn out with a hook when the liquor in the pan is boiling. Their use is to receive a selenitic matter, known by the name of *soft scratch*, which falls during the evaporation of the salt-water. See the article *Sea*-SALT.

SCRATCHES, in farriery. See FARRIERY.

SCREED, with plasterers, is the floated work behind a cornice, and is only necessary when a cornice is to be executed without bracketing.

SCREW, one of the six mechanical powers. See Plate 11. A screw is a cylinder cut into several concave surfaces, or rather a channel or groove made in a cylinder, by carrying on two spiral planes the whole length of the screw, in such a manner that they may be always equally inclined to the axis of the cylinder in their whole progress, and also inclined to the base of it in the same angle. See MECHANICS.

Fig. 1. To *construct a common, or one-threaded Screw.*—Make a parallelogram of paper equal in length to the cylinder which is to be screwed, and equal in breadth to the circumference of that cylinder. Divide the side of the parallelogram, which is equal to the circumference of the cylinder, into two equal parts. Divide the other side of the parallelogram, which is equal in length to the cylinder, into as many parts as the thickness or breadth of the intended thread will run over. Then join the second point on the circumference side to the second point on the length-side of the parallelogram, and so join all the succeeding points as you see in the figure.

Fig. 2. *To make a four-threaded Screw, or that which is commonly used for the letter press.*—Make a parallelogram, as described before; divide that side which is equal to the circumference of the cylinder into eight equal parts, or twice the number of threads. Divide the other side into as many parts as the distance between two threads will run over, then join the points as in fig. 1.

To make a left-handed Screw.—Make the parallels to the right instead of the left, as expressed by fig. 3. This is the true and only practicable way of making all kinds of screws that are cut on a cylinder.

Archimedes's SCREW. See HYDROSTATICS.

Endless or *Perpetual* SCREW, one so fitted in a compound machine as to turn a dented wheel; so called, because it may be turned for ever without coming to an end. If in the endless or perpetual screw, AB (fig. 4.), whose threads take the teeth of the wheel CD, you take the distance of two threads, according to the length of the axis AB; or the distance of two teeth in the wheel CD, in the direction of the circumference; and if a weight W act at the circumference of the wheel: then, if the power D be to the weight W as that distance of the teeth or threads to the length described by the power P in one revolution, the power and weight will be in equilibrio; because in one revolution of P, the wheel DC, with the weight W, has moved only the distance of one tooth.

SCRIBE, in Hebrew ספר *sopher*, is very common in scripture, and has several significations. It signifies, 1. A clerk, writer, or secretary. This was a very considerable employment in the court of the kings of Judah, in which the scripture often mentions the secretaries as the first officers of the crown. Seraiah was scribe or secretary to king David (2 Sam. viii. 17.). Shevah and Shemaiah exercised the same office under the same prince (2 Sam. xx. 25.). In Solomon's time we find Elihoreph and Ahiah secretaries to that prince (1 Kings iv. 4.). Shebna under Hezekiah (2 Kings xix. 2.). And Shaphan under Josiah (2 Kings xxii. 8.). As there were but few in those times that could write well, the employment of a scribe or writer was very considerable. 2. A scribe is put for a commissary or muster-master of an army, who makes the review of the troops, keeps the list or roll, and calls them over. Under the reign of Uzziah king of Judah, there is found Jeil the scribe who had under his hand the king's armies (2 Chr. xxvi. 11.). And at the time of the captivity, it is said the captain of the guard, among other considerable persons, took the principal scribe of the host, or secretary at war, which mustered the people of the land (2 Kings xxv. 19.). 3. Scribe is put for an able and skilful man, a doctor of the law, a man of learning that understands affairs. Jonathan, David's uncle by the father's side, was a counsellor, a wise man, and a scribe (1 Chr. xxvii. 32.). Baruch, the disciple and secretary to Jeremiah, is called a *scribe* (Jer. xxxvi. 26.). And Ezra is celebrated as a skilful scribe in the law of his God (Ezra vii. 6.). The scribes of the people, who are frequently mentioned in the Gospel, were public writers and professed doctors of the law, which they read and explained to the people. Some place the original of scribes under Moses: but their name does not appear till under the Judges. It is said, that in the wars of Barak against Sisera, "out of Machir came down governors, and out of Zebulun they that handle the pen of the writer." (Judges v. 14.). Others think that David first instituted them, when he established the several classes of the priests and Levites. The scribes were of the tribe of Levi; and at the time that David is said to have made the regulations in that tribe, we read that 6000 men of them were constituted officers and judges (1 Chr. xxiii. 4.); among whom it is reasonable to think the scribes were included. For in 2 Chr. xxiv. 6. we read of Shemaiah the scribe, one of the Levites; and in 2 Chr. xxxiv. 13. we find it written, "Of the Levites that were scribes and officers."

The scribes and doctors of the law, in the scripture phrase, mean the same thing; and he that in Matt. xxii. 35. is called a *doctor of the law*, or a *lawyer*, in Mark xii. 28. is named a *scribe*, or *one of the scribes*. And as the whole religion of the Jews at that time chiefly consisted in pharisaical traditions, and in the use that was made of them to explain the scripture; the greatest number of the doctors of the law, or of the scribes, were pharisees; and we almost always find them joined together in scripture. Each of them valued themselves upon their knowledge of the law, upon their studying and teaching it. (Matt. xxii. 52.): they had the key of knowledge, and sat in Moses's chair (Matt. xxiii. 2.). Epiphanius, and the author of the *Recognitions* imputed to St. Clement, reckon the scribes among the sects of the Jews; but it is certain they made no sect by themselves; they were only distinguished by their study of the law.

SCRIBONIUS (LARGUS), an antient physician in the reign of Augustus or Tiberius, was the author of several works; the best edition of which is that of John Rhodius.

SCRIPTURE is a word derived from the Latin *scriptura*, and in its original sense is of the same import with *writing*, signifying "any thing written." It is, however, commonly used to denote the writings of the Old and New Testaments; which are called sometimes *the Scriptures*, sometimes the *sacred* or *holy Scriptures*, and sometimes *canonical Scripture*. These books are called *the Scriptures* by way of eminence, as they are the most important of all writings; they are said to be *holy* or *sacred* on account of the sacred doctrines which they teach; and they are termed *canonical*, because, when their number and authenticity were ascertained, their names were inserted in ecclesiastical *canons*, to distinguish them from other books; which, being of no authority, were kept as it were out of sight, and therefore styled *apocryphal*.

The authenticity of the Old Testament may be proved from the character of the Jews, from internal evidence, and from testimony.

1. The character of the Jews affords a strong presumptive evidence that they have not forged or corrupted the Old Testament. Were a person brought before a court of justice on a suspicion of forgery, and yet no presumption or positive evidence of his guilt could be produced, it would be allowed by all that he ought to be acquitted. But further, if the forgery alleged were inconsistent with the character of the accused; if it tended to expose to disgrace and reproach his general principles and conduct; or if we were assured that he considered forgery as an impious and abominable crime—it would require very strong testimony to establish his guilt. The case now mentioned corresponds exactly with the character and situation of the Jews. If a Jew had forged any book of the Old Testament, he must have been impelled to so bold and dangerous an enterprise by some very powerful motive. It could not be national pride, for there is scarcely one of these books which does not severely censure the national manners. It could not be the love of fame; for that passion would have taught him to flatter and extol the national character; and the punishment, if detected, would have been infamy and death. The love of wealth could not produce such a forgery; for no wealth was to be gained.

The Jews were selected from the other nations of the world, and preserved a distinct people from the time of their emigration from Egypt to the Babylonish captivity, a period of 892 years. The principal purposes for which they were selected was to preserve in a world running headlong into idolatry the knowledge and worship of the one true God, and to be the guardians of those sacred books that contained the prophecies which were to prove to future ages the divine mission of the Redeemer of mankind. To fit them for these important trusts, the spirit of their laws and the rites of their religion had the strongest tendency. Miracles were openly performed, to convince them that the God of Israel was the God of all the earth, and that he alone was to be worshipped. Public calamities always befel them when they became apostates to their God; yet they continued violently attached to idolatry till their captivity in Babylon made them for ever renounce it.

The Jews then had two opposite characters at different periods of their history: At first they were addicted to idolatry; afterwards they acquired a strong antipathy against it.

Had any books of the Old Testament been forged before the Babylonish captivity, when the Jews were devoted to idolatry, is it to be conceived that the impostor would have inveighed so strongly against this vice, and so often imputed to it the calamities of the state; since by such conduct he knew that he would render himself obnoxious to the people, and to those idolatrous monarchs who persecuted the prophets?

But it may next be supposed, that "the sacred books were forged after the Babylonish captivity, when the principles of the Jews would lead them to inveigh against the worship of idols. But these principles would surely never lead them to expose the character of their ancestors, and to detail their follies and their crimes. Never had any people more national pride, or a higher veneration for their ancestors, than the Jews. Miracles and prophecies ceased soon after their return to Jerusalem; and from that period their respect for the sacred books approached to superstition. They preserved them with pious care, they read them often in their synagogues, and they considered every attempt to alter the text as an act of sacrilege. Is it possible that such men could be guilty of forgery, or could false writings be easily imposed on them?

2. There is an internal evidence in the books of the Old Testament that proves them to have been written by different persons, and at distant periods; and enables us with precision to ascertain a time at or before which they must have been composed. It is an undeniable fact that Hebrew ceased to be the living language of the Jews during the Babylonish captivity, and that the Jewish productions after that period were in general written either in Chaldee or in Greek. The Jews of Palestine, some ages before the coming of our Saviour, were unable, without the assistance of a Chaldee paraphrase, to understand the Hebrew original. It necessarily follows, therefore, that every book which is written in pure Hebrew was composed either before or about the time of the Babylonish captivity. This being admitted, we may advance a step further, and contend that the period which elapsed between the composition of the most antient and the most modern book of the Old Testament was very considerable; or, in other words, that the most antient books of the Old Testament were written many ages before the Babylonish captivity.

No language continues stationary; and the Hebrew, like other tongues, passed through the several stages of infancy, youth, manhood, and old age. If therefore, on comparison, the several parts of the Hebrew Bible are found to differ not only in regard to style, but also in regard to character and cultivation, we have strong internal marks that they were composed at different and distant periods. No classical scholar would believe, independent of the Grecian history, that the poems ascribed to Homer were written in the age of Demosthenes, the Orations of Demosthenes in the time of Origen, or the Commentaries of Origen in the time of Lascaris and Chrysoloras. For the very same reason, it is certain that the five books which are ascribed to Moses were not written in the time of David, the Psalms of David in the age of Isaiah, nor the prophecies of Isaiah in the time of Malachi; and since the Hebrew became a dead language about the time of the Babylonish captivity, the book of Malachi could not have been written much later. Before that period therefore were written the prophecies of Isaiah, still earlier the Psalms of David, and much earlier than these the books which are ascribed to Moses.

3. Let us now consider the evidence of testimony for the authenticity of the Old Testament. As the Jews were a more antient people than the Greeks or Romans, and for many ages totally unconnected with them, it is not to be expected that we should derive much evidence from the historians of those nations: it is to the Jews alone we must look for information. But it has unfortunately happened that few of their works except the Scriptures themselves have been preserved to posterity. Josephus is the most antient of the Jewish historians to whom we can appeal. He informs us, that the Old Testament was divided into three parts, the Law, the Prophets, and the Hagiographa or poetical books. No man, says he, hath ever dared to add, or take away from them. He tells us also, that other books were written after the time of Artaxerxes; but as they were not composed by prophets, they were not reckoned worthy of the same degree of credit.

Since the promulgation of the Christian religion, it is impossible that any material alterations or corruptions could have taken place in the books of the Old Testament; for they have been in the hands both of Jews and Christians from that period. Had the Jews attempted to make any alterations, the Christians would have detected and exposed them; nor would the Jews have been less severe against the Christians if they had corrupted the sacred text. But the copies in the hands of Jews and Christians agree; and therefore we justly conclude, that the Old Testament is still pure and uncorrupted.

The division mentioned by our Saviour into the Law, the Prophets and the Psalms, corresponds with that of Josephus. We have therefore sufficient evidence, it is hoped, to convince even a deist, that the Old Testament existed at that time. And if the deist will only allow, that Jesus Christ was a personage of a virtuous and irreproachable character, he will acknowledge that we draw a fair conclusion when we assert that the Scriptures were not corrupted in his time: for when he accused the Pharisees of making the law of no effect by their traditions, and when he enjoined his hearers to search the Scriptures, he could not have failed to mention the corruptions or forgeries of Scripture, if any in that age had existed. But we are assured, by very respectable authority, that the canon of the Old Testament was fixed some centuries before the birth of Jesus Christ. Jesus the son of Sirach, the author of Ecclesiasticus, makes evident references to the prophecies of Isaiah (Ecclesiasticus xlviii. 22.), Jeremiah (xlix. 6.), and Ezekiel (xlix. 8.), and mentions these prophets by name. He speaks also of the twelve minor prophets (xlix. 10.). It appears also from the prologue, that the law and the prophets, and other antient books, existed at the same period. The book of Ecclesiasticus, according to the calculation of the best chronologers, was written in Syriac about A. M. 3772, that is, 232 years before the Christian era, and was translated into Greek in the next century by the grandson of the author. The prologue was added by the translator: but this circumstance does not diminish the evidence for the antiquity of Scripture; for he informs us, that the law and the prophets, and the other books of their fathers, were studied by his grandfather: a sufficient proof that they existed in his time. As no authentic books of a more antient date, except the sacred writ-

ings themſelves, have reached our time, we can aſcend no higher in ſearch of teſtimony.

There is, however, one remarkable hiſtorical fact, which proves the exiſtence of the law of Moſes at the diſſolution of the kingdom of Iſrael, when the ten tribes were carried captive to Aſſyria by Shalmaneſer, and diſperſed among the provinces of that extenſive empire; that is, about 741 years before Chriſt. It was about that time the Samaritans were tranſported from Aſſyria to repeople the country, which the ten captive tribes of Iſrael had formerly inhabited. The poſterity of the Samaritans ſtill inhabit the land of their fathers, and have preſerved copies of the Pentateuch, two or three of which were brought to this country in the laſt century. The Samaritan Pentateuch is written in old Hebrew characters (ſee PHILOLOGY), and therefore muſt have exiſted before the time of Ezra. But ſo violent were the animoſities which ſubſiſted between the Jews and Samaritans, that in no period of their hiſtory would the one nation have received any books from the other. They muſt therefore have received them at their firſt ſettlement in Samaria from the captive prieſt whom the Aſſyrian monarch ſent to teach them how they ſhould fear the Lord (2 Kings xvii.).

The canon of the Old Teſtament, as both Jewiſh and Chriſtian writers agree, was completed by Ezra and ſome of his immediate ſucceſſors (ſee BIBLE). In our copies the ſacred books are divided into 39. The Jews reckoned only 22, correſponding to the number of letters in the Hebrew alphabet. They united the books of Judges and Ruth; they joined the two books of Samuel; the books of Kings and Chronicles were reckoned one; Ezra and Nehemiah one; the Prophecies and Lamentations of Jeremiah were taken under the ſame head; and the 12 minor prophets were conſidered as one book—ſo that the whole number of books in the Jewiſh canon amounted to 22.

The Pentateuch conſiſts of the five books Geneſis, Exodus, Leviticus, Numbers, and Deuteronomy. Several obſervations have been already made reſpecting the authenticity of theſe under the article PENTATEUCH; but ſeveral additional remarks have occurred, which may not improperly be given in this place. For many of theſe we acknowledge ourſelves indebted to a ſermon publiſhed by the reverend Mr. Marſh, whoſe reſearch and learning and critical accuracy will be acknowledged by every reader of diſcernment.

One of the ſtrongeſt arguments that have occurred to us in ſupport of the authenticity of the Pentateuch, and the inſpiration of the writer, has already been given under the article RELIGION, which ſee: But we ſhall in this place preſent two arguments of a different kind, which would be ſufficient to prove at leaſt the former of theſe concluſions. We argue from the language and contents of the Moſaic writings, and from the teſtimony of the other books of Scripture.

From the contents and language of the Pentateuch there ariſes a very ſtrong preſumption that Moſes was its author. The very mode of writing in the four laſt books diſcovers an author contemporary with the events which he relates; every deſcription, both religious and political, is a proof that the writer was preſent at each reſpective ſcene; and the legiſlative and hiſtorical parts are ſo interwoven with each other, that neither of them could have been written by a man who lived in a later age. The account which is given in the book of Exodus of the conduct of Pharaoh towards the children of Iſrael, is ſuch as might be expected from a writer who was not only acquainted with the country at large, but had frequent acceſs to the court of its ſovereign: and the minute geographical deſcription of the paſſage through Arabia is ſuch, as could have been given only by a man like Moſes, who had ſpent 40 years in the land of Midian. The language itſelf is a proof of its high antiquity, which appears partly from the great ſimplicity of the ſtyle, and partly from the uſe of archaiſms or antiquated expreſſions, which in the days even of David and Solomon were obſolete*. But the ſtrongeſt argument that can be produced to ſhow that the Pentateuch was written by a man born and educated in Egypt, is the uſe of Egyptian words; words which never were, nor ever could have been uſed by a native of Paleſtine: and it is a remarkable circumſtance, that the very ſame thing which Moſes had expreſſed by a word that is pure Egyptian, Iſaiah, as might be expected from his birth and education, has expreſſed by a word that is purely Hebrew †.

That Moſes was the author of the Pentateuch is proved alſo from the evidence of teſtimony. We do not here quote the authority of Diodorus Siculus, of Longinus, or Strabo, becauſe their information muſt have been derived from the Jews. We ſhall ſeek no authority but that of the ſucceeding ſacred books themſelves, which bear internal evidence that they were written in different ages, and therefore could not be forged unleſs we were to adopt the abſurd opinion that there was a ſucceſſion of impoſtors among the Jews, who united together in the ſame fraud. The Jews were certainly beſt qualified to judge of the authenticity of their own books. They could judge of the truth of the facts recorded, and they could have no intereſt in adopting a forgery. Indeed, to ſuppoſe a whole nation combined in committing a forgery, and that this combination ſhould continue for many hundred years, would be the moſt chimerical ſuppoſition that ever entered into the mind of man. Yet we muſt make this ſuppoſition, if we reject the hiſtorical facts of the Old Teſtament. No one will deny that the Pentateuch exiſted in the time of Chriſt and his apoſtles; for they not only mention it, but quote it. "This we admit," reply the advocates for the hypotheſis which we are now combating; "but you cannot therefore conclude that Moſes was the author; for there is reaſon to believe it was compoſed by Ezra." But unfortunately for men of this opinion, both Ezra and Nehemiah aſcribe the book of the law to Moſes. 2 The Pentateuch was in the poſſeſſion of the Samaritans before the time of Ezra. 3. It exiſted in the reign of Amaziah king of Judah, A. C. 839 years. 4. It was in public uſe in the reign of Jehoſaphat, A. C. 912; for that virtuous prince appointed Levites and prieſts who taught in Judah, and had the book of the law of the Lord with them, and went about throughout all the cities of Judah and taught the people. 5. It is referred to by David in his dying admonitions to Solomon. The ſame royal bard makes many alluſions to it in the book of Pſalms, and ſometimes quotes it. There remains therefore only one reſource to thoſe who contend that Moſes was not the author, *viz.* that it was written in the period which elapſed between the age of Joſhua and that of David. But the whole hiſtory of the Jews from their ſettlement in Canaan to the building of the temple preſuppoſes that the book of the law was written by Moſes. 6. We have ſatisfactory evidence that it exiſted in the time of Joſhua. One paſſage may be quoted where this fact is ſtated. The Divine Being makes uſe of theſe words to

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* For inſtance, הוא *ille*, and נער *puer*, which are uſed in both genders by no other writer than Moſes. See Gen. xxiv. 14. 16. 28. 55 57. xxxviii. 21. 25.

† For inſtance, אחו (perhaps written originally אחי. and the י lenghtened into ו by miſtake), written by the Seventy $\alpha\chi\iota$ or $\alpha\chi\epsilon\iota$, Gen. xli. 2. and תבה, written by the Seventy $\vartheta\iota\beta\eta$ or $\vartheta\iota\beta\iota\varsigma$. See *La Croze Lexicon Ægyptiacum*, art. AXI and ΘHBI.

The ſame thing which Moſes expreſſes by אחו, Gen. xli. 2. Iſaiah xix. 7. expreſſes by ערות, for the Seventy have tranſlated both of theſe words by $\alpha\chi\iota$.

Joshua: "Only be thou ſtrong, and very courageous, that thou mayeſt obſerve to do all according to *the law* which Moſes my ſervant commanded thee: turn not from it to the right hand or to the left, that thou mayeſt proſper whitherſoever thou goeſt. *This book of the law* ſhall not depart out of thy mouth; but thou ſhalt meditate therein day and night, that thou mayeſt obſerve to do according to all that is written therein."

To the foregoing demonſtration objections may be ſtated. "We will admit the force of your arguments, and grant that Moſes actually wrote a work called the book of the law; but how can we be certain that it was the very work which is now current under his name? And unleſs you can ſhow this to be at leaſt probable, your whole evidence is of no value." To illuſtrate the force or weakneſs of this objection, let us apply it to ſome antient Greek author, and ſee whether a claſſical ſcholar would allow it to be of weight. "It is true that the Greek writers ſpeak of Homer as an antient and celebrated poet; it is true alſo that they have quoted from the works which they aſcribe to him various paſſages that we find at preſent in the Iliad and Odyſſey: yet ſtill there is a poſſibility that the poems which were written by Homer, and thoſe which we call the *Iliad* and *Odyſſey*, were totally diſtinct productions." Now an advocate for Greek literature would reply to this objection, not with a ſerious anſwer, but with a ſmile of contempt; and he would think it beneath his dignity to ſilence an opponent who appeared to be deaf to the cleareſt conviction. But ſtill more may be ſaid in defence of Moſes than in defence of Homer; for the writings of the latter were not depoſited in any temple or ſacred archive, in order to ſecure them from the devaſtations of time; whereas the copy of the book of the law, as written by Moſes, was intruſted to the prieſts and the elders, preſerved in the ark of the covenant, and read to the people every ſeventh year. Sufficient care therefore was taken not only for the preſervation of the original record, but that no ſpurious production ſhould be ſubſtituted in its ſtead. And that no ſpurious production ever has been ſubſtituted in the ſtead of the original compoſition of Moſes, appears from the evidence both of the Greek and the Samaritan Pentateuch. For, as theſe agree with the Hebrew, except in ſome trifling variations, to which every work is expoſed by length of time, it is abſolutely certain that the five books which we now aſcribe to Moſes are one and the ſame work with that which was tranſlated into Greek in the time of the Ptolemies, and, what is of ſtill greater importance, with that which exiſted in the time of Solomon. And as the Jews could have had no motive whatſoever, during that period which elapſed between the age of Joſhua and that of Solomon, for ſubſtituting a ſpurious production inſtead of the original as written by Moſes, and, even had they been inclined to attempt the impoſture, would have been prevented by the care which had been taken by their lawgiver, we muſt conclude that our preſent Pentateuch is the very identical work that was delivered by Moſes.

The poſitive evidence being now produced, we might be expected to anſwer ſome particular objections that have been urged. But this would carry us much beyond our limits; and as moſt of them occur in the book of Geneſis, we ſhall refer the reader, for a ſeparate examination, to the various authors who have contended for the authenticity of the ſacred writings (particularly to the biſhop of Landaff's Anſwer to Paine's Age of Reaſon), and ſhall here only mention the objections to the four laſt books. Theſe may be compriſed under one head, viz. expreſſions and paſſages in theſe books which could not have been written by Moſes. 1. The account of the death of Moſes, in the laſt chapter of Deuteronomy, we allow muſt have been added by ſome ſucceeding writer; but this can never prove that the book of Deuteronomy is ſpurious. What is more common among ourſelves than to ſee an account of the life and death of an author ſubjoined to his works, without informing us by whom the narrative was written? 2. It has been objected, that Moſes always ſpeaks of himſelf in the third perſon. This is the objection of fooliſh ignorance, and therefore ſcarcely deſerves an anſwer. We ſuſpect that ſuch perſons had never read the claſſics, particularly Cæſar's Commentaries, where the author uniformly ſpeaks of himſelf in the third perſon, as every writer of correct taſte will do who reflects on the abſurdity of employing the pronoun of the firſt perſon in a work intended to be read long after his death. (See GRAMMAR.) 3. As to the objection, that in ſome places the text is defective, as in Exodus xv. 8. it is not directed againſt the author, but againſt ſome tranſcriber; for what is wanting in the Hebrew is inſerted in the Samaritan. 4. The only other objection that deſerves notice is made from two paſſages. It is ſaid in one place that the bed of Og is at Ramah *to this day*; and in another (Deut. iii. 4.), "Jair the ſon of Manaſſeh took all the country of Argob unto the coaſts of Geſhuri and Maacathi, and called them after his own name, Baſhan-havoth jair, *unto this day*." The laſt clauſe in both theſe paſſages could not have been written by Moſes, but it was probably placed in the margin by ſome tranſcriber by way of explanation, and was afterwards by miſtake inſerted in the text. Whoever doubts the truth of this aſſertion may have recourſe to the manuſcripts of the Greek Teſtament, and he will find that the ſpurious additions in the texts of ſome manuſcripts are actually written in the margin of others.

That the Pentateuch, therefore, at leaſt the four laſt books of it, was written by Moſes, we have very ſatisfactory evidence; which, indeed, at the diſtance of 3000 years is wonderful, and which cannot be affirmed of any profane hiſtory written at a much later period.

For an account of the doctrines and precepts contained in the Scriptures, ſee THEOLOGY. For proofs of their divine origin, ſee RELIGION, PROPHECY, and MIRACLES.

SCRIVENER, one who draws contracts, or whoſe buſineſs it is to place money at intereſt. If a ſcrivener is entruſted with a bond, he may receive the intereſt; and if he fails, the obligee ſhall bear the loſs: and ſo it is if he receive the principal and deliver up the bond; for, being entruſted with the ſecurity itſelf, it muſt be preſumed that he is truſted with power to receive intereſt or principal; and the giving up the bond on payment of the money ſhall be a diſcharge thereof. But if a ſcrivener ſhall be entruſted with a mortgage-deed, he hath only authority to receive the intereſt, not the principal; the giving up the deed in this caſe not being ſufficient to reſtore the eſtate, but there muſt be a reconveyance, &c. It is held, where a ſcrivener puts out his client's money on a bad ſecurity, which upon inquiry might have been eaſily found ſo, yet he cannot in equity be charged to anſwer for the money; for it is here ſaid, no one would venture to put out money of another upon a ſecurity, if he were obliged to warrant and make it good in caſe a loſs ſhould happen, without any fraud in him.

SCROBICULUS CORDIS, the ſame as ANTICARDIUM.

SCROFANELLO, in ichthyology, a name by which ſome have called a ſmall fiſh of the Mediterranean, more uſually known by the name of the *ſcorpæna*.

SCROLL, in HERALDRY. See that article. When the motto relates to the creſt, the ſcroll is properly placed above the atchievement; otherwiſe it ſhould be annexed to the eſcutcheon. Thoſe of the order of knighthood are generally placed round ſhields.

SCROPHULA, the KING'S EVIL. See MEDICINE.

SCROPHULARIA, FIGWORT, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is quinquefid; the corolla almoſt globoſe, and reſupinated; the capſule bilocular. There are ſeveral ſpecies, of which the moſt remarkable are, 1. *Nodoſa*, or the

common figwort, which grows in woods and hedges. The root is tuberous; the ſtalks are four or five feet high, and branched towards the top; the leaves are heart-ſhaped, ferrated, and acute. The flowers are of a dark red colour, ſhaped like a cap or helmet; the lower lip greeniſh: they grow in looſe dichotomous ſpikes or *racemi* at the top of the branches. The leaves have a fetid ſmell and bitter taſte. A decoction of them is ſaid to cure hogs of the meaſles. An ointment made of the root was formerly uſed to cure the piles and ſcrophulous ſores, but is at preſent out of practice. 2. *Aquatica*, water-figwort, or betony. The root is fibrous; ſtem erect, ſquare, about four feet high. The leaves are oppoſite, elliptical, pointed, ſlightly ſcollopcd, on decurrent footſtalks. Flowers purple, in looſe naked ſpikes. It grows on the ſides of rivulets and other wet places, and has a fetid ſmell, though not ſo ſtrong as the preceding.—The leaves are uſed in medicine as a corrector of ſena, and in powder to promote ſneezing. 3. *Scorodonia*, or balm-leaved figwort. The ſtem is erect, ſquare, about two feet high. The leaves are oppoſite, doubly ſerrated. The flowers are duſky purple, in compoſite bunches. It grows on the banks of rivulets, &c. in Cornwall. 4. *Vernalis*, or yellow figwort. The ſtalks are ſquare, hairy, brown, about two feet high. The leaves are heart-ſhaped, roundiſh, hairy, indented, oppoſite.—The flowers are yellow, on ſingle forked footſtalks from the alæ of the leaves. It grows in hedges in Surrey.

SCROTUM. See Anatomy.

SCRUPI, in natural hiſtory, the name of a claſs of foſſils, formed in detached maſſes, without any cruſts; of no determinate figure or regular ſtructure; and compoſed of a cryſtalline or ſparry matter, debaſed by an admixture of earth in various proportions. Under this claſs are comprehended, 1. The *te'augia*. 2. The *petrinia*. 3. The *lithozugia*. 4. The *jaſpides* or jaſpers.

SCRUPLE, Scrupulus, or *Scrupulum*, the leaſt of the weights uſed by the antients, which amongſt the Romans was the 24th part of an ounce, or the 3d part of a dram. The ſcruple is ſtill a weight among us, containing the 3d part of a dram, or 20 grains. Among goldſmiths it is 24 grains.

Scruple, in Chaldean chronology, is $\frac{1}{1080}$ part of an hour, called by the Hebrews *helakin*. Theſe ſcruples are much uſed by the Jews, Arabs, and other eaſtern people in computations of time.

Scruples *of half Duration*, an arch of the moon's orbit, which the moon's centre deſcribes from the beginning of an eclipſe to its middle.

Scruples *of Immerſion* or *Incidence*, an arch of the moon's orbit, which her centre deſcribes from the beginning of the eclipſe to the time when its centre falls into the ſhadow.

Scruples *of Emerſion*, an arch of the moon's orbit, which her centre deſcribes in the time from the firſt emerſion of the moon's limb to the end of the eclipſe.

SCRUTINY, *(Scrutinium)*, in the primitive church, an examination or probation practiſed in the laſt week of Lent, on the catechumens who were to receive baptiſm on the Eaſter-day. The ſcrutiny was performed with a great many ceremonies. Exorciſms and prayers were made over the heads of the catechumens; and on Palm Sunday, the Lord's Prayer and Creed were given them, which they were afterwards made to rehearſe. This cuſtom was more in uſe in the church of Rome than anywhere elſe; though it appears, by ſome miſſals, to have been likewiſe uſed, though much later, in the Gallican church. It is ſuppoſed to have ceaſed about the year 860. Some traces of this practice ſtill remain at Vienne, in Dauphiné, and at Liege.

Scrutiny is alſo uſed, in the canon law, for a ticket or little paper billet, wherein at elections the electors write their votes privately, ſo as it may not be known for whom they vote.—Among us the term *ſcrutiny* is chiefly uſed for a ſtrict peruſal and examination of the ſeveral votes haſtily taken at an election; in order to find out any irregularities committed therein, by unqualified voters, &c.

SCRUTORE, or Scrutoir (from the French *eſcritoire*), a kind of cabinet, with a door or lid opening downwards for conveniency of writing on, &c.

SCRY, in falconry, denotes a large flock of fowl.

SCUDDING, the movement by which a ſhip is carried precipitately before a tempeſt. As a ſhip flies with amazing rapidity through the water whenever this expedient is put in practice, it is never attempted in a contrary wind, unleſs when her condition renders her incapable of ſuſtaining the mutual effort of the wind and waves any longer on her ſide, without being expoſed to the moſt imminent danger of being overſet. A ſhip either ſcuds with a ſail extended on her foremaſt, or, if the ſtorm is exceſſive, without any ſail; which in the ſea-phraſe is called *ſcudding under bare poles*. In ſloops and ſchooners, and other ſmall veſſels, the ſail employed for this purpoſe is called the *ſquare ſail*. In large ſhips, it is either the foreſail at large, reefed, or with its gooſe-wings extended, according to the degree of the tempeſt; or it is the fore-top ſail, cloſe reefed, and lowered on the cap; which laſt is particularly uſed when the ſea runs ſo high as to becalm the foreſail occaſionally, a circumſtance which expoſes the ſhip to the danger of broaching-to.—The principal hazards incident to ſcudding are generally, a pooping ſea; the difficulty of ſteering, which expoſes the veſſel perpetually to the riſk of broaching-to; and the want of ſufficient ſea-room. A ſea ſtriking the ſhip violently on the ſtern may daſh it inwards, by which ſhe muſt inevitably founder. In broaching-to (that is, inclining ſuddenly to windward), ſhe is threatened with being immediately overturned; and, for want of ſea-room, ſhe is endangered by ſhipwreck on a lee-ſhore, a circumſtance too dreadful to require explanation.

SCULPONEÆ, among the Romans, a kind of ſhoes worn by ſlaves of both ſexes. Theſe ſhoes were only blocks of wood made hollow, like the French ſabots.

SCULPTURE,

IS the art of carving wood or hewing ſtone into images. It is an art of the moſt remote antiquity, being practiſed, as there is reaſon to believe, before the general deluge. We are induced to aſſign to it this early origin, by conſidering the expedients by which, in the firſt ſtages of ſociety, men have every where ſupplied the place of alphabetic characters. Theſe, it is univerſally known, have been picture-writing, ſuch as that of the Mexicans, which, in the progreſs of refinement and knowledge, was gradually improved into the hieroglyphics of the Egyptians and other antient nations. See Hieroglyphics.

That mankind ſhould have lived near 1700 years from the creation of the world to the flood of Noah, without falling upon any method to make their conceptions permanent, or to communicate them to a diſtance, is extremely improbable; eſpecially when we call to mind that ſuch methods of writing have been found, in modern times, among people much leſs enlightened than thoſe muſt have been who were capable of building ſuch a veſſel as the ark. But if the antediluvians were acquainted with any kind of writing, there can be little doubt of its being hieroglyphical writing. Mr. Bryant has proved that the Chaldeans were poſ-

ſeſſed of that art before the Egyptians; and Beroſus informs us, that a delineation of all the monſtrous forms which inhabited the chaos, when this earth was in that ſtate, was to be ſeen in the temple of Belus in Babylon. This delineation, as he deſcribes it, muſt have been a hiſtory in hieroglyphical characters; for it conſiſted of human figures with wings, with two heads, and ſome with the horns and legs of goats. This is exactly ſimilar to the hieroglyphical writing of the Egyptians; and it was preſerved, our author ſays, both in drawings and *engravings* in the temple of the god of Babylon. As Chaldea was the firſt peopled region of the earth after the flood, and as it appears from Pliny, as well as from Beroſus, that the art of engraving upon bricks baked in the ſun was there carried to a conſiderable degree of perfection at a very early period, the probability certainly is, that the Chaldeans derived the art of hieroglyphical writing, and conſequently the rudiments of the art of ſculpture, from their antediluvian anceſtors.

It is generally thought that ſculpture had its origin from idolatry, as it was found neceſſary to place before the people the images of their gods to enliven the fervour of their devotion: but this is probably a miſtake. The worſhip of the heavenly bodies, as the only gods of the heathen nations, prevailed ſo long before the deification of dead men was thought of (ſee POLYTHEISM), that we cannot ſuppoſe mankind to have been, during all that time, ignorant of the art of hieroglyphical writing. But the deification of departed heroes undoubtedly gave riſe to the almoſt univerſal practice of repreſenting the gods by images of a human form; and therefore we muſt conclude, that the elements of ſculpture were known before that art was employed to enliven the devotion of idolatrous worſhippers. The pyramids and obeliſks of Egypt, which were probably temples, or rather altars, dedicated to the ſun (ſee PYRAMID), were covered from top to bottom with hieroglyphical emblems of men, beaſts, birds, fiſhes, and reptiles, at a period prior to that in which there is any unexceptionable evidence that mere ſtatue-worſhip prevailed even in that nurſery of idolatry.

But though it appears thus evident that picture-writing was the firſt employment of the ſculptor, we are far from imagining that idolatrous worſhip did not contribute to carry his art to that perfection which it attained in ſome of the nations of antiquity. Even in the dark ages of Europe, when the other fine arts were almoſt extinguiſhed, the mummery of the church of Rome, and the veneration which ſhe taught for her ſaints and martyrs, preſerved among the Italians ſome veſtiges of the ſiſter-arts of ſculpture and painting; and therefore, as human nature is everywhere the ſame, it is reaſonable to believe that a ſimilar veneration for heroes and demigods would, among the antient nations, have a ſimilar effect. But if this be ſo, the preſumption is, that the Chaldeans were the firſt who invented the art of hewing blocks of wood and ſtone into the figures of men and other animals; for the Chaldeans were unqueſtionably the firſt idolaters, and their early progreſs in ſculpture is confirmed by the united teſtimonies of Beroſus, Alexander Polyhiſtor, Apollodorus, and Pliny; not to mention the eaſtern tradition, that the father of Abraham was a ſtatuary.

Againſt this concluſion Mr. Bromley, in his late Hiſtory of the Fine Arts, has urged ſome plauſible arguments. In ſtating theſe he profeſſes not to be original, or to derive his information from the fountain-head of antiquity. He adopts, as he tells us, the theory of a French writer, who maintains, that in the year of the world 1949, about 300 years after the deluge, the Scythians under Brouma, a deſcendant of Magog the ſon of Japhet, extended their conqueſts over the greater part of Aſia. According to this ſyſtem, Brouma was not only the civilizer of India, and the author of the Braminical doctrines, but alſo diffuſed the principles of the Scythian mythology over Egypt, Phœnicia, Greece, and the continent of Aſia.

Of theſe principles Mr. Bromley has given us no diſtinct enumeration: the account which he gives of them is not to be found in one place, but to be collected from a variety of diſtant paſſages. In attempting therefore to preſent the ſubſtance of his ſcattered hints in one view, we will not be confident that we have omitted none of them. The ox, ſays he, was the Scythian emblem of the generator of animal life, and hence it became the principal divinity of the Arabians. The ſerpent was the ſymbol of the ſource of intelligent nature. Theſe were the common points of union in all the firſt religions of the earth. From Egypt the Iſraelites carried with them a religious veneration for the ox and the ſerpent. Their veneration for the ox appeared ſoon after they marched into the wilderneſs, when in the abſence of Moſes they called upon Aaron to make them gods which ſhould go before them. The idea of having an idol to go before them, ſays our author, was completely Scythian; for ſo the Scythians acted in all their progreſs through Aſia, with this difference, that their idol was a living animal. The Iſraelites having gained their favourite god, which was an ox (not a calf as it is rendered in the book of Exodus), next proceeded to hold a feſtival, which was to be accompanied with dancing; a ſpecies of gaiety common in the feſtivals which were held in adoration of the emblematic *Urotal* or ox in that very part of Arabia near Mount Sinai where this event took place. It is mentioned too as a curious and important fact, that the ox which was revered in Arabia was called *Adonai*. Accordingly Aaron announcing the feaſt to the ox or golden calf, ſpeaks thus, *To-morrow is a feaſt to Adonai*, which is in our tranſlation rendered *to the Lord*. In the time of Jeroboam we read of the golden calves ſet up as objects of worſhip at Bethel and Dan. Nor was the reverence paid to the ox confined to Scythia, to Egypt, and to Aſia; it extended much further.—The ancient Cimbri, as the Scythians did, carried an ox of bronze before them on all their expeditions. Mr. Bromley alſo informs us, that as great reſpect was paid to the living ox among the Greeks, as was offered to its ſymbol among other nations.

The emblem of the ſerpent, continues Mr. Bromley, was marked yet more decidedly by the expreſs direction of the Almighty. That animal had ever been conſidered as emblematic of the ſupreme generating power of intelligent life: And was that idea, ſays he, diſcouraged, ſo far as it went to be a ſign or ſymbol of life, when God ſaid to Moſes, "Make thee a brazen ſerpent, and ſet it upon a pole, and it ſhall come to paſs that every one who is bitten, when he looketh upon it, ſhall live?"—In Egypt the ſerpent ſurrounded their Iſis and Oſiris, the diadems of their princes, and the bonnets of their prieſts. The ſerpent made a diſtinguiſhed figure in Grecian ſculpture. The fable of Echidne, the mother of the Scythians, gave her figure terminating as a ſerpent to all the founders of ſtates in Greece; from which their earlieſt ſculptors repreſented in that form the Titan princes, Cecrops, Draco, and even Ericthonius. Beſides the ſpear of the image of Minerva, which Phidias made for the citadel of Athens, he placed a ſerpent, which was ſuppoſed to guard that goddeſs. The ſerpent was combined with many other figures. It ſometimes was coiled round an egg as an emblem of the creation; ſometimes round a trident, to ſhow its power over the ſea; ſometimes it encircled a flambeau, to repreſent life and death.

In Egypt, as well as in Scythia and India, the divinity was repreſented on the leaves of the tamara or lotus. Pan was worſhipped as a god in that country, as well as over the eaſt. Their ſphinxes, and all their combined figures of animal creation, took their origin from the mother of the Scythians, who brought forth an offspring that was half a woman and half a ſerpent.—Their pyramids and obeliſks aroſe from the idea of flame; the firſt emblem of the ſupreme principle, introduced by the Scythians, and which even the influence of Zoroaſter and the Magi could not remove.

We are told that the Bacchus of the Greeks is derived from

the Brouma of the Indians; that both are reprefented as feated on a fwan fwimming over the waves, to indicate that each was the god of humid nature, not the god of wine, but the god of waters. The mitre of Bacchus was fhaped like half an egg; an emblem taken from this circumftance. that at the creation the egg from which all things fprung was divided in the middle. Pan alfo was revered among the Scythians; and from that people were derived all the emblems by which the Greeks reprefented his divinity.

It would be tedious to follow our author through the whole of this fubject; and were we to fubmit to the labour of collecting and arranging his fcattered materials, we fhould ftill view his fyftem with fome degree of fufpicion. It is drawn, as he informs us, from the work of M. D'Ancarville, entitled *Recherches fur l'Origine, l'Efprit et les Progrès, des Arts de la Grèce.*

To form conclufions concerning the origin of nations, the rife and progrefs of the arts and fciences, without the aid of hiftorical evidence, by analogies which are fometimes accidental, and often fanciful, is a mode of reafoning which cannot readily be admitted. There may indeed, we acknowledge, be refemblances in the religion, language, manners, and cuftoms, of different nations, fo ftriking and fo numerous, that to doubt of their being defcended from the fame ftock would favour of fcepticifm.—But hiftorical theories muft not be adopted rafhly. We muft be certain that the evidence is credible and fatisfactory before we proceed to deduce any conclufions. We muft firft know whether the Scythian hiftory itfelf be authentic, before we make any comparifon with the hiftory of other nations. But what is called the Scythian hiftory, every man of learning knows to be a collection of fables. Herodotus and Juftin are the two antient writers from whom we have the fulleft account of that warlike nation; but thefe two hiftorians contradict each other, and both write what cannot be believed of the fame people at the fame period of their progrefs. Juftin tells us, that there was a long and violent conteft between the Scythians and Egyptians about the antiquity of their refpective nations; and after ftating the arguments on each fide of the queftion, which, as he gives them, are nothing to the purpofe, he decides in favour of the claim of the Scythians. Herodotus was too partial to the Egyptians, not to give them the palm of antiquity: and he was probably in the right: for Juftin defcribes his moft antient of nations, even in the time of Darius Hyftafpes, as ignorant of all the arts of civil life. "They occupied their land in common (fays he), and cultivated none of it. They had no houfes nor fettled habitations, but wandered with their cattle from defert to defert. In thefe rambles they carried their wives and children in tumbrels covered with the fkins of beafts, which ferved as houfes to protect them from the ftorms of winter. They were without laws, governed by the dictates of natural equity. They coveted not gold or filver like the reft of mankind, and lived upon milk and honey. Though they were expofed to extreme cold, and had abundance of flocks, they knew not how to make garments of wool, but clothed themfelves in the fkins of wild beafts." This is the moft favourable account which any antient writer gives of the Scythians. By Strabo and Herodotus they are reprefented as the moft favage of mortals, delighting in war and bloodfhed, cutting the throats of all ftrangers who came among them, eating their flefh, and making cups and pots of their fkulls. Is it conceivable that fuch favages could be fculptors; or that, even fuppofing their manners to have been fuch as Juftin reprefents them, a people fo fimple and ignorant could have impofed their mythology upon the Chaldeans, Phœnicians, and Egyptians, whom we know by the moft incontrovertible evidence to have been great and polifhed nations fo early as in the days of Abraham? No! We could as foon admit other novelties of more importance, with which the French of the prefent age pretend to enlighten the world, as this origin affigned by Mr. Bromley to the art of fculpture, unlefs fupported by better authority than that of D'Ancarville.

The inference of our author from the name of the facred ox in Arabia, and from the dancing and gaiety which were common in the religious feftivals of the Arabians, appears to us to be very haftily drawn. At the early period of the departure of the Ifraelites from Egypt, the language of the Hebrews, Egyptians, and Arabians, differed not more from each other than do the different dialects of the Greek tongue which are found in the poems of Homer (fee PHILOLOGY, fect. iii.); and it is certain, that for many years after the formation of the golden-calf, the Hebrews were ftrangers to every fpecies of idolatry but that which they had brought with them from their houfe of bondage. See REMPHAN.

Taking for granted therefore that the Scythians did not impofe their mythology upon the eaftern nations, and that the art of fculpture, as well as hieroglyphic writing and idolatrous worfhip, prevailed firft among the Chaldeans, we fhall endeavour to trace the progrefs of this art through fome other nations of antiquity, till we bring it to Greece, where it was carried to the higheft perfection to which it has yet attained

The firft intimation that we have of the art of fculpture is in the book of Genefis, where we are informed, that when Jacob, by the divine command, was returning to Canaan. his wife Rachel carried along with her the teraphim or idols of her father. Thefe we are affured were fmall, fince Rachel found it fo eafy to conceal them from her father, notwithftanding his anxious fearch. We are ignorant, however, how thefe images were made, or of what materials they were compofed. The firft perfon mentioned as an artift of eminence is Bezaleel, who formed the cherubims which covered the mercy-feat.

The Egyptians alfo cultivated the art of fculpture; but there were two circumftances that obftructed its progrefs, 1. The perfons of the Egyptians were not poffeffed of the graces of form, of elegance, or of fymmetry; and of confequence they had no perfect ftandard to model their tafte. They refembled the Chinefe in the caft of their face, in their great bellies, and in the clumfy rounding of their contours. 2. They were reftrained by their laws to the principles and practices of their anceftors, and were not permitted to introduce any innovations. Their ftatues were always formed in the fame ftiff attitude, with the arms hanging perpendicularly down the fides. What perfection were they capable of who knew no other attitude than that of chairmen? So far were they from attempting any improvements, that in the time of Adrian the art continued in the fame rude ftate as at firft; and when their flavifh adulation for that emperor induced them to place the ftatue of his favourite Antinous among the objects of their worfhip, the fame inanimate ftiffnefs in the attitude of the body and pofition of the arms was obferved. We believe it will fcarcely be neceffary to inform our readers that the Egyptian ftatue juft now mentioned is very different from the celebrated ftatue of Antinous, of which fo many moulds have been taken that imitations of it are now to be met with almoft in every cabinet in Europe.

Notwithftanding the attachment of the Egyptians to antient ufages, Winkelman thinks he has difcovered two different ftyles of fculpture which prevailed at different periods. The firft of thefe ends with the conqueft of Egypt by Cambyfes. The fecond begins at that time, and extends beyond the reign of Alexander the Great. In the firft ftyle, the lines which form the contour are ftraight and projecting a little; the pofition is ftiff and unnatural. In fitting figures the legs are parallel, the feet fqueezed together, and the arms fixed to the fides; but in the figures of women the left arm is folded acrofs the breaft; the bones and mufcles are faintly difcernible; the eyes are flat and looking obliquely, and the eyebrows funk; features which deftroy entirely the beauty of the head; the cheek-bones are high, the chin fmall

and chiefly; the ears are generally placed higher than in nature, and the feet are too large and flat. In short, if we are to look for any model in the statues of Egypt, it is not for the model of beauty but of deformity. The statues of men are naked, only they have a short apron, and a few folds of drapery surrounding their waist. The vestments of women are only distinguishable by the border, which rises a little above the surface of the statue. In this age it is evident the Egyptians knew little of drapery.

Of the second style of sculpture practised among the Egyptians, Winkelman thinks he has found specimens in the two figures of basaltes in the Capitol, and in another figure at Villa Albani, the head of which has been renewed. The two first, he remarks, bear visible traces of the former style, which appear especially in the form of the mouth and the rounds of the chin.—The hands possess more elegance; and the feet are placed at a greater distance from one another than was customary in more antient times. In the first and third figures the arms hang down close to the sides. In the second they hang more freely. Winkelman suspects that these three statues have been made after the conquest of Egypt by the Greeks. They are clothed with a tunic, a robe, and a mantle. The tunic, which is puckered into many folds, descends from the neck to the ground. The robe in the first and third statues seems close to the body, and is only perceptible by some little folds. It is tied under the breast, and covered by the mantle, the two buttons of which are placed under the shoulder.

The Antinous of the Capitol is composed of two pieces, which are joined under the haunches. But as all the Egyptian figures which now remain have been hewn out of one block, we must believe that Diodorus, in saying the stone was divided, and each half finished by a separate artist, spoke only of a colossus. The same author informs us, that the Egyptians divided the human body into 21¼ parts; but it is to be regretted that he has not given a more minute detail of that division.

The Egyptian statues were not only formed by the chisel, they were also polished with great care. Even those on the summit of an obelisk, which could only be viewed at a distance, were finished with as much labour and care as if they had admitted a close inspection. As they are generally executed in granite or basaltes, stones of a very hard texture, it is impossible not to admire the indefatigable patience of the artists.

The eye was often of different materials from the rest of the statue; sometimes it was composed of a precious stone or metal. We are assured that the valuable diamond of the empress of Russia, the largest and most beautiful hitherto known, formed one of the eyes of the famous statue of Scheringham in the temple of Brama.

Those Egyptian statues which still remain are composed of wood or baked earth: and the statues of earth are covered with green enamel.

The Phœnicians possessed both a character and situation highly favourable to the cultivation of statuary. They had beautiful models in their own persons, and their industrious character qualified them to attain perfection in every art for which they had a taste. Their situation raised a spirit of commerce, and commerce induced them to cultivate the arts. Their temples shone with statues and columns of gold, and a profusion of emeralds was every where scattered. All the great works of the Phœnicians have been unfortunately destroyed; but many of the Carthaginian medals are still preserved, ten of which are deposited in the cabinet of the grand duke of Florence. But though the Carthaginians were a colony of Phœnicians, we cannot from their works judge of the merit of their ancestors.

The Persians made no distinguished figure in the arts of design. They were indeed sensible to the charms of beauty, but they did not study to imitate them. Their dress, which consisted of long flowing robes concealing the whole person, prevented them from attending to the beauties of form. Their religion, too, which taught them to worship the divinity in the emblem of fire, and that it was impious to represent him under a human form, seemed almost to prohibit the exercise of this art, by taking away those motives which alone could give it dignity and value: and as it was not customary among them to raise statues to great men, it was impossible that statuary could flourish in Persia.

The Etrurians or antient Tuscans, in the opinion of Winkelman, carried this art to some degree of perfection at an earlier period than the Greeks. It is said to have been introduced before the siege of Troy by Dædalus, who, in order to escape the resentment of Minos king of Crete, took refuge in Sicily, from whence he passed into Italy, where he left many monuments of his art. Pausanias and Diodorus Siculus inform us that some works ascribed to him were to be seen when they wrote, and that these possessed that character of majesty which afterwards distinguished the labours of Etruria.

A character strongly marked forms the chief distinction in those productions of Etruria which have descended to us. Their style was indeed harsh and overcharged: a fault also committed by Michael Angelo, the celebrated painter of modern Etruria; for it is not to be supposed that a people of such rude manners as the Etrurians could communicate to their works that vividness and beauty which the elegance of Grecian manners inspired. On the other hand, there are many of the Tuscan statues which bear so close a resemblance to those of Greece, that antiquarians have thought it probable that they were conveyed from that country or Magna Græcia into Etruria about the time of the Roman conquest, when Italy was adorned with the spoils of Greece.

Among the monuments of Etrurian art two different styles have been observed. In the first the lines are straight, the attitude stiff, and no idea of beauty appears in the formation of the head. The contour is not well rounded, and the figure is too slender. The head is oval, the chin piked, the eyes flat, and looking asquint.

These are the defects of an art in a state of infancy, which an accomplished master could never fall into, and are equally conspicuous in Gothic statues as in the productions of the antient natives of Florence. They resemble the style of the Egyptians so much, that one is almost induced to suppose that there had once been a communication between these two nations; but others think that this style was introduced by Dædalus.

Winkelman supposes that the second epoch of this art commenced in Etruria, about the time at which it had reached its greatest perfection in Greece, in the age of Phidias; but this conjecture is not supported by any proofs. To describe the second style of sculpture among the Etrurians, is almost the same as to describe the style of Michael Angelo and his numerous imitators. The joints are strongly marked, the muscles raised, the bones distinguishable: but the whole mien harsh. In designing the bone of the leg, and the separation of the muscles of the calf, there is an elevation and strength above life. The statues of the gods are designed with more delicacy. In forming them, the artists were anxious to show that they could exercise their power without that violent distension of the muscles which is necessary in the exertions of beings merely human; but in general their attitudes are unnatural, and the actions strained.—If a statue, for instance, hold any thing with its fore fingers, the rest are stretched out in a stiff position.

According to antient history, the Greeks did not emerge from the savage state till a long time after the Egyptians, Chaldeans, and Indians, had arrived at a considerable degree of civilization. The original rude inhabitants of Greece were civilized by colonies which arrived among them, at different times, from Egypt and Phœnicia. These brought along with them the religion, the letters, and the arts of their parent countries: and

if sculpture had its origin from the worship of idols, there is reason to believe that it is one of the arts which were thus imported; for that the gods of Greece were of Egyptian and Phœnician extraction is a fact incontrovertible; (see MYSTERIES, MYTHOLOGY, PHILOLOGY, PHILOSOPHY, and TITAN.) The original statues of the gods, however, were very rude. The earliest objects of idolatrous worship have every where been the heavenly bodies; and the symbols consecrated to them were generally pillars of a conical or pyramidal figure. It was not till hero-worship was engrafted on the planetary, that the sculptor thought of giving to the sacred statue any part of the human form (see POLYTHEISM); and it appears to have been about the æra of their revolution in idolatry that the art of sculpture was introduced among the Greeks. The first representations of their gods were round stones placed upon cubes or pillars; and these stones they afterwards formed roughly, so as to give them something of the appearance of a head. Agreeable to this description was a Jupiter, which Pausanias saw in Tegeum, in Arcadia. These representations were called *Hermes*; not that they represented Mercury, but from the word *herma*, which signified a rough stone. It is the name which Homer gives to the stones which were used to fix vessels to the shore. Pausanias saw at Pheres 30 deities made of unformed blocks or cubical stones. The Lacedemonians represented Castor and Pollux by two parallel posts; and a transverse beam was added, to express their mutual affection.

If the Greeks derived from foreign nations the rudiments of the arts, it must redound much to their honour, that in a few centuries they carried them to such wonderful perfection as entirely to eclipse the fame of their masters. It is by tracing the progress of sculpture among them that we are to study the history of this art; and we shall see its origin and successive improvements correspond with nature, which always operates slowly and gradually.

VIEW OF GRECIAN SCULPTURE.

The great superiority of the Greeks in the art of sculpture may be ascribed to a variety of causes. The influence of climate over the human body is so striking, that it must have fixed the attention of every thinking man who has reflected on the subject. The violent heats of the torrid zone, and the excessive cold of the polar regions, are unfavourable to beauty. It is only in the mild climates of the temperate regions that it appears in its most attractive charms. Perhaps no country in the world enjoys a more serene air, less tainted with mists and vapours, or possesses in a higher degree that mild and genial warmth which can unfold and expand the human body into all the symmetry of muscular strength, and all the delicacies of female beauty, in greater perfection than the happy climate of Greece; and never was there any people that had a greater taste for beauty, or were more anxious to improve it. Of the four wishes of Simonides, the second was to have a handsome figure. The love of beauty was so great among the Lacedemonian women, that they kept in their chambers the statues of Nereus, of Narcissus, of Hyacinthus, and of Castor and Pollux; hoping that by often contemplating them they might have beautiful children.

There was a variety of circumstances in the noble and virtuous freedom of the Grecian manners that rendered these models of beauty peculiarly subservient to the cultivation of the fine arts. There were no tyrannical laws, as among the Egyptians, to check their progress. They had the best opportunities to study them in the public places, where the youth, who needed no other veil than chastity and purity of manners, performed their various exercises quite naked. They had the strongest motives to cultivate sculpture, for a statue was the highest honour which public merit could attain. It was an honour ambitiously sought, and granted only to those who had distinguished themselves in the eyes of their fellow citizens.— As the Greeks preferred natural qualities to acquired accomplishments, they decreed the first rewards to those who excelled in agility and strength of body. Statues were often raised to wrestlers. Even the most eminent men of Greece, in their youth, sought renown in gymnastic exercises. Chrysippus and Cleanthes distinguished themselves in the public games before they were known as philosophers. Plato appeared as a wrestler both at the Isthmian and Pythian games; and Pythagoras carried off the prize at Elis, (see PYTHAGORAS.) The passion by which they were inspired was the ambition of having their statues erected in the most sacred place of Greece, to be seen and admired by the whole people. The number of statues erected on different occasions was immense; of course the number of artists must have been great, their emulation ardent, and their progress rapid.

As most of their statues were decreed for those who vanquished in the public games, the artists had the opportunity of seeing excellent models; for those who surpassed in running, boxing, and wrestling, must in general have been well formed, yet would exhibit different kinds of beauty.

The high estimation in which sculptors were held was very favourable to their art. Socrates declared the artists the only wise men. An artist could be a legislator, a commander of armies, and might hope to have his statue placed beside those of Miltiades and Themistocles, or those of the gods themselves.— Besides, the honour and success of an artist did not depend on the caprice of pride or of ignorance. The productions of art were estimated and rewarded by the greatest sages in the general assembly of Greece, and the sculptor who had executed his work with ability and taste was confident of obtaining immortality.

It was the opinion of Winkelman, that liberty was highly favourable to this art; but, though liberty is absolutely necessary to the advancement of science, it may be doubted whether the fine arts owe their improvement to it. Sculpture flourished most in Greece, when Pericles exercised the power of a king; and in the reign of Alexander, when Greece was conquered.— It attained no perfection in Rome till Augustus had enslaved the Romans. It revived in Italy under the patronage of the family of Medici, and in France under the despotic rule of Louis XIV. It is the love of beauty, luxury, wealth, or the patronage of a powerful individual, that promotes the progress of this art.

It will now be proper to give a particular account of the ideas which the Greeks entertained concerning the standard of beauty in the different parts of the human body. And with respect to the head, the profile which they chiefly admired is peculiar to dignified beauty. It consists in a line almost straight, or marked by such slight and gentle inflections as are scarcely distinguishable from a straight line. In the figures of women and young persons, the forehead and nose form a line approaching to a perpendicular.

Antient writers, as well as artists, assure us that the Greeks reckoned a small forehead a mark of beauty, and a high forehead a deformity. From the same idea, the Circassians wore their hair hanging down over their foreheads almost to their eyebrows. To give an oval form to the countenance, it is necessary that the hair should cover the forehead, and thus make a curve about the temples; otherwise the face, which terminates in an oval form in the inferior part, will be angular in the higher part, and the proportion will be destroyed. This rounding of the forehead may be seen in all handsome persons, in all the heads of ideal beauty in antient statues, and especially in those of youth. It has been overlooked, however, by modern statuaries. Bernini, who modelled a statue of Louis XIV. in his youth, turned back the hair from the forehead.

It is generally agreed that large eyes are beautiful; but their size is of less importance in sculpture than their form, and the manner in which they are enchased. In ideal beauty, the eyes are always sunk deeper than they are in nature, and consequently the eyebrows have a greater projection. But in large statues, placed at a certain distance, the eyes, which are of the same colour with the rest of the head, would have little effect if they were not sunk. By deepening the cavity of the eye, the statuary increases the light and shade, and thus gives the head more life and expression. The same practice is used in small statues. The eye is a characteristic feature in the heads of the different deities. In the statues of Apollo, Jupiter, and Juno, the eye is large and round. In those of Pallas they are also large; but by lowering the eyelids, the virgin air and expression of modesty are delicately marked. Venus has small eyes, and the lower eyelid being raised a little, gives them a languishing look and an enchanting sweetness. It is only necessary to see the Venus de Medicis to be convinced that large eyes are not essential to beauty, especially if we compare her small eyes with those which resemble them in nature. The beauty of the eyebrows consists in the fineness of the hair, and in the sharpness of the bone which it covers; and matters of the art considered the joining of the eyebrows as a deformity, though it is sometimes to be met with in antient statues.

The beauty of the mouth is peculiarly necessary to constitute a fine face. The lower lip must be fuller than the upper, in order to give an elegant rounding to the chin. The teeth seldom appear, except in laughing satyrs. In human figures the lips are generally close, and a little opened in the figures of the gods. The lips of Venus are half open.

In figures of ideal beauty, the Grecian artists never interrupted the rounding of the chin by introducing a dimple: for this they considered not as a mark of beauty, and only to be admitted to distinguish individuals. The dimple indeed appears in some antient statues, but antiquaries suspect it to be the work of a modern hand. It is suspected also, that the dimple which is sometimes found on the cheeks of antient statues is a modern innovation.

No part of the head was executed by the antients with more care than the ears, though little attention has been given to them by modern artists. This character is so decisive, that if we observe in any statue that the ears are not highly finished, but only roughly marked, we may conclude with certainty that we are examining a modern production. The antients were very attentive to copy the precise form of the ear in taking likenesses. Thus, where we meet with a head the ears of which have a very large anterior opening, we know it to be the head of Marcus Aurelius.

The manner in which the antient artists formed the hair also enables us to distinguish their works from those of the moderns. On hard and coarse stones the hair was short, and appeared as if it had been combed with a wide comb; for that kind of stone was difficult to work, and could not without immense labour be formed into curled and flowing hair. But the figures executed in marble in the most flourishing period of the art have the hair curled and flowing; at least where the head was not intended to be an exact resemblance, for then the artist conformed to his model. In the heads of women, the hair was thrown back, and tied behind in a waving manner, leaving considerable intervals; which gives the agreeable variety of light and shade, and produces the effects of the claro-obscuro. The hair of the Amazons is disposed in this manner. Apollo and Bacchus have their hair falling down their shoulders; and young persons, till they arrived at manhood, wore their hair long. The colour of the hair which was reckoned most beautiful, was fair; and this they gave without distinction to the most beautiful of their gods, Apollo, and Bacchus, and likewise to their most illustrious heroes.

Although the ravages of time have preserved but few of the hands or feet of antient statues, it is evident from what remains how anxious the Grecian artists were to give every perfection to these parts. The hands of young persons were moderately plump, with little cavities or dimples at the joints of the fingers. The fingers tapered very gently from the root to the point, like well proportioned columns, and the joints were scarcely perceptible. The terminating joint was not bent, as it commonly appears in modern statues.

In the figures of young men the joints of the knee are faintly marked. The knee unites the leg to the thigh without making any remarkable projections or cavities. The most beautiful legs and best-turned knees, according to Winkelman, are preserved in the Apollo Saurocthones, in the Villa Borghese; in the Apollo which has a swan at his feet; and in the Bacchus of Villa Medicis. The same able connoisseur remarks, it is rare to meet with beautiful knees in young persons, or in the elegant representations of art. As the antients did not cover the feet as we do, they gave to them the most beautiful turning, and studied the form of them with the most scrupulous attention.

The breasts of men were large and elevated. The breasts of women did not possess much amplitude. The figures of the deities have always the breasts of a virgin, the beauty of which the antients made to consist in a gentle elevation. So anxious were the women to resemble this standard, that they used several arts to restrain the growth of their breasts. The breasts of the nymphs and goddesses were never represented swelling, because that is peculiar to those women who suckle. The paps of Venus contract and end in a point, this being considered as an essential characteristic of perfect beauty. Some of the moderns have transgressed these rules, and have fallen into great improprieties.

The lower part of the body in the statues of men was formed, like that of the living body after a profound sleep and good digestion. The navel was considerably sunk, especially in female statues.

As beauty never appears in equal perfection in every part of the same individual, perfect or ideal beauty can only be produced by selecting the most beautiful parts from different models; but this must be done with such judgment and care, that these detached beauties when united may form the most exact symmetry. Yet the antients sometimes confined themselves to one individual, even in the most flourishing age. Theodorus, whom Socrates and his disciples visited, served as a model to the artists of his time. Phryne also appears to have been a model to the painters and sculptors. But Socrates, in his conversation with Parrhasius, says, that when a perfect beauty was to be produced, the artists joined together the most striking beauties which could be collected from the finest figures. We know that Zeuxis, when he was going to paint Helen, united in one picture all the beauties of the most handsome women of Crotona.

The Grecian sculptors, who represented with such success the most perfect beauty of the human form, were not regardless of the drapery of their statues. They clothed their figures in the most proper stuff, which they wrought into that shape which was best calculated to give effect to their design.

The vestments of women in Greece generally consisted of linen cloth, or some other light stuff, and in latter times of silk and sometimes of woollen cloth. They had also garments embroidered with gold. In the works of sculpture, as well as in those of painting, one may distinguish the linen by its transparency and small united folds. The other light stuffs which were worn by the women were generally of cotton produced in the isle

of Cos; and these the art of statuary was able to distinguish from the linen vestments. The cotton cloth was sometimes striped, and sometimes embellished with a profusion of flowers. Silk was also employed; but whether it was known in Greece before the time of the Roman emperors cannot easily be determined. In paintings, it is distinguishable by changing its colour in different lights to red, violet, and sky-blue. There were two sorts of purple; that which the Greeks called the *colour of the sea*, and Tyrian purple, which resembled lac. Woollen garments are easily known by the amplitude of their folds. Besides these, cloth of gold sometimes composed their drapery: but it was not like the modern fabric, consisting of a thread of gold or silver spun with a thread of silk; it was composed of gold or silver alone, without any mixture.

The vestments of the Greeks, which deserve particular attention, are the tunic, the robe, and the mantle.

The tunic was that part of the dress which was next to the body. It may be seen in sleeping figures, or in those in deshabille; as in the Flora Farnese, and in the statues of the Amazons in the Capitol. The youngest of the daughters of Niobe, who throws herself at her mother's side, is clothed only with a tunic. It was of linen, or some other light stuff, without sleeves, fixed to the shoulders by a button, so as to cover the whole breast. None but the tunics of the goddess Ceres and comedians have long straight sleeves.

The robes of women commonly consisted of two long pieces of woollen cloth, without any particular form, attached to the shoulders by a great many buttons, and sometimes by a clasp. They had straight sleeves which came down to the wrists. The young girls, as well as the women, fastened their robe to their side by a cincture, in the same way as the high priest of the Jews fastened his, as it is still done in many parts of Greece. The cincture formed on the side a knot of ribbons sometimes resembling a rose in shape, which has been particularly remarked in the two beautiful daughters of Niobe. In the younger of these the cincture is seen passing over the shoulders and the back. Venus has two cinctures, the one passing over the shoulder, and the other surrounding the waist. The latter is called *cestus* by the poets.

The mantle was called *peplon* by the Greeks, which signifies properly the mantle of Pallas. The name was afterwards applied to the mantles of the other gods, as well as to those of men. This part of the dress was not square, as some have imagined, but of a roundish form. The antients indeed speak in general of square mantles, but they received this shape from four tassels, which were fixed to them; two of these were visible, and two were concealed under the mantle. The mantle was brought under the right arm, and over the left shoulder; sometimes it was attached to the shoulder by two buttons, as may be seen in the beautiful statue of Leucothoe at Villa Albani.

The colour of vestments peculiar to eastern statues is too curious to be omitted. To begin with the figures of the gods.—The drapery of Jupiter was red, that of Neptune is supposed by Winkelman to have been sea-green. The same colour also belonged to the Nereids and Nymphs. The mantle of Apollo was blue or violet. Bacchus was dressed in white. Martianus Capella assigns green to Cybele. Juno's vestments were sky-blue, but she sometimes had a white veil. Pallas was robed in a flame-coloured mantle. In a painting of Herculaneum, Venus is in flowing drapery of a golden yellow. Kings were arrayed in purple; priests in white; and conquerors sometimes in sea-green.

With respect to the head, women generally wore no covering but their hair; when they wished to cover their head, they used the corner of their mantle. Sometimes we meet with veils of a fine transparent texture. Old women wore a kind of bonnet upon their head, an example of which may be seen in a statue in the Capitol, called the *Præfica*; but Winkelman thinks it is a statue of Hecuba.

The covering of the feet consisted of shoes or sandals. The sandals were generally an inch thick, and composed of more than one sole of cork. Those of Pallas in Villa Albani had two soles, and other statues had no less than five.

Winkelman has assigned four different styles to this art. The *antient* style, which continued until the time of Phidias; the *grand* style, formed by that celebrated statuary; the *beautiful*, introduced by Praxiteles, Apelles, and Lysippus; and the *imitative* style, practised by those artists who copied the works of the ancient masters.

The most authentic monuments of the antient style are medals, containing an inscription, which leads us back to very distant times. The writing is from right to left in the Hebrew manner; an usage which was abandoned before the time of Herodotus. The statue of Agamemnon at Elis, which was made by Ornatas, has an inscription from right to left. This artisan flourished 50 years before Phidias; it is in the intervening period therefore between these two artists, that we are to look for the cessation of this practice. The statues formed in the antient style were neither distinguished by beauty of shape nor by proportion, but bore a close resemblance to those of the Egyptians and Etrurians *; the eyes were long and flat; the section of the mouth not horizontal; the chin was pointed; the curls of the hair were ranged in little rings, and resembled grains inclosed in a heap of raisins. What was still worse, it was impossible by inspecting the head to distinguish the sex.

The characters of this antient style were these: The designing was energetic, but harsh; it was animated, but without gracefulness; and the violence of the expression deprived the whole figure of beauty.

The grand style was brought to perfection by Phidias, Polycletus, Scopas, Alcamenes, Myron, and other illustrious artists. It is probable, from some passages of antient writers, that in this style were preserved some characters of the antient manner, such as the straight lines, the squares and angles. The antient masters, such as Polycletus, being the legislators of proportions, says Winkelman, and of consequence thinking they had a right to distribute the measures and dimensions of the parts of the human body, have undoubtedly sacrificed some degree of the form of beauty to a grandeur which is harsh, in comparison of the flowing contours and graceful forms of their successors. The most considerable monuments of the grand style are the statues of Niobe and her daughters, and a figure of Pallas, to be seen in Villa Albani; which, however, must not be confounded with the statue which is modelled according to the first style, and is also found in the same place. The head possesses all the characters of dignified beauty, at the same time exhibiting the rigidness of the antient style. The face is defective in gracefulness; yet it is evident how easy it would have been to give the features more roundness and grace. The figures of Niobe and her daughters have not, in the opinion of Winkelman, that austerity of appearance which marks the age of the statue of Pallas. They are characterised by grandeur and simplicity: so simple are the forms, that they do not appear to be the tedious productions of art, but to have been created by an instantaneous effort of nature.

The third style was the graceful or beautiful. Lysippus was perhaps the artist who introduced this style. Being more conversant than his predecessors with the sweet, the pure, the flow-

* This is a proof additional to those that will be found in the articles to which we have referred, that the Greeks received the rudiments of the art of sculpture from the nations to which they were confessedly indebted for the elements of science.

ing, and the beautiful lines of nature, he avoided the square forms which the masters of the second style had too much employed. He was of opinion that the use of the art was rather to please than to astonish, and that the aim of the artist should be to raise admiration by giving delight. The artists who cultivated this style did not, however, neglect to study the sublime works of their predecessors. They knew that grace is consistent with the most dignified beauty, and that it possesses charms which must ever please: they knew also that these charms are enhanced by dignity. Grace is infused into all the movements and attitudes of their statues, and it appears in the delicate turns of the hair, and even in the adjusting of the drapery. Every sort of grace was well known to the antients; and great as the ravages of time have been amongst the works of art, specimens are still preserved, in which can be distinguished *dignified* beauty, *attractive* beauty, and a beauty *peculiar to infants*. A specimen of dignified beauty may be seen in the statue of one of the muses in the palace of Barberini at Rome; and in the garden of the pope, on the Quirinal, is the statue of another muse, which affords a fine instance of attractive beauty. Winkelman says, that the most excellent model of infant beauty which antiquity has transmitted to us is a satyr of a year old, which is preserved, though a little mutilated, in Villa Albani.

The great reputation of Praxiteles and Apelles raised an ardent emulation in their successors, who despairing to surpass such illustrious masters, were satisfied with imitating their works. But it is well known that a mere imitator is always inferior to the master whom he attempts to copy. When no original genius appears, the art must therefore decline.

Clay was the first material which was employed in statuary. An instance of this may be seen in a figure of Alcamenes in bas-relief in Villa Albani. The antients used their fingers, and especially their nails, to render certain parts more delicate and lively: hence arose the phrase *ad unguem factus homo*, "an accomplished man." It was the opinion of count Caylus that the antients did not use models in forming their statues. But to disprove this, it is only necessary to mention an engraving on a stone in the cabinet of Stosch, which represents Prometheus engraving the figure of a man, with a plummet in his hand to measure the proportions of his model. The antients as well as the moderns made works in plaster; but no specimens remain except some figures in bas-relief, of which the most beautiful were found at Baia.

The works made of ivory and silver were generally of a small size. Sometimes, however, statues of a prodigious size were formed of gold and ivory. The colossal Minerva of Phidias, which was composed of these materials, was 26 cubits high.—It is indeed scarcely possible to believe that statues of such a size could entirely consist of gold and ivory. The quantity of ivory necessary to a colossal statue is beyond conception. M. de Pauw calculates that the statue of Jupiter Olympus, which was 54 feet high, would consume the teeth of 300 elephants.

The Greeks generally hewed their marble statues out of one block, though they after worked the heads separately, and sometimes the arms. The heads of the famous group of Niobe and her daughters have been adapted to their bodies after being separately finished. It is proved by a large figure representing a river, which is preserved in Villa Albani, that the antients first hewed their statues roughly before they attempted to finish any part. When the statue had received its perfect figure, they next proceeded to polish it with pumice stone, and again carefully retouched every part with the chisel.

The antients, when they employed porphyry, usually made the head and extremities of marble. It is true, that at Venice there are four figures entirely composed of porphyry; but these are the productions of the Greeks of the middle age. They also made statues of basaltes and alabaster.

Without expression, gesture, and attitude, no figure can be beautiful, because in these the graces always reside. It was for this reason that the Graces are always represented as the companions of Venus.

The expression of tranquillity was frequent in Grecian statues, because, according to Plato, that was considered as the middle state of the soul between pleasure and pain. Experience too shows that in general the most beautiful persons are endowed with the sweetest and most engaging manner. Without a sedate tranquillity dignified beauty could not exist. It is in this tranquillity, therefore, that we must look for the complete display of genius.

The most elevated species of tranquillity and repose was studied in the figures of the gods. The father of the gods, and even inferior divinities, are represented without emotion or resentment. It is thus that Homer paints Jupiter shaking Olympus by the motion of his hair and his eyebrows—

Shakes his ambrosial curls, and gives the nod,
The stamp of fate and sanction of the god.

Jupiter is not always exhibited in this tranquil state. In a bas-relief belonging to the marquis Rondini he appears seated on an arm-chair with a melancholy aspect. The Apollo of the Vatican represents the god in a fit of rage against the serpent Python, which he kills at a blow. The artist, adopting the opinion of the poets, has made the nose the seat of anger, and the lips the seat of disdain.

To express the action of a hero, the Grecian sculptors delineated the countenance of a noble virtuous character repressing his groans, and allowing no expression of pain to appear. In describing the actions of a hero the poet has much more liberty than the artist. The poet can paint them such as they were before men were taught to subdue their passions by the restraints of law, or the refined customs of social life. But the artist, obliged to select the most beautiful forms, is reduced to the necessity of giving such an expression of the passions as may not shock our feelings and disgust us with his production. The truth of these remarks will be acknowledged by those who have seen two of the most beautiful monuments of antiquity; one of which represents the fear of death, the other the most violent pains and sufferings. The daughters of Niobe, against whom Diana has discharged her fatal arrows, are exhibited in that state of stupefaction which we imagine must take place when the certain prospect of death deprives the soul of all sensibility. The fable presents us an image of that stupor which Eschylus describes as seizing the Niobe when they were transformed into a rock. The other monument referred to is the image of Laocoon, which exhibits the most agonizing pain that can affect the muscles, the nerves, and the veins. The sufferings of the body and the elevation of the soul are expressed in every member with equal energy, and form the most sublime contrast imaginable. Laocoon appears to suffer with such fortitude, that, whilst his lamentable situation pierces the heart, the whole figure fills us with an ambitious desire of imitating his constancy and magnanimity in the pains and sufferings that may fall to our lot.

Philoctetes is introduced by the poets shedding tears, uttering complaints, and rending the air with his groans and cries; but the artist exhibits him silent and bearing his pains with dignity. The Ajax of the celebrated painter Timomachus is not drawn in the act of destroying the sheep which he took from the Grecian chiefs, but in the moments of reflection which succeeded that phrensy. So far did the Greeks carry their love of calmness and slow movements, that they thought a quick step always announced rusticity of manners. Demosthenes reproaches Nicobulus for this very thing; and from the words he makes use of, it appears, that to speak with insolence and to walk hastily were reckoned synonymous.

In the figures of women, the artists have conformed to the

principle obferved in all the antient tragedies, and recommended by Ariftotle, never to make women fhow too much intrepidity or exceffive cruelty. Conformable to this maxim, Clytemneftra is reprefented at a little diftance from the fatal fpot, watching the murderer, but without taking any part with him. In a painting of Timomachus reprefenting Medea and her children, when Medea lifts up the dagger they fmile in her face, and her fury is immediately melted into compaffion for the innocent victims. In another reprefentation of the fame fubject, Medea appears hefitating and indecifive. Guided by the fame maxims, the artifts of moft refined tafte were careful to avoid all deformity, choofing rather to recede from truth than from their accuftomed refpect for beauty, as may be feen in feveral figures of Hecuba. Sometimes, however, fhe appears in the decrepitude of age, her face furrowed with wrinkles, and her breafts hanging down.

Illuftrious men, and thofe invefted with offices of dignity, are reprefented with a noble affurance and firm afpect. The ftatues of the Roman emperors refemble thofe of heroes, and are far removed from every fpecies of flattery, in the gefture, in the attitude, and action. They never appear with haughty looks, or with the fplendor of royalty; no figure is ever feen prefenting any thing to them with bended knee, except captives; and none addreffes them with an inclination of the head. In modern works too little attention has been paid to the antient *coftume*. Winkelman mentions a bas-relief, which was lately executed at Rome for the fountain of Trevi, reprefenting an architect in the act of prefenting the plan of an aqueduct to Marcus Agrippa. The modern fculptor, not content with giving a long beard to that illuftrious Roman, contrary to all the antient marble ftatues as well as medals which remain, exhibits the architect on his knees.

In general, it was an eftablifhed principle to banifh all violent paffions from public monuments. This will ferve as a decifive mark to diftinguifh the true antique from fuppofititious works. A medal has been found exhibiting two Affyrians, a man and woman, tearing their hair, with this infcription, ASSYRIA. ET. PALAESTINA. IN. POTEST. P. R. REDAC. S. C. The forgery of this medal is manifeft from the word *Palaeftina*, which is not to be found in any antient Roman medal with a Latin infcription. Befides, the violent action of tearing the hair does not fuit any fymbolical figure. This extravagant ftyle, which was called by the antients *parenthyrfis*, has been imitated by moft of the modern artifts. Their figures refemble comedians on the antient theatres, who, in order to fuit the diftant fpectators, put on painted mafks, employed exaggerated geftures, and far over-leaped the bounds of nature. This ftyle has been reduced into a theory in a treatife on the paffions compofed by Le Brun. The defigns which accompany that work exhibit the paffions in the very higheft degree, approaching even to phrenfy: but thefe are calculated to vitiate the tafte, efpecially of the young; for the ardour of youth prompts them rather to feize the extremity than the middle; and it will be difficult for that artift who has formed his tafte from fuch impaffioned models ever to acquire that noble fimplicity and fedate grandeur which diftinguifhed the works of antient tafte.

Proportion is the bafis of beauty, and there can be no beauty without it; on the contrary, proportion may exift where there is little beauty. Experience every day teaches us that knowledge is diftinct from tafte; and proportion, therefore, which is founded on knowledge, may be ftrictly obferved in any figure, and yet the figure have no pretenfions to beauty. The antients, confidering ideal beauty as the moft perfect, have frequently employed it in preference to the beauty of nature.

The body confifts of three parts as well as the members.—The three parts of the body are the trunk, the thighs, and the legs. The inferior parts of the body are the thighs, the legs, and the feet. The arms alfo confift of three parts. Thefe three parts muft bear a certain proportion to the whole as well as to one another. In a well formed man the head and body muft be proportioned to the thighs, the legs, and the feet, in the fame manner as the thighs are proportioned to the legs and the feet, or the arms to the hands. The face alfo confifts of three parts, that is, three times the length of the nofe; but the head is not four times the length of the nofe, as fome writers have afferted. From the place where the hair begins to the crown of the head are only three-fourths of the length of the nofe, or that part is to the nofe as 9 to 12.

It is probable that the Grecian as well as Egyptian artifts have determined the great and fmall proportions by fixed rules; that they have eftablifhed a pofitive meafure for the dimenfions of length, breadth, and circumference. This fuppofition alone can enable us to account for the great conformity which we meet with in antient ftatues. Winkelman thinks that the foot was the meafure which the antients ufed in all their great dimenfions, and that it was by the length of it that they regulated the meafure of their figures, by giving to them fix times that length. This in fact is the length which Vitruvius affigns, *Pes vero altitudinis corporis fextæ*, l. 3. cap. 1. That celebrated antiquary thinks the foot is a more determinate meafure than the head or the face, the parts from which modern painters and fculptors too often take their proportions. This proportion of the foot to the body, which has appeared ftrange and incomprehenfible to the learned Huetius, and has been entirely rejected by Perrault, is however founded upon experience. After meafuring with great care a vaft number of figures, Winkelman found this proportion obferved not only in Egyptian ftatues, but alfo in thofe of Greece. This fact may be determined by an infpection of thofe ftatues the feet of which are perfect. One may be fully convinced of it by examining fome divine figures, in which the artifts have made fome parts beyond their natural dimenfions. In the Apollo Belvidere, which is a little more than feven heads high, the foot is three Roman inches longer than the head. The head of the Venus de Medicis is very fmall, and the height of the ftatue is feven heads and a half: the foot is three inches and a half longer than the head, or precifely the fixth part of the length of the whole ftatue.

Practice of Sculpture.

We have been thus minute in our account of the Grecian fculpture, becaufe it is the opinion of the ableft critics that modern artifts have been more or lefs eminent as they have ftudied with the greater or lefs attention the models left us by that ingenious people: Winkelman goes fo far as to contend that the moft finifhed works of the Grecian mafters ought to be ftudied in preference even to the works of nature. This appears to be paradoxical; but the reafon affigned by the Abbé for his opinion is, that the faireft lines of beauty are more eafily difcovered, and make a more ftriking and powerful impreffion, by their reunion in thefe fublime copies, than when they are fcattered far and wide in the original. Allowing, therefore, the ftudy of nature the high degree of merit it fo juftly claims, it muft neverthelefs be granted, that it leads to true beauty by a much more tedious, laborious, and difficult path, than the ftudy of the *antique*, which prefents immediately to the artift's view the object of his refearches, and combines in a clear and ftrong point of light the various rays of beauty that are difperfed through the wide domain of nature.

As foon as the artift has laid this excellent foundation, acquired an intimate degree of familiarity with the beauties of the Grecian ftatues, and formed his tafte after the admirable models they exhibit, he may then proceed with advantage and affurance to the imitation of nature. The ideas he has already formed of the perfection of nature, by obferving her difperfed

beauties combined and collected in the compoſitions of the antient artiſts, will enable him to acquire with facility, and to employ with advantage, the detached and partial ideas of beauty which will be exhibited to his view in a ſurvey of nature in her actual ſtate. When he diſcovers theſe partial beauties, he will be capable of combining them with thoſe perfect forms of beauty with which he is already acquainted. In a word, by having always preſent to his mind the noble models already mentioned, he will be in ſome meaſure his own oracle, and will draw rules from his own mind.

There are, however, two ways of imitating nature. In the one a ſingle object occupies the artiſt, who endeavours to repreſent it with preciſion and truth; in the other, certain lines and features are taken from a variety of objects, and combined and blended into one regular whole. All kinds of copies belong to the firſt kind of imitation; and productions of this kind muſt be executed neceſſarily in the Dutch manner, that is to ſay, with high finiſhing, and little or no invention. But the ſecond kind of imitation leads directly to the inveſtigation and diſcovery of true beauty, of that beauty whoſe idea is connate with the human mind, and is only to be found there in its higheſt perfection. This is the kind of imitation in which the Greeks excelled, and in which men of genius excite the young artiſts to excel after their example, *viz.* by ſtudying nature as they did.

After having ſtudied in the productions of the Grecian maſters their choice and expreſſion of ſelect nature, their ſublime and graceful contours, their noble draperies, together with that ſedate grandeur and admirable ſimplicity that conſtitute their chief merit, the curious artiſts will do well to ſtudy the manual and mechanical part of their operations, as this is abſolutely neceſſary to the ſucceſsful imitation of their excellent manner.

It is certain that the antients almoſt always formed their firſt models in wax: to this modern artiſts have ſubſtituted clay, or ſome ſuch compoſition: they prefer clay before wax in the carnations, on account of the yielding nature of the latter, and its ſticking in ſome meaſure to every thing it touches. We muſt not, however, imagine from hence that the method of forming models of wet clay was either unknown or neglected among the Greeks; on the contrary, it was in Greece that models of this kind were invented. Their author was Dibutades of Sicyon; and it is well known that Arceſilas, the friend of Lucullus, obtained a higher degree of reputation by his clay models than by all his other productions. Indeed, if clay could be made to preſerve its original moiſture, it would undoubtedly be the fitteſt ſubſtance for the models of the ſculptor; but when it is placed either in the fire or left to dry imperceptibly in the air, its ſolid parts grow more compact, and the figure loſing thus a part of its dimenſions, is neceſſarily reduced to a ſmaller volume. This diminution would be of no conſequence did it equally affect the whole figure, ſo as to preſerve its proportions entire. But this is not the caſe: for the ſmaller parts of the figure dry ſooner than the larger; and thus loſing more of their dimenſions in the ſame ſpace of time than the latter do, the ſymmetry and proportions of the figure inevitably ſuffer. This inconveniency does not take place in thoſe models that are made in wax. It is indeed extremely difficult, in the ordinary method of working the wax, to give it that degree of ſmoothneſs that is neceſſary to repreſent the ſoftneſs of the carnations or fleſhy parts of the body. This inconvenience may, however, be remedied, by forming the model firſt in clay, then moulding it in plaſter, and laſtly caſting it in wax. And, indeed, clay is ſeldom uſed but as a mould in which to caſt a figure of plaſter, ſtucco, or wax, to ſerve henceforth for a model by which the meaſures and proportions of the ſtatue are to be adjuſted. In making waxen models, it is common to put half a pound of colophony to a pound of wax; and ſome add turpentine, melting the whole with oil of olives.

So much for the firſt or preparatory ſteps in this procedure. It remains to conſider the manner of working the marble after the model ſo prepared; and the method here followed by the Greeks ſeems to have been extremely different from that which is generally obſerved by modern artiſts. In the antient ſtatues we find the moſt ſtriking proofs of the freedom and boldneſs that accompanied each ſtroke of the chiſel, and which reſulted from the artiſt's being perfectly ſure of the accuracy of his idea, and the preciſion and ſteadineſs of his hand: the moſt minute parts of the figure carry theſe marks of aſſurance and freedom; no indication of timorouſneſs or diffidence appears; nothing that can induce us to fancy that the artiſt had occaſion to correct any of his ſtrokes. It is difficult to find, even in the ſecond-rate productions of the Grecian artiſts, any mark of a falſe ſtroke or a random touch. This firmneſs and preciſion of the Grecian chiſel were certainly derived from a more determined and perfect ſet of rules than thoſe which are obſerved in modern times.

The method generally obſerved by the modern ſculptor is as follows: Firſt, out of a great block of marble he ſaws another of the ſize required, which is performed with a ſmooth ſteel ſaw, without teeth, caſting water and ſand thereon from time to time; then he faſhions it by taking off what is ſuperfluous with a ſteel point and a heavy hammer of ſoft iron; after this, bringing it near the meaſure required, he reduces it ſtill nearer with another finer point; he then uſes a flat cutting inſtrument, having notches in its edge: and then a chiſel to take off the ſcratches which the former has left; till, at length, taking raſps of different degrees of fineneſs, by degrees he brings his work into a condition for poliſhing.

After this, having ſtudied his model with all poſſible attention, he draws upon this model horizontal and perpendicular lines which interſect each other at right angles. He afterwards copies theſe lines upon his marble, as the painter makes uſe of ſuch tranſverſal lines to copy a picture, or to reduce it to a ſmaller ſize. Theſe tranſverſal lines or ſquares, drawn in an equal number upon the marble and upon the model, in a manner proportioned to their reſpective dimenſions, exhibit accurate meaſures of the ſurfaces upon which the artiſt is to work; but cannot determine, with equal preciſion, the depths that are proportioned to theſe ſurfaces. The ſculptor, indeed, may determine theſe depths by obſerving the relation they bear to his model; but as his eye is the only guide he has to follow in this eſtimate, he is always more or leſs expoſed to error, or at leaſt to doubt. He is never ſure that the cavities made by his chiſel are exact; a degree of uncertainty accompanies each ſtroke; nor can he be aſſured that it has carried away neither too much nor too little of his marble. It is equally difficult to determine, by ſuch lines as have already been mentioned, the external and internal contours of the figure, or to transfer them from the model to the marble. By the internal contour is underſtood that which is deſcribed by the parts which approach towards the centre, and which are not marked in a ſtriking manner.

It is further to be noticed, that in a complicated and laborious work, which an artiſt cannot execute without aſſiſtance, he is often obliged to make uſe of foreign hands, that have not the talents or dexterity that are neceſſary to finiſh his plan. A ſingle ſtroke of the chiſel that goes too deep is a defect not to be repaired; and ſuch a ſtroke may eaſily happen, where the depths are ſo imperfectly determined. Defects of this kind are inevitable, if the ſculptor, in chipping his marble, begins by forming the depths that are requiſite in the figure he deſigns to repreſent. Nothing is more liable to error then this manner of proceeding. The cautious artiſt ought, on the contrary, to form theſe depths gradually, by little and little, with the utmoſt circumſpection and care; and the determining of them with preciſion ought to be conſidered as the laſt part of his work, and as the finiſhing touches of his chiſel.

The various inconveniences attending this method determined feveral eminent artifts to look out for one that would be liable to lefs uncertainty, and productive of fewer errors. The French academy of painting at Rome hit upon a method of copying the antient ftatues, which fome fculptors have employed with fuccefs, even in the figures which they finifhed after models in clay or wax. This method is as follows. The ftatue that is to be copied is inclofed in a frame that fits it exactly. The upper part of this frame is divided into a certain number of equal parts, and to each of thefe parts a thread is fixed with a piece of lead at the end of it. Thefe threads, which hang freely, fhow what parts of the ftatue are moft removed from the centre with much more perfpicuity and precifion than the lines which are drawn upon its furface, and which pafs equally over the higher and hollow parts of the block: they alfo give the artift a tolerable rule to meafure the more ftriking variations of height and depth, and thus render him more bold and determined in the execution of his plan.

But even this method is not without its defects: for, as it is impoffible, by the means of a ftraight line, to determine with precifion the procedure of a curve, the artift has, in this method, no certain rule to guide him in his contours; and as often as the line which he is to defcribe deviates from the direction of the plumb-line, which is his main guide, he muft neceffarily find himfelf at a lofs, and be obliged to have recourfe to conjecture.

It is alfo evident, that this method affords no certain rule to determine exactly the proportion which the various parts of the figure ought to bear to each other, confidered in their mutual relation and connections. The artift, indeed, endeavours to fupply this defect by interfecting the plumb-lines by horizontal ones. This recourfe has, neverthelefs, its inconveniencies, fince the fquares formed by tranfverfal lines, that are at a diftance from the figure (though they be exactly equal), yet reprefent the parts of the figure as greater or fmaller, according as they are more or lefs removed from our pofition or point of view. But, notwithftanding thefe inconveniences, the method now under confideration is certainly the beft that has hitherto been employed: it is more practicable and fure than any other we know, though it appears, from the remarks we have now been making, that it does not exhibit a fure and univerfal criterion to a fculptor who executes after a model.

To polifh the ftatue, or make the parts of it fmooth and fleek, they ufe pumice-ftone and fmelt; then tripoli; and when a ftill greater luftre is required, they ufe burnt ftraw. For the *Cafting of Statues*, fee FOUNDERY, and PLASTER *of Paris*.

SCUM, properly denotes the impurities which a liquor, by boiling, cafts up to the furface. The term *fcum* is alfo ufed for what is more properly called the fcoria of metals.

SCUPPERS, in a fhip, are certain channels cut through the water ways and fides of a fhip, at proper diftances, and lined with plated lead, in order to carry the water off from the deck into the fea. The fcuppers of the lower deck of a fhip of war are ufually furnifhed with a leathern pipe, called the *fcupper hofe*, which hangs downward from the mouth or opening of the fcupper. The intent of this is to prevent the water from entering when the fhip inclines under a weight of fail.

SCURVY, in medicine, fee that article. In the opinion of Dr. Beddoes, the mineral acids, efpecially the nitric and vitriolic, may be employed in the prevention or cure of this dreadful difeafe with as much fuccefs as the vegetable acids.—But of all the fubftances that can at once be cheaply procured and long preferved, he thinks the concrete acid of tartar by far the moft promifing. It is very grateful, and comes near to the citric acid. In tropical countries the fcurvy is feldom known.

SCURVY-*grafs*, in botany. See COCHLEARIA. The *officinalis*, or common officinal fcurvy-grafs, grows upon rocks on the fea coaft, and on the Highland mountains, abundantly. It has an acrid, bitter, and acid tafte, and is highly recommended for the fcurvy. There are inftances of a whole fhip's crew having been cured by it; and as it abounds with acid falts, there can be no doubt but that it is a great retifier of putrefaction. The beft way of taking it is raw in a falad. It is alfo diuretic, and ufeful in dropfies. The Highlanders efteem it as a good ftomachic. The *coronopus*, another fpecies, was fome years ago rendered famous, the afhes of it being an ingredient in Mrs. Joanna Stephens's celebrated medicine for the ftone and gravel; but, unfortunately for thofe afflicted with that excruciating complaint, it has not been able to fupport its credit. It is acrid, and taftes like garden crefs.

SCUTAGE (*fcutagium*, Sax. *fcildpening*), was a tax or contribution raifed by thofe that held lands by knights fervice towards furnifhing the king's army, at one, two, or three merks for every knight's fee. Henry III. for his voyage to the Holy Land, had a tenth granted by the clergy, and *fcutage* three merks of every knight's fee by the *laity*. This was alfo levied by Henry II. Richard I. and King John. See KNIGHT-*Service*.

SCUTE (*fcutum*), a French gold coin of 3s. 4d. in the reign of king Henry V. Catharine, queen of England, had an affurance made her of fundry caftles, manors, lands, &c. valued at the fum of 40,000 *fcutes*, every two whereof were worth a noble. *Rot. Parl.* 1 *Hen.* VI.

SCUTELLARIA, SKULL-CAP, in botany: A genus of the gymnofpermia order, belonging to the didynamia clafs of plants; and in the natural method ranking under the 40th order, *Perfonatæ*. The calyx is fhort, tubulated, has the mouth entire, and clofe after flowering. There are two fpecies in Britain, the *galericulata* and *minor*. 1. The *Galericulata, Blue Scull-cap*, or *Hooded Willow-herb*. The ftems are weak, branched, and above a foot high; the leaves are heart-fhaped, narrow-pointed, on fhort foot-ftalks, and fcalloped; the flowers are blue, in pairs, on pedicles from the alæ of the leaves, and pendulous. It grows on the banks of rivers and lakes, is bitter, and has a garlic fmell. 2. *Minor, little red Skull-cap*, or *Willow-herb*. The ftalks are about eight inches high; the leaves are heart-fhaped, oval; the flowers are purple. It grows in fens, and on the fides of lakes.

SCUTTLES, in a fhip, fquare holes cut in the deck, big enough to let down the body of a man, and which ferve upon fome occafions to let the people down into any room below, or from one deck to another.

SCYLAX, a celebrated mathematician and geographer of Caria, flourifhed under the reign of Darius Hyftafpes, about 558 B. C. Some have attributed to him the invention of geographical tables. We have under his name a geographical work publifhed by Hoefchelius; but it is written by a much later author, and is perhaps only an abridgment of Scylax's Antient Geography.

SCYLLA (anc. geog.), a rock in the Fretum Siculum, near the coaft of Italy, dangerous to fhipping, oppofite to Charybdis, a whirlpool on the coaft of Sicily; both of them famous in mythology. Scylla and Charybdis have been almoft fubdued by the repeated convulfions of this part of the earth, and by the violence of the current, which is continually increafing the breadth of the ftraits. If proper allowance be made for thefe

circumſtances, we ſhall acquit the antients of any exaggeration, notwithſtanding the very dreadful colours in which they have painted this paſſage. It is formed by a low peninſula, called *Cape Pelorus*, ſtretching to the eaſtward on the Sicilian ſide, immediately within which lies the famous whirlpool of Charybdis, and by the rocks of Scylla, which a few miles below on the Calabrian ſhore project towards the weſt. The current runs with ſurpriſing force from one to the other alternately in the direction of the tide, and the tides themſelves are very irregular. Thus veſſels, by ſhunning the one, were in the utmoſt danger of being ſwallowed up by the other.

At preſent, in moderate weather, when the tide is either at ebb or flood, boats paſs all over the whirlpool: but, in general, it is like the meeting of two contending currents, with a number of eddies all around; and, even now, there is ſcarcely a winter in which there are not ſome wrecks.

"At the time when we paſſed the Straits (ſays Captain Sutherland, from whom we have obtained this accurate information) the weather was as favourable as we could wiſh; and yet, in ſpite of a ſtrong breeze and the current, which hurried us on with ſurpriſing velocity, the ſhip's head was ſuddenly whirled round near three points; but the wind blowing freſh, in a few ſeconds ſhe daſhed through the eddy that had caught her; for, to avoid Scylla, and ſecure Meſſina, we had kept pretty cloſe to Charybdis."

SCYROS, an iſland in the Ægean ſea, at the diſtance of about 28 miles north-eaſt from Eubœa. It is 60 miles in circumference. It was originally in the poſſeſſion of the Pelaſgians and Carians. Achilles retired there to avoid going to the Trojan war, and became father of Neoptolemus by Deidamia the daughter of king Lycomedes. Scyros was conquered by the Athenians under Cimon. It was very rocky and barren. Now *Sciro*. E. lon. 25. 0. N. lat. 38. 15.

SCYTALA LACONICA, in antiquity, a ſtratagem or device of the Lacedemonians, for the ſecret writing of letters to their correſpondents, ſo that, if they ſhould chance to be intercepted, nobody might be able to read them.—To this end they had two wooden rollers or cylinders, perfectly alike and equal; one whereof was kept in the city, the other by the perſon to whom the letter was directed. For the letter, a ſkin of very thin parchment was wrapped round the roller, and thereon was the matter written; which done, it was taken off, and ſent away to the party, who, upon putting it in the ſame manner upon his roller, found the lines and words in the very ſame diſpoſition as when they were firſt written. This expedient they ſet a very high value on; though, in truth, artleſs and groſs enough: the moderns have improved vaſtly on this method of writing. See CIPHER.

SCYTALIA, in botany: A genus of the monogynia order, belonging to the octandria claſs of plants; and in the natural method ranking with thoſe that are doubtful. This calyx is very ſhort, monophyllous, and ſomewhat quinquedentated; the corolla pentapetalous; the filaments hairy at the baſe; the berry unilocular, with one ſeed of a ſoft pulpy conſiſtence. There is only one ſpecies, viz. the *Sinenſis*, a native of the Eaſt Indies.

SCYTHIA, an antient name for the northern parts of Aſia, now known by the name of *Tartary*; alſo for ſome of the north-eaſtern parts of Europe. This vaſt territory, which extends itſelf from the Iſter or Danube, the boundary of the Celts, that is, from about the 25th to almoſt the 110th degree of eaſt longitude, was divided into Scythia in Europe and Scythia in Aſia, including, however, the two Sarmatias; or, as they are called by the Greeks, *Sauromatias*, now the Circaſſian Tartary, which lay between and ſevered the two Scythias from each other. Sauromatia was alſo diſtinguiſhed into European and Aſiatic; and was divided from the European Scythia by the river Don or Tanais, which falls into the Palus Mæotis; and from the Aſiatic by the Rha, now Volga, which empties itſelf into the Caſpian ſea.

1. The Aſiatic Scythia comprehended, in general, great Tartary, and Ruſſia in Aſia; and, in particular, the Scythia beyond or without Imaus contained the regions of Bogdoi or Oſtiacoi, and Tanguti. That within, or on this ſide Imaus, had Turkeſtan and Mongal, the Uſbeck or Zagatai, Kalmuc and Nagaian Tartars; beſides Siberia, the land of the Samoiedes, and Nova Zembla. Theſe three laſt not being ſo ſoon inhabited as the former, as may be reaſonably ſuppoſed, were wholly unknown to the antients; and the former were peopled by the Bactrians, Sogdians, Gandari, Sacks, and Maſſagetes. As for Sarmatia, it contained Albania, Iberia, and Colchis; which makes now the Circaſſian Tartary, and the province of Georgia.

2. Scythia in Europe reached (towards the ſouth-weſt) to the Po and the Alps, by which it was divided from Celto-Gallia. It was bounded on the ſouth by the Iſter or Danube and the Euxine ſea. Its northern limits have been ſuppoſed to ſtretch to the ſpring-heads of the Boriſthenes or Nieper, and the Rha or Volga, and ſo to that of the Tanais.—The antients divided this country into Scythia Arimaſpæa, which lay eaſtward, joining to Scythia in Aſia; and Sarmatia Europeana on the weſt. In Scythia properly ſo called were the Arimaſpæi on the north; the Getæ or Dacians along the Danube, on the ſouth; and the Neuri between theſe two. So that it contained the European Ruſſia or Muſcovy, and the Leſſer Crim Tartary eaſtward; and, on the weſt, Lithuania, Poland, part of Hungary, Tranſilvania, Walachia, Bulgaria, and Moldavia. Sarmatia is ſuppoſed to have reached northward to that part of Swedeland called *Feningia*, now *Finland*; in which they placed the Oœnes, Panoti, and Hippopodes. This part they divided from northern Germany, now the weſt part of Sweden and Norway, by the *Mare Sarmaticum* or *Scythicum*, which they ſuppoſed ran up into the northern ocean, and, dividing Lapland into two parts, formed the weſtern part of Sweden, with Norway, into one iſland, and Finland into another; ſuppoſing this alſo to be cut off from the continent by the gulph of that name.

Although the antient Scythians were celebrated as a warlike people, yet their hiſtory is too uncertain and obſcure to enable us to give any detail which would not prove equally tireſome and unintereſting to the reader. Mr. Pinkerton, in a diſſertation on their origin, endeavours to prove that they were the moſt antient of nations; and he aſſigns for the place of their firſt habitation the country known by the name of Perſia. From Perſia, he thinks, they proceeded in numerous hordes weſtward, ſurrounded the Euxine, peopled Germany, Italy, Gaul, the countries bordering on the Baltic, with part of Britain and Ireland. That the Scythians were of Aſiatic origin cannot, we think, be queſtioned; and as Perſia was peopled at a very early period, it may not improbably have been their parent country: but when our author contends that their empire had ſubſiſted for more than 1500 years before Ninus the founder of the Aſſyrian monarchy, and that it extended from Egypt to the Ganges, and from the Perſian gulf and Indian ſea to the Caſpian, we cannot help thinking that his prejudices againſt the Celts, and his deſire to do honour to his favourite Goths, have made him advance a paradox inconſiſtent with the moſt authentic records of antiquity. His diſſertation however is ingenious, and replete with a variety of curious learning.

SCYTHIAN *Lamb*, in natural hiſtory. See *Scythian* LAMB.

SCYTHROPS, a generical name given by Mr. Latham to a bird of which hitherto but one ſpecies has been obſerved. It is about the ſize of a crow, and two feet three inches in length. The bill is large, convex, ſurrowed on the ſides, and bent at the tip; the noſtrils are placed at the baſe of it, and the tongue is

cloven at the end. The general colour of the plumage is a brownifh afh, but the tip of each feather of the back, wings, and tail, is black. The tail has each feather banded with black at the end, and the tip itfelf white; but the inner webs of the feather are marked with black and white bands. The toes are placed two forwards and two backwards, as in the parrot genus. This curious bird is a native of New Holland, and we believe in that part of the world is not uncommon, but its manners are as yet quite unknown. We are happy in being able to prefent our readers with an engraving of it from an excellent drawing with which we were lately favoured. See 2d plate 7.

SEA, in a ftrict fenfe, fignifies a large portion of water almoft furrounded by land, as the Baltic and Mediterranean feas; but it is frequently ufed for that vaft body of water which encompaffes the whole earth.

What proportion the fuperficies of the fea bears to that of the land cannot eafily be afcertained. Buffon has fuppofed that the furface of our globe is equally divided between land and water, and has accordingly calculated the fuperficies of the fea to be 85,490,506 fquare miles. But it is now well known that the ocean covers much more than the half of the earth's furface. Buffon believed the exiftence of a vaft fouthern continent, which captain Cook has fhown to be vifionary. It was this circumftance which mifled him. According to the moft accurate obfervations hitherto made, the furface of the fea is to the land as three to one; the ocean therefore extends over 128,235,759 fquare miles, fuppofing the fuperficies of the whole globe to be 170,981,012 fquare miles. To afcertain the depth of the fea is ftill more difficult than its fuperficies both on account of the numerous experiments which it would be neceffary to make, and the want of proper inftruments for that purpofe. Beyond a certain depth the fea has hitherto been found unfathomable; and though feveral methods have been contrived to obviate this difficulty, none of them has completely anfwered the purpofe. We know in general that the depth of the fea increafes gradually as we leave the fhore; but if this continued beyond a certain diftance, the depth in the middle of the ocean would be prodigious. Indeed the numerous iflands everywhere fcattered in the fea demonftrate the contrary, by fhowing us that the bottom of the water is unequal like the land, and that, fo far from uniformly finking, it fometimes rifes into lofty mountains. If the depth of the fea be in proportion to the elevation of the land, as has generally been fuppofed, its greateft depth will not exceed five or fix miles, for there is no mountain fix miles perpendicular above the level of the fea. The fea has never been actually founded to a greater depth than a mile and 66 feet; every thing beyond that therefore refts entirely upon conjecture and analogical reafoning, which ought never to be admitted to determine a fingle point that can be afcertained by experiment, becaufe, when admitted, they have too often led to falfe conclufions. Along the coafts, where the depth of the fea is in general well known, it has always been found proportioned to the height of the fhore: when the coaft is high and mountainous, the fea that wafhes it is deep; when, on the contrary, the coaft is low, the water is fhallow. Whether this analogy holds at a diftance from the fhore, experiments alone can determine.

To calculate the quantity of water contained in the fea, while its depth is unknown, is impoffible. But if we fuppofe with Buffon that its medium depth is the fourth part of a mile, the ocean, if its fuperficies be 128,235,759 fquare miles, will contain 32,058,939,75 cubic miles of water.

Let us now endeavour to compute the quantity of water which is conftantly difcharged into the fea. For this purpofe let us take a river whofe velocity and quantity of water are known, the Po, for inftance, which according to Riccioli is 1000 feet (or 100 perches of Boulogne) broad, 10 feet deep, and runs at the rate of four miles in an hour; confequently that river difcharges into the fea 200,000 cubic perches of water in an hour, or 4,800,000 in a day. A cubic mile contains 125,000,000 cubic perches; the Po therefore will take 26 days to difcharge a cubic mile of water into the fea. Let us now fuppofe, what is perhaps not very far from the truth, that the quantity of water which the fea receives from the rivers in any country is proportioned to the extent of that country. The Po from its origin to its mouth traverfes a country 380 miles long, and the rivers which fall into it on every fide rife from fources about fixty miles diftant from it. The Po, therefore, and the rivers which it receives, water a country of 45 600 fquare miles. Now, fince the whole fuperficies of the dry land is about 42,745,253 fquare miles, it follows, from our fuppofition, that the quantity of water difcharged by all the rivers in the world, in one day, is 36 cubic miles, and in a year 13,140. If therefore the fea contains 32,058,939 cubic miles of water, it would take all the rivers in the world 2439 years to difcharge an equal quantity.

It may feem furprifing that the fea, fince it is continually receiving fuch an immenfe fupply of water, does not vifibly increafe, and at laft cover the whole earth. But our furprife will ceafe, if we confider that the rivers themfelves are fupplied from the fea, and that they do nothing more than carry back thofe waters which the ocean is continually lavifhing upon the earth. Dr. Halley has demonftrated that the vapours raifed from the fea and tranfported upon land are fufficient to maintain all the rivers in the world. The fimplicity of this great procefs is aftonifhing: the fea not only connects diftant countries, and renders it eafy to tranfport the commodities of one nation to another, but its waters rifing in the air defcend in fhowers to fertilife the earth and nourifh the vegetable kingdom, and collecting into rivers flow onwards, bringing fertility and wealth and commerce along with them, and again return to the fea to repeat the fame round.

The knowledge of this procefs of nature might, one would think, have convinced philofophers that the proportion between fea and land continued always nearly the fame. Philofophers however have formed different theories about this as well as moft other fubjects, maintaining on the one hand that the fea is continually encroaching on the land, and on the other that the land is conftantly gaining on the fea. Both fides have fupported their theories by arguments, demonftrations, and uncontrovertible facts!

The height of the mountains, fay the philofophers who fupport the encroachments of the fea, is continually diminifhing; expofed to the violence of every ftorm, the hardeft rocks muft at laft give way and tumble down. The rivers are continually fweeping along with them particles of earth, which they depofite in the bottom of the fea. Both the depth of the ocean then and the height of the dry land muft be always decreafing; the waters therefore muft, unlefs a part of them were annihilated, fpread over a greater extent of furface in proportion as thefe caufes operate. This reafoning, convincing as it is, might be confirmed by a great number of facts: it will be fufficient however to mention one or two. In the reign of Auguftus the Ifle of Wight made a part of Britain, fo that the Englifh croffed over to it at low water with cart-loads of tin; yet that ifland is at prefent feparated from Britain by a channel half a mile wide. The Godwin fands on the eaftern fhore of England were formerly the fertile eftate of earl Godwin. Nor are the encroachments of the fea confined to Britain. In the bay of Baiæ near Naples there are remains of houfes and ftreets ftill vifible below the prefent level of the fea. The fea therefore is making continued encroachments upon the land; and the time will come, fay they, when the waters will again cover the furface of the earth.

Such are the arguments of thofe philofophers who maintain

the continual encroachments of the ſea. Thoſe who maintain the oppoſite theory, that the land is gradually gaining on the ſea, though they pretend not to deny the facts advanced by their opponents, affirm that they are altogether inſufficient to eſtabliſh the hypotheſis which they were brought forward to ſupport. Though the rivers carry down particles of earth into the ſea, theſe, ſay they, are either accumulated on other ſhores, or, collecting in the bottom of the ocean, harden into ſtone, which being poſſeſſed of a vegetative power riſes by degrees above the ſurface of the ſea and forms rocks, and mountains, and iſlands. The vegetative nature of ſtone indeed is ſufficient, of itſelf, to convince us that the quantity of earth muſt be daily accumulating, and conſequently that the ſurface of the ſea is diminiſhing in extent. Celſius, a Swediſh philoſopher (for this diſpute has been carried on in Sweden with the greateſt keenneſs), has endeavoured to build this theory with more ſolid materials than vegetable ſtone. In a curious memoir, publiſhed in 1743, he aſſerts that the Baltic and the Atlantic, at leaſt that part of it which waſhes Norway, is conſtantly diminiſhing; and he proves this by the teſtimony of a great many aged pilots and fiſhermen, who affirmed that the ſea was become much ſhallower in many places than it had been during their youth: that many rocks formerly covered with water were now ſeveral feet above the ſurface of the ſea: that loaded veſſels uſed formerly to ride in many places where pinnaces and barks could now with difficulty ſwim. He produces inſtances of antient ſea-port towns now ſeveral leagues from the ſhore, and of anchors and wrecks of veſſels found far within the country. He mentions a particular rock which 168 years before was at the bottom of the ſea, but was then raiſed eight feet above its furaſce. In another place where the water 50 years before had reached to the knee there was then none. Several rocks, too, which during the infancy of ſome old pilots had been two feet under water, were then three feet above it. From all theſe obſervations M. Celſius concludes, that the water of the Baltic decreaſes in height $4\frac{1}{2}$ lines in a year, 4 inches 5 lines in 18 years, 4 feet 5 inches in a hundred years, and in a thouſand years 45 feet. Conſcious, however, that theſe facts, how concluſive ſoever as far as relates to the Baltic, can never determine the general queſtion, M. Celſius advances another argument in ſupport of his theory. All that quantity of moiſture, ſays he, which is imbibed by plants is loſt to the general maſs of water, being converted into earth by the putrefaction of vegetables. This notion had been mentioned by Newton, and was adopted by Van Helmont: if granted, it follows as a conſequence that the earth is continually increaſing, and the water diminiſhing in a very rapid degree.

Such are the arguments advanced in ſupport of both theories; for it is needleſs to mention a notion of Linnæus that the whole earth was formerly covered with water except a ſingle mountain. When fairly weighed, they amount to nothing more than this, that the ſea has encroached upon the land in ſome places, and retired in others; a concluſion which we are very willing to allow. What was advanced by thoſe philoſophers, who maintain that the ſea is continually encroaching on the land, about the depth of the ſea conſtantly diminiſhing, muſt remain a mere aſſertion till they prove by experiments, either that this is really the caſe, or that nature has no way of reſtoring thoſe particles of earth which are waſhed down by the rivers. Nor have they any good reaſon to affirm that the height of the mountains is decreaſing. Can a ſingle uncontrovertible inſtance be produced of this? Are the Alps or the Apennines, or Taurus, or Caucaſus, leſs lofty now than they were a thouſand years ago? We mean not to deny that the rain actually waſhes down particles of earth from the mountains, nor to affirm that the hardeſt rocks are able to reſiſt continual ſtorms, nor that many mountains have ſuffered, and continue to ſuffer daily, from a thouſand accidents. But the effects produced by all theſe cauſes are ſo trifling as to be altogether imperceptible *. Nature has aſſiduouſly guarded againſt ſuch accidents; ſhe has formed the mountains of the moſt durable materials; and where they are covered with earth, ſhe has bound it together by a thick and firm matting of graſs, and thus ſecured it from the rains; and ſhould accident deprive it of this covering, ſhe takes care immediately to ſupply the defect. Even ſhould the earth be ſwept away together with its covering, nature has ſtill ſuch reſources left as frequently reſtore things to their former ſtate. Many kinds of moſs, one would be tempted to think, have been created for this very purpoſe: they take root and flouriſh almoſt upon the bare rock, and furniſh as they decay a ſufficient bed for ſeveral of the hardy Alpine plants. Theſe periſh in their turn, and others ſucceed them. The roots of the plants bind faſt the earth as it accumulates, more plants ſpring up and ſpread wider, till by degrees the whole ſurface is covered with a firm coat of graſs. Even the rain, which always contains in it a good deal of earth, contributes ſomething to haſten the proceſs.

As the vegetation of ſtone, an argument advanced by the philoſophers who ſupport the oppoſite theory, is now, we believe, given up by all parties, it is needleſs to take any further notice of it here, (ſee STONE). The hypotheſis of M. Celſius, that water is converted into earth, has alſo ſhared the ſame fate, becauſe it was unſupported by experiment, and contrary to every thing that we know either about earth or water. It is a little extraordinary that philoſophers have been ſo laviſh of water as to convert it in this manner into ſtone and earth, when they had given it, one would think, ſufficient employment before in making new worlds and in confuting Moſes.

As the ſea covers ſo great a portion of the globe, we ſhould no doubt, by exploring its bottom, diſcover a vaſt number of intereſting particulars. Unfortunately, in the greater part of the ocean this has hitherto been impoſſible. Part, however, has been examined; and the diſcoveries which this examination has produced may enable us to form ſome idea at leaſt of the whole. The bottom of the ſea, as might have been conjectured indeed beforehand, bears a great reſemblance to the ſurface of the dry land, being, like it, full of plains, rocks, caverns, and mountains; ſome of which are abrupt and almoſt perpendicular, while others riſe with a gentle declivity, and ſometimes tower above the water and form iſlands. Neither do the materials differ which compoſe the bottom of the ſea and the baſis of the dry land. If we dig to a conſiderable depth in any part of the earth, we uniformly meet with rock; the ſame thing holds in the ſea. The ſtrata, too, are of the ſame kind, diſpoſed in the ſame manner, and form indeed but one whole. The ſame kind of mineral and bituminous ſubſtances are alſo found interſperſed with theſe ſtrata; and it is to them probably that the ſea is indebted for its bitter taſte. Over theſe natural and original ſtrata an artificial bed has pretty generally been formed, compoſed of different materials in different places. It conſiſts frequently of muddy tartareous ſubſtances firmly cemented together, ſometimes of ſhells or coral reduced to powder, and near the mouths of rivers it is generally compoſed of fine ſand or gravel. The bottom of the ſea reſembles the land likewiſe in another particular: many freſh ſprings and even rivers riſe out of it, which, diſplacing the ſalt water, render the lower part of the ſea wherever they abound quite freſh. An inſtance of this kind occurs near Goa on the weſtern coaſt of Indoſtan, and another in the Medi-

* M. Genſanne pretends that the Pyrenean mountains become an inch lower every ten years. But, even according to his own calculation, it would require a million of years to level theſe mountains with the plain, though they continued to decreaſe at the ſame rate; and philoſophers tell us that this rate is conſtantly diminiſhing!

terranean sea not far from Marseilles. These facts occasioned a notion, which later experiments have exploded, that the sea beyond a certain depth was always fresh.

Substances of a very beautiful appearance are frequently brought up by the sounding line from the bottom of the sea. The plummet is hollowed below, and this cavity filled with tallow, to which some of the substances adhere which form the bed of the ocean. These are generally sand, gravel, or mud; but they are sometimes of the brightest scarlet, vermilion, purple, and yellow; and sometimes, though less frequently, they are blue, green, or white. These colours are owing to a kind of jelly which envelops the substances, and vanish entirely as soon as this jelly dries. At times, however, they assume the appearance of tartareous crusts, and are then so permanent, that they can be received into white wax melted and poured round them, and perhaps by proper care might be converted into valuable paints.

Sea-water is really, as any one may convince himself by pouring it into a glass, as clear and transparent as river water. The various appearances therefore which it assumes are owing to accidental causes, and not to any change in the water itself. The depth, or the materials which compose the bottom of the sea, occasions it to assume different colours in different places. The Arabian gulph, for instance, is said to be red, from the colour of the sands which form its bed. The appearance of the sea is affected too by the winds and the sun, while the clouds that pass over it communicate all their various and fleeting colours. When the sun shines it is green; when the sun gleams through a fog it is yellow; near the north pole it appears black; while in the torrid zone its colour is often brown. Sometimes the sea assumes a luminous appearance. See LIGHT.

The sea contains the greatest quantity of salt in the torrid zone, where otherwise from the excessive heat it would be in danger of putrefaction: as we advance northward this quantity diminishes, till at the pole it nearly vanishes altogether. Under the line Lucas found that the sea contained a seventh part of solid contents, consisting chiefly of sea-salt. At Harwich he found it yielded $\frac{1}{23}$th of sea-salt. At Carlscroon in Sweden it contains $\frac{1}{64}$th part *, and on the coast of Greenland a great deal less. This deficiency of salt near the poles probably contributes a good deal towards the prodigious quantities of ice which are met with in these seas; for salt water requires a much greater degree of cold to freeze it than fresh water. It was this circumstance, probably, together with its constant motion, which induced the antients to believe that the sea never froze. Even among the moderns it has been a generally received opinion, that sea-ice is originally formed in rivers. Buffon has made the great quantities of ice with which the South sea abounds an argument for the existence of a continent near the Antarctic pole. But it is now well known that great quantities of ice are formed at a distance from land. Sea ice is of two kinds; field ice, which extends along the shore, and is only two or three feet thick; and mountain ice, which abounds in the middle of the ocean. The size of these mountains is sometimes prodigious. The sea-ice is always fresh, and has been often of great use to navigators. The weight of sea-water is to that of river-water as 73 to 70; that is, a cubic foot of sea-water weighs 73 lb. while the same quantity of river-water weighs only 70 lb.; but this proportion varies in different places. It is worthy of our attention, too, that the water at the surface of the sea contains less salt than near the bottom; the difference indeed is inconsiderable, but still it is something. The comte de Marsigli found the same quantity of water, when taken from the bottom of the Mediterranean, to weigh one ounce, three pennyweights, 51 grains; whereas from the surface it weighed only one ounce, three pennyweights, 49 grains. He repeated the experiment frequently with nearly the same result.

The sea, with respect to temperature, may be divided into two regions: The first begins at the surface of the water, and descends as far as the influence of the sun's rays; the second reaches from thence to the bottom of the sea. In summer the lower region is considerably colder than the upper: but it is probable that during winter the very reverse takes place; at least the comte de Marsigli found it so repeatedly in the Mediterranean. This naturally results from the situation of the water near the bottom of the sea. Uninfluenced by the changes in the atmosphere, it retains always nearly the same degree of temperature: and this is considerably above congelation; for the lower region of the sea, at least in the temperate parts of the world, was never known to freeze. Captain Ellis let down a sea gauge (see GAUGE) in latitude 25° 13′ north, and longitude 25° 12′ west, to take the degrees of temperature and saltness of the sea at different depths. It descended 5346 feet, which is a mile and eleven fathoms. He found the sea salter and colder in proportion to its depth till the gauge had descended 3900 feet, when the mercury in the thermometer came up at 53; but the water never grew colder, though he let down the gauge 2446 feet lower. At the surface the thermometer stood at 84.

The sea has three kinds of motion: 1. The first is that undulation which is occasioned by the wind. This motion is entirely confined to the surface; the bottom even during the most violent storms remains perfectly calm. Mr. Boyle has remarked, from the testimony of several divers, that the sea is affected by the winds only to the depth of six feet. It would follow from this, that the height of the waves above the surface does not exceed six feet; and that this holds in the Mediterranean at least, we are informed by the comte de Marsigli, though he also sometimes observed them, during a very violent tempest, rise two feet higher. It is affirmed by Pliny, and several other antient writers, that oil calms the waves of the sea; and that divers were accustomed to carry some of it for that purpose in their mouths. This account was always considered by the moderns as a fable, and treated with such contempt, that they did not even deign to put it to the test of experiment, till doctor Franklin accidentally discovered its truth. Happening in 1757 to be in the middle of a large fleet, he observed that the water round one or two vessels was quite calm and smooth, while everywhere else it was very much agitated by the winds. He applied to the captain for an explanation of this phenomenon, who replied, that the cooks, he supposed, had thrown their greasy water out at the scupper-holes, and by that means oiled the sides of the vessels in question. This answer did not satisfy the doctor at first; but recollecting what Pliny had said on the subject, he resolved at least to try the experiment. He did so accordingly in 1762, and found that oil actually calmed the waves of the sea. He repeated the experiment upon lake Champlain: the oil spread itself with great rapidity upon the surface, but did not produce the desired effect, because, having been thrown in upon the side opposite to the wind, it was immediately driven to the edge of the water. But upon throwing in a like quantity upon the other side of the lake, it calmed in an instant several yards of the surface; and, gradually spreading, rendered all that part of the lake, to the extent of at least half an acre, as smooth as glass. The curious effect produced by this liquid may be accounted for by the repulsion which exists between oil and water, and between oil and air, which prevents all immediate contact, all rubbing of the one upon the other.

2. The second kind of motion is that continual tendency which the whole water in the sea has towards the west. It is greater

* This gradual diminution of saltness from the equator to the pole is not, however, without particular exceptions. The Mediterranean sea contains $\frac{1}{27}$th of sea salt, which is less than the German sea contains.

near the equator than about the poles; and indeed cannot be ſaid to take place at all in the northern hemiſphere beyond the tropic. It begins on the weſt ſide of America, where it is moderate: hence that part of the ocean has been called *Pacific*. As the waters advance weſtward their motion is accelerated; ſo that, after having traverſed the globe, they ſtrike with great violence on the eaſtern ſhore of America. Being ſtopped by that continent, they turn northward, and run with conſiderable impetuoſity into the gulph of Mexico; from thence they proceed along the coaſt of North America, till they come to the ſouth ſide of the great bank at Newſoundland, when they turn off, and run down through the Weſtern Iſles. This current is called the *Gulph Stream*. It was firſt accurately deſcribed by Dr. Franklin, who remarked alſo, that the water in it, having been originally heated in the torrid zone, cools ſo gradually in its paſſage northward, that even the latitude might be found in any part of the ſtream by means of a thermometer. This motion of the ſea weſtward has never been explained: it ſeems to have ſome connection with the trade winds and the diurnal revolution of the earth on its axis.

3. The third and moſt remarkable motion of the ſea is the tide, which is a regular ſwell of the ocean once every 12 hours, owing, as Newton has demonſtrated, to the attraction of the moon. In the middle of the ſea the tide ſeldom riſes higher than one or two feet, but on the coaſt it frequently reaches the height of 45 feet, and in ſome places even more. The tide generally riſes higher in the evening than in the morning: on the coaſt of Britain this holds in winter, but in ſummer the morning tides are higheſt. In ſome ſeas it is ſaid that there are no tides. This cannot be owing to their being ſurrounded by land, becauſe there is a tide in the lakes of North America. For an explanation of theſe and other phenomena we refer to the article TIDE.

SEA-*Air*, that part of the atmoſphere which is above the ſea. Sea-air has been found ſalubrious and remarkably beneficial in ſome diſeaſes. This may be owing to its containing a greater portion of oxygen, and being leſs impregnated with noxious vapours than the land. Dr. Ingenhouſz made ſeveral experiments to aſcertain the ſalubrity of ſea-air. By mixing equal meaſures of common air and nitrous air, he found, that at Graveſend they occupied about 104, or one meaſure and $\frac{4}{100}$ of a meaſure: whereas on ſea, about three miles from the mouth of the Thames, two meaſures of air (one of common and one of nitrous air) occupied from 0.91. to 0.94. He attempted a ſimilar experiment on the middle of the channel between the Engliſh coaſt and Oſtend; but the motion of the ſhip rendered it impracticable. He found that in rainy and windy weather the ſea-air contained a ſmaller quantity of vital air than when the weather was calm. On the ſea-ſhore at Oſtend it occupied from $94\frac{1}{2}$ to 97; at Bruges he found it at 105; and at Antwerp $109\frac{1}{2}$. Dr. Ingenhouſz thus concludes his paper: It appears, from theſe experiments, that the air at ſea and cloſe to it is in general purer and fitter for animal life than the air on the land, though it ſeems to be ſubject to the ſame inconſtancy in its degree of purity with that of the land. People are in general very healthy at Gibraltar, though there are very few trees near that place; which Dr. Ingenhouſz thinks is owing to the purity of the air, ariſing from the neighbourhood of the ſea. Moſt ſmall iſlands are very healthy. At Malta people are little ſubject to diſeaſes, and live to a very advanced age.

SEA-*Anemony*. See ANIMAL-*Flower*.

SEA-*Bear*. } See PHOCA.
SEA-*Calf*. }

SEA-*Cow*. See TRICHECUS.

SEA-*Crow*, MIRE-*Crow*, or *Pewit*. See LARUS.

SEA-*Dead*. See ASPHALTITES.

SEA-*Devil*. See LOPHIUS.

SEA-*Gage*. See *Sea*-GAGE.

SEA-*Hare*. See LAPLYSIA.

SEA-*Horſe*, in ichthyology, the Engliſh name of the *Hippocamus*. See SYNGNATHUS.

SEA-*Lemon*. See DORIS.

SEA-*Lion*. See PHOCA.

SEA-*Mall*, or SEA-*Mew*. See LARUS.

SEA-*Man*. See MERMAID.

SEA-*Marks*. The erection of beacons, light-houſes, and ſea-marks, is a branch of the royal PREROGATIVE. By 8 Eliz. 13. the corporation of the Trinity-houſe are empowered to ſet up any beacons or ſea-marks wherever they ſhall think them neceſſary; and if the owner of the land or any other perſon ſhall deſtroy them, or take down any ſteeple, tree, or other known ſea-mark, he ſhall forfeit 100l. ſterling; or, in caſe of inability to pay it, he ſhall be *ipſo facto* out-lawed.

SEA-*Needle*, *Gar Fiſh*. See ESOX.

SEA-*Nettle*. See ANIMAL-*Flower*.

SEA-*Pie*, or *Oyſter Catcher*. See HÆMATOPUS.

SEA *Plants*, are thoſe vegetables that grow in ſalt water within the ſhores of the ſea. The old botaniſts divided theſe into three claſſes. 1. The firſt claſs, according to their arrangement, contained the *algæ*, the *fuci*, the *ſea-moſſes* or *confervas*, and the different ſpecies of ſponges. 2. The ſecond contained ſubſtances of a hard texture, like ſtone or horn, which ſeem to have been of the ſame nature with what we call *zoophyta*, with this difference, that we refer ſponges to this claſs, and not to the firſt. The third claſs was the ſame with our *lithophyta*, comprehending *corals*, *madrepora*, &c. It is now well known that the genera belonging to the ſecond and third of theſe claſſes, and even ſome referred to the firſt, are not vegetables, but animals, or the productions of animals. See CORALLINA, MADREPORA, SPONGIA. Sea-plants, then, properly ſpeaking, belong to the claſs of cryptogamia, and the order of algæ; and, according to Bomare, are all comprehended under the genus of fucus. We may alſo add ſeveral ſpecies of the ulva and conferva and the ſargazo. The fuci and marine ulvæ are immerſed in the ſea, are ſeſſile, and without root. The marine conſervæ are either ſeſſile or floating. The ſargazo grows beyond ſoundings.

As ſome ſpecies of the fucus, when dried and preſerved, are extremely beautiful, the curious, and eſpecially thoſe who proſecute the ſtudy of botany, muſt be anxious to know the beſt method of preſerving them without deſtroying their colour and beauty. The following method is recommended by M. Mauduit: Take a ſheet of paper, or rather of paſteboard, and cover it with varniſh on both ſides; and having rowed in a boat to the rock where the fucus abounds, plunge your varniſhed paper into the water, and, detaching the fucus, receive it upon the paper. Agitate the paper gently in the water, that the plant may be properly ſpread over it; and lift them up together ſoftly out of the water: then fix down with pins the ſtrong ſtalks, that they may not be diſplaced, and leave the plant lying upon the varniſhed paper to dry in the open air. When it is fully dry, the different parts will retain their poſition, and the plant may be preſerved within the leaves of a book. If you wiſh to free it from the ſlime and ſalt which adhere to it, it may be waſhed gently in freſh water, after being removed from the rock on which it grew.

SEA-*Serpent*, a monſtrous creature, ſaid to inhabit the northern ſeas about Greenland and the coaſts of Norway. The following marvellous account of this monſter is given by Guthrie: "In 1756, one of them was ſhot by the maſter of a ſhip: its head reſembled that of a horſe: the mouth was large and black, as were the eyes, a white mane hanging from its neck: it floated on the ſurface of the water, and held its head at leaſt two feet out of the ſea: between the head and the neck were ſeven or eight folds, which were very thick; and the length of this ſnake was more than 100 yards, ſome ſay fathoms. They

have a remarkable averſion to the ſmell of caſtor ; for which reaſon, ſhip, boat, and bark maſters provide themſelves with quantities of that drug, to prevent being overſet, the ſerpent's olfactory nerves being remarkably exquiſite. The particularities related of this animal would be incredible, were they not atteſted upon oath. Egede, a very reputable author, ſays, that on the 6th day of July 1734, a large and frightful ſea-monſter raiſed itſelf ſo high out of the water, that its head reached above the main top maſt of the ſhip; that it had a long ſharp ſnout, broad paws, and ſpouted water like a whale ; that the body ſeemed to be covered with ſcales ; the ſkin was uneven and wrinkled, and the lower part was formed like a ſnake. The body of this monſter is ſaid to be as thick as a hogſhead ; his ſkin is variegated like a tortoiſe ſhell ; and his excrement, which floats upon the ſurface of the water, is corroſive." Notwithſtanding the belief of Guthrie, and the teſtimony which he produces, we canot help doubting of the exiſtence of the ſea-ſerpent. Its bulk is ſaid to be ſo diſproportionate to all the known animals of our globe, that it requires more than ordinary evidence to render it credible ; but the evidence which is offered is ſo very feeble and unſatisfactory, that no man of ſound judgement would think it ſufficient to eſtabliſh the truth of an extraordinary fact.

Sea-*Sickneſs*, a diſorder incident to moſt perſons on their firſt going to ſea, occaſioned by the agitation of the veſſel. In voyages, ſea-ſickneſs, though it continues in general only for the firſt day or two, is extremely harraſſing to ſome people at intervals, eſpecially on any increaſed motion of the veſſel. Sometimes, by long continuance, it cauſes fever, head-ache, quick pulſe, thirſt, white tongue, and a total deprivation of the retention of the ſtomach ; evils which are always difficult to remove, and frequently terminate only with the voyage. This indiſpoſition is conſiderably alleviated by a ſmall tea ſpoonful of ether, taken now and then in a glaſs of water, and applying ſome of it to the temples and noſtrils. The antient writers recommend acid fruits, bread and vegetables ſoaked in vinegar, after the ſtomach has been cleanſed by vomiting ; but not to attempt to ſuppreſs the vomiting until that end was obtained. An old remedy for ſea-ſickneſs, and a very common one among ſailors, is a draught or two of ſea-water ; which, though a diſguſting medicine at ſuch a time, yet where the firſt paſſages are foul and loaded, generally produces the deſired effect when the perturbation it occaſions ceaſes.

Sea-*Star.* See Asterias.

Sea-*Urchin.* See Echinus.

Sea-*Water*, the ſalt water of the ſea. The principal ſalts contained in ſea water are, 1ſt, Common marine or culinary ſalt, compounded of foſſil alkali or ſoda and marine acid ; 2dly, A ſalt formed by the union of the ſame acid with magneſian earth ; and, laſtly, A ſmall quantity of ſelenite. In Sir Torbern Bergman's analyſis of ſea-water taken up in the beginning of June 1776, about the latitude of the Canaries, from the depth of 60 fathoms, the ſolid contents of a pint of the water were,

	Grs.				
Of common ſalt	$2{:}3\frac{6}{11}$		3	Ↄ	Grs.
Salited magneſia	$69\frac{1}{11}$	or	5	1	$10\frac{9}{11}$
Gypſum -	$8\frac{2}{11}$				
Total -	$330\frac{9}{11}$				

The quantity of ſaline matter contained in a pint of ſea-water, in the Britiſh ſeas, is, according to Neumann, about one ounce in each pint.

The ſaltneſs of this water is judged to ariſe from great multitudes both of mines and mountains of ſalt diſperſed here and there in the depths of the ſea. Dr. Halley ſuppoſes that it is probable the greateſt part of the ſea-ſalt, and of all ſalt lakes, as the Caſpian Sea, the Dead Sea, the Lake of Mexico, and the Titicaca in Peru, is derived from the water of the rivers which they receive : and ſince this ſort of lakes has no exit or diſcharge but by the exhalation of vapours, and alſo ſince theſe vapours are entirely freſh, or devoid of ſuch particles, it is certain that the ſaltneſs of the ſea and of ſuch lakes muſt from time to time increaſe; and therefore the ſaltneſs at this time muſt be greater than at any time heretofore. He further adds, that if, by experiments made in different ages, we could find the different quantity of ſalt which the ſame quantity of water (taken up in the ſame place, and in all other the ſame circumſtances) would afford, it would be eaſy from thence, by rules of proportion, to find the age of the world very nearly, or the time wherein it has been acquiring its preſent ſaltneſs.

This opinion of Dr. Halley is ſo improbable, that it is ſurpriſing ſo acute a philoſopher could have adopted it. That freſh water rivers ſhould in the courſe of many thouſand years produce ſaltneſs in the ſea, is quite incredible. If this were the caſe, every ſea or great body of water which receives rivers muſt be ſalt, and muſt poſſeſs a degree of ſaltneſs in proportion to the quantity of water which the rivers diſcharge. But ſo far is this from being true, that the Palus Mæotis and the great lakes in America do not contain ſalt but freſh water. It may indeed be objected, that the quantity of ſalt which the rivers carry along with them and depoſit in the ſea, muſt depend on the nature of the ſoil through which they flow, which may in ſome places contain no ſalt at all : and this may be the reaſon why the great lakes in America and the Palus Mæotis are freſh.—But to this opinion, which is merely hypothetical, there are inſurmountable objections. It is a curious fact, that the ſaltneſs of the ſea is greateſt under the line, and diminiſhes gradually as we advance to the poles. We muſt therefore ſuppoſe, if Dr. Halley's theory be true, that the earth contains more ſalt in the tropical regions than in the temperate zones, and more in the temperate zones than in the frigid ; and conſequently that the rivers in theſe different regions contain a quantity of ſalt proportionable to their diſtance from the equator. This, however, muſt firſt be proved by experiment, and cannot be aſſumed as an eſtabliſhed fact. But there is another circumſtance that entirely deſtroys this theory. If we allow that the ſea receives its ſaltneſs from the rivers, it muſt be equally ſalt or nearly ſo in every part of the earth. For, according to a ſimple and well known principle in chemiſtry, *when any ſubſtance is diſſolved in water with the aſſiſtance of agitation, at whatever part of the water it is introduced, it will be equally diffuſed through the whole liquid.* Now, though it were true that a greater quantity of ſalt were introduced into the ſea under the line than towards the poles, from the conſtant agitation occaſioned by the wind and tide, the ſalt muſt ſoon pervade the whole maſs of water. To ſay that the ſuperior degree of heat in the tropical regions may diſſolve a greater quantity of ſalt, will not deſtroy our argument ; for it is an eſtabliſhed principle in chemiſtry, that cold water will diſſolve nearly as great a quantity of ſalt as hot water can diſſolve.

The ſaltneſs of the ſea has alſo been aſcribed to the ſolution of ſubterraneous mines of ſalt, which is ſuppoſed to abound in the bottom of the ſea and along its ſhores. But this hypotheſis cannot be ſupported. If the ſea were conſtantly diſſolving ſalt, it would ſoon become ſaturated ; for it cannot be ſaid that it is deprived of any part of its ſalt by evaporation, ſince rain water is freſh. If the ſea were to become ſaturated, neither fiſhes nor vegetables could live in it. We muſt therefore deſpair of being able to account for the ſaltneſs of the ſea by ſecond cauſes; and muſt ſuppoſe that it has been ſalt from the creation. It is impoſſible indeed to ſuppoſe that the waters of the ſea were at any period freſh ſince the formation of fiſhes and ſea-plants : for, as theſe will not live in water ſaturated with ſalt, neither will they live in water that is freſh ; we therefore conclude that the ſalt-

neſs of the ſea has been nearly the ſame in all ages. This is the ſimpleſt hypotheſis of the three that has been mentioned. It explains beſt the various phenomena, and is involved in feweſt difficulties. We ſhall, however, allow that there may be ſome exceptions; that the ſaltneſs of ſome ſeas, or of particular parts of the ſame ſea, may be increaſed by mines of rock-ſalt diſperſed near its ſhores.

With regard to the uſe of this ſalt property of ſea-water, it is obſerved, that the ſaltneſs of the ſea preſerves its waters pure and ſweet, which otherwiſe would corrupt and ſtink like a filthy lake, and conſequently that none of the myriads of creatures which now live therein could then have a being. From thence alſo the ſea-water becomes much heavier, and therefore ſhips of greater ſize and quantity may be uſed thereon. Salt-water alſo doth not freeze ſo ſoon as freſh-water, whence the ſeas are more free for navigation. Dr. Ruſſel has written on the uſe of ſea-water in ſcrofulous diſeaſes; and experience has proved it an important remedy.

Preſervation of SEA-*Water from Putrefaction.* As it is ſometimes neceſſary to preſerve ſea-water in caſks for bathing and other purpoſes, it is of importance to know how to keep it from putrefaction. Many experiments were made to determine this point by Mr. Henry, and are recorded in the firſt volume of the Memoirs of the Literary and Philoſophical Society of Mancheſter. His firſt experiment we ſhall here preſent to our readers. "To one quart of ſea water were added two ſcruples of freſh quicklime; to another, half an ounce of common culinary ſalt; and a third was kept as a ſtandard without any addition. The mouths of the bottles being looſely covered with paper, they were expoſed to the action of the ſun in ſome of the hotteſt weather in ſummer. In about a week the ſtandard became very offenſive; and the water, with the additional quantity of ſalt, did not continue ſweet many hours longer; whereas that with lime continued many months without ever exhibiting the leaſt marks of putridity." When he added a dram more of quicklime, the whole of the magneſia contained in the water was ſeparated; and when a further addition was made, a lime-water was immediately formed. He therefore concluded, that two ſcruples of quicklime are ſufficient to preſerve a quart of ſea-water. The proportions, however, may vary a little, according to the ſtrength of the quicklime employed.

Freſhening of SEA-*Water.* The method of making ſea-water freſh was long a deſideratum. Many methods have been propoſed for this purpoſe; but without ſucceſs. At length Dr. Irving brought the proceſs to a very high degree of ſimplicity and perfection, by which the water is obtained pure, without much expenſe of fuel or a complicated apparatus. For this valuable diſcovery he received a reward of 5000l. The advantages of his method remain to be ſtated, which may be reduced to the following: 1. The aboliſhing all ſtills, ſtill-heads, worm-pipes, and their tubes, which occupy ſo much ſpace as to render them totally incompatible with the neceſſary buſineſs of the ſhip; and uſing in the room of theſe the ſhip's kettle or boiler, to the top whereof may occaſionally be applied a ſimple tube, which can be eaſily made on board a veſſel at ſea, of iron plate, ſtove-funnel, or tin ſheet; ſo that no ſituation can prevent a ſhip from being completely ſupplied with the means of diſtilling ſea-water. 2. In conſequence of the principles of diſtillation being fully aſcertained, the contrivance of the ſimpleſt means of obtaining the greateſt quantity of diſtilled water, by making the tube ſufficiently large to receive the whole column of vapour, and placing it nearly in a horizontal direction, to prevent any compreſſion of the fluid, which takes place ſo much with the common worm. 3. The adopting of the ſimpleſt and moſt efficacious means of condenſing vapour; for nothing more is required in the diſtillation but keeping the ſurface of the tube always wet, which is done by having ſome ſea-water at hand, and a perſon to dip a mop or ſwab into this water, and paſs it along the upper ſurface of the tube. By this operation the vapour contained in the tube will be entirely condenſed with the greateſt rapidity imaginable; for by the application of the wet mop thin ſheets of water are uniformly ſpread, and mechanically preſſed upon the ſurface of the hot tube; which being converted into vapour make way for a ſucceſſion of freſh ſheets; and thus, both by the evaporation and cloſe contact of the cold water conſtantly repeated, the heat is carried off more effectually than by any other method yet known. 4. The carrying on the diſtillation without any addition, a correct chemical analyſis of ſea-water having evinced the futility of mixing ingredients with it, either to prevent an acid from riſing with the vapour, or to deſtroy any bituminous oil ſuppoſed to exiſt in ſea-water, and to contaminate the diſtilled water, giving it that fiery unpalatable taſte inſeparable from the former proceſſes. 5. The aſcertaining the proper quantity of ſea-water that ought to be diſtilled, whereby the freſh-water is prevented from contracting a noxious impregnation of metallic ſalts, and the veſſel from being corroded and otherwiſe damaged by the ſalts caking on the bottom of it. 6. The producing a quantity of ſweet and wholeſome water, perfectly agreeable to the taſte, and ſufficient for all the purpoſes of ſhipping. 7. The taking advantage of the dreſſing the ſhip's proviſions, ſo as to diſtill a very conſiderable quantity of water from the vapour, which would otherwiſe be loſt, without any addition of fuel. To ſum up the merits of this method in a few words: The uſe of a ſimple tube, of the moſt eaſy conſtruction, applicable to any ſhip's kettle. The rejecting all ingredients; aſcertaining the proportion of water to be diſtilled, with every advantage of quality, ſaving of fuel, and preſervation of boilers. The obtaining freſh water, wholeſome, palatable, and in ſufficient quantities. Taking advantage of the vapour which aſcends in the kettle while the ſhip's proviſions are boiling. All theſe advantages are obtained by the above-mentioned ſimple addition to the common ſhip's kettles. But Dr. Irving propoſes to introduce two further improvements. The firſt is a hearth, or ſtove, ſo conſtructed that the fire which is kept up the whole day for the common buſineſs of the ſhip ſerves likewiſe for diſtillation; whereby a ſufficient quantity of water for all the economical purpoſes of the ſhip may be obtained, with a very inconſiderable addition to the expenſe of fuel. The other improvement is that of ſubſtituting, even in the largeſt ſhips, caſt-iron boilers, of a new conſtruction, in the place of coppers.

As ſoon as ſea-water is put into the boiler, the tube is to be fitted either into the top or lid, round which, if neceſſary, a bit of wet linen may be applied, to make it fit cloſe to the mouth of the veſſel; there will be no occaſion for luting, as the tube acts like a funnel in carrying off vapour. When the water begins to boil, the vapour ſhould be allowed to paſs freely for a minute, which will effectually clean the tube and upper part of the boiler. The tube is afterwards to be kept conſtantly wet, by paſſing a mop or ſwab, dipped in ſea-water, along its upper ſurface. The waſte water running from the mop may be carried off by means of a board made like a ſpout, and placed beneath the tube. The diſtillation may be continued till three-fourths of the water be drawn off, and no further. This may be aſcertained either by a gauge-rod put into the boiler, or by meaſuring the water diſtilled. The brine is then to be let out. Water may be diſtilled in the ſame manner while the proviſions are boiling. When the tube is made on ſhore, the beſt ſubſtance for the purpoſe is thin copper well tinned, this being more durable in long voyages than tin-plates. Inſtead of mopping, the tube, if required, may have a caſe made alſo of copper, ſo much larger in diameter as to admit a thin ſheet of water to circulate between them by means of a ſpiral copper thread, with a pipe of an inch diameter at each end of the caſe; the lower for receiving cold water, and the upper for carrying it off when heated.

When only a very ſmall portion of room can be conveniently allowed for diſtillation, the machine (pl. 13. fig. 2.), which is only 27 inches long, may be ſubſtituted, as was done in this voyage. The principal intention of this machine, however, is to diſtill rum and other liquors; for which purpoſe it has been employed with extraordinary ſucceſs, in preventing an *empyreuma*, or fiery taſte.

Figure 1. in the ſame plate, repreſents in perſpective a ſection of the two boilers taken out of the frame. In the back part at D, E, are ſeen openings for the cocks. On the top is a diſtilling tube A, B, C, five inches in diameter at A, and decreaſing in ſize to three inches at C; the length from B to C is five feet. Near C is a ring to prevent the water which is applied to the ſurface from mixing with the diſtilled water. In the inſide of the tube, below B, is a ſmall lip or ledging, to hinder the diſtilled water from returning into the boiler by the rolling of the ſhip.

In figure 2. A, B, C, D, repreſent a vertical ſection of a copper box, 27 inches long, ſeven inches wide, and 11 in height, tinned on the inſide. In the bottom F is an aperture about ſix inches in diameter, having a ring to fit on the ſtill or boiler.—The dotted lines, which run nearly horizontal, are veſſels of thin copper, tinned on the outſide, two feet long, ſeven inches wide, and three quarters of an inch deep. At G is a funnel to receive cold water, which is conveyed into the veſſels by communicating pipes, contrived in ſuch a manner as to form a complete and quick circulation of the water through their whole extent.—When the water is become hot by the action of the ſteam, it is diſcharged by the horizontal pipe at A. E is a pipe from which the diſtilled water or ſpirits run, and is bent in ſuch a form that the liquor running from it acts as a valve, and hinders any ſteam from eſcaping that way. On the top of the box, at H, is a ſafety-valve, which prevents any danger from a great accumulation of vapour not condenſed for want of a proper ſupply of cold water.

We ſhall now mention a different method, diſcovered by the chevalier Lorgna, by congelation of ſea-water. Sea-water requires a very great degree of cold in order to become ice. Our author found that a freezing mixture, made by mixing three parts of pounded ice with two parts of common ſalt, was quite ſufficient to freeze it. The cold produced by this mixture is equal to about 4° below nought of Fahrenheit's thermometer.

A quantity of ſea-water is never entirely congealed, a portion of it always remaining fluid; and, what is very remarkable, this fluid part is incomparably more full of ſalt and more nauſeous than the reſt: hence, if this be ſeparated from the congealed part, the latter on being melted will be found to contain much leſs ſalt than it did before congelation. This we ſhall call *the water of the firſt purification.*

If the water of the firſt purification be again congealed, a part of it will remain fluid as in the firſt operation. This fluid portion will contain a greater proportion of ſalt than the reſt, which is of courſe more pure, and, being melted, forms the water of the ſecond purification. Thus, by repeatedly freezing the ſame ſea-water, and ſeparating the fluid from the congealed part in every operation, it is at laſt perfectly purified, ſo as to be entirely diveſted of ſalt, and as fit for drink and other purpoſes as the pureſt water that is uſed.

At firſt the ſea-water, in order to be congealed, requires a very great degree of cold, as mentioned above: the ice formed in it conſiſts rather of ſcales or filaments than of a compact body, and the quantity of the fluid part bears a conſiderable proportion to the quantity of ice. But as the water, by undergoing the ſucceſſive congelations, becomes more and more pure, ſo it becomes capable of being congealed by a ſmaller and ſmaller degree of cold; the ice is at the ſame time more compact, and in greater quantity; the fluid part at laſt becoming very inconſiderable.

Sea-*Weed*, or *Alga Marina*, is commonly uſed as a manure on the ſea-coaſt, where it can be procured in abundance. The beſt ſort grows on rocks, and is that from which kelp is made. The next to this is called the *peaſy ſea-weed*; and the worſt is that with a long ſtalk. In the neighbourhood of Berwick, the farmers mix it with ſtable dung and earth, and thus obtain a great quantity of excellent manure. Sea-weed is found alſo to be a very fit manure for gardens, as it not only enriches them, but deſtroys the vermin by which they are uſually infeſted.

Sea *Wolf*. See Anarrhicas.

Saltneſs of the Sea. See Sea-*Water*.

South Sea. See Pacific *Ocean*, and South *Sea*.

SEAL, a puncheon, piece of metal, or other matter, uſually either round or oval; whereon are engraven the arms, device, &c. of ſome prince, ſtate, community, magiſtrate, or private perſon, often with a legend or inſcription; the impreſſion whereof in wax ſerves to make acts, inſtruments, &c. authentic.

The uſe of ſeals, as a mark of authenticity to letters and other inſtruments in writing, is extremely antient. We read of it among the Jews and Perſians in the earlieſt and moſt ſacred records of hiſtory. And in the book of Jeremiah there is a very remarkable inſtance, not only of an atteſtation by ſeal, but alſo of the other uſual formalities attending a Jewiſh purchaſe. In the civil law, alſo, ſeals were the evidence of truth, and were required, on the part of the witneſſes at leaſt, at the atteſtation of every teſtament. But in the times of our Saxon anceſtors they were not much in uſe in England. For though ſir Edward Coke relies on an inſtance of king Edwyn's making uſe of a ſeal about 100 years before the conqueſt, yet it does not follow that this was the uſage among the whole nation: and perhaps the charter he mentions may be of doubtful authority, from this very circumſtance of its being ſealed: ſince we are aſſured by all our antient hiſtorians that ſealing was not then in common uſe. The method of the Saxons was, for ſuch as could write, to ſubſcribe their names, and, whether they could write or not, to affix the ſign of the croſs; which cuſtom our illiterate vulgar do for the moſt part to this day keep up, by ſigning a croſs for their mark when unable to write their names. And indeed this inability to write, and therefore making a croſs in its ſtead, is honeſtly avowed by Cædwalla, a Saxon king, at the end of one of his charters. In like manner, and for the ſame unſurmountable reaſon, the Normans, a brave but illiterate nation, at their firſt ſettlement in France uſed the practice of ſealing only, without writing their names; which cuſtom continued when learning made its way among them, though the reaſon for doing it had ceaſed; and hence the charter of Edward the Confeſſor to Weſtminſter-abbey, himſelf being brought up in Normandy, was witneſſed only by his ſeal, and is generally thought to be the oldeſt ſealed charter of any authenticity in England. At the Conqueſt, the Norman lords brought over into this kingdom their own faſhions; and introduced waxen ſeals only, inſtead of the Engliſh method of writing their names, and ſigning with the ſign of the croſs. The impreſſions of theſe ſeals were ſometimes a knight on horſeback, ſometimes other devices; but coats of arms were not introduced into ſeals, nor indeed uſed at all, till about the reign of Richard I. who brought them from the croiſade in the Holy Land, where they were firſt invented, and painted on the ſhields of the knights, to diſtinguiſh the variety of perſons of every Chriſtian nation who reſorted thither, and who could not, when clad in complete ſteel, be otherwiſe known or aſcertained.

This neglect of ſigning, and reſting only upon the authenticity of ſeals, remained very long among us; for it was held in

all our books, that sealing alone was sufficient to authenticate a deed: and so the common form of attesting deeds, "sealed and delivered," continues to this day; notwithstanding the statute 29 Car. II. c. 3. revives the Saxon custom, and expressly directs the signing in all grants of land and many other species of deeds: in which, therefore, signing seems to be now as necessary as sealing, though it hath been sometimes held that the one includes the other.

The king's *great seal* is that whereby all patents, commissions, warrants, &c. coming down from the king are sealed; the keeping whereof is in the hands of the lord chancellor. The king's *privy-seal* is a seal that is usually first set to grants that are to pass the great seal.

SEAL. See KEEPER *of the Privy Seal.*

SEAL is also used for the wax or lead, and the impression thereon affixed to the thing sealed. An amalgam of mercury with gold, reduced to the consistency of butter by straining off part of the mercury through leather, has been recommended as a proper material for taking off the impression of seals in wax. In this state, the compound scarcely contains one part of mercury to two of gold; yet is of a silver whiteness, as if there was none of the precious metal in it. In this state it grows soft on being warmed or worked between the fingers; and is therefore proper for the purpose above mentioned, but is not superior to some amalgams made with the inferior metals, as is well known to some impostors, who have sold for this use amalgams of the base metals as curious preparations of gold.

SEAL, in zoology. See PHOCA.

SEALER, an officer in chancery appointed by the lord chancellor or keeper of the great seal to seal the writs and instruments there made in his presence.

SEALING, in architecture, the fixing a piece of wood or iron in a wall with plaster, mortar, cement, lead, or other solid binding. For staples, hinges, and joints, plaster is very proper.

SEALING-*Wax*. See WAX.

SEAM, or SEME of corn, is a measure of eight bushels.

SEAM *of Glass*, the quantity of 120 pounds, or 24 stones, each five pounds weight. The seam of wood is a horse-load.

SEAM, in mines, the same with a vein or stratum of metal.

SEAMANSHIP.

BY this word we express that noble art, or, more purely, the qualifications which enable a man to exercise the noble art of working a ship. A SEAMAN, in the language of the profession, is not merely a mariner or labourer on board a ship, but a man who understands the structure of this wonderful machine, and every subordinate part of its mechanism, so as to enable him to employ it to the best advantage for pushing her forward in a particular direction, and for avoiding the numberless dangers to which she is exposed by the violence of the winds and waves. He also knows what courses can be held by the ship, according to the wind that blows, and what cannot, and which of these is most conducive to her progress in her intended voyage: and be must be able to perform every part of the necessary operation with his own hands. As the seamen express it, he must be able "to hand, reef, and steer."

We are justified in calling it a *noble art*, not only by its importance, which it is quite needless to amplify or embellish, but by its immense extent and difficulty, and the prodigious number and variety of principles on which it is founded—all of which must be possessed in such a manner that they shall offer themselves without reflection in an instant, otherwise the pretended seaman is but a lubber, and cannot be trusted on his watch.

The art is practised by persons without what we call *education*, and in the humbler walks of life, and therefore it suffers in the estimation of the careless spectator. It is thought little of, because little attention is paid to it. But if multiplicity, variety, and intricacy of principles, and a systematic knowledge of these principles, entitle any art to the appellation of *scientific* and *liberal*, seamanship claims these epithets in an eminent degree. We are amused with the pedantry of the seaman, which appears in his whole language. Indeed it is the only pedantry that amuses. A scholar, a soldier, a lawyer, nay, even the elegant courtier, would disgust us, were he to make the thousandth part of the allusions to his profession that is well received from the jolly seaman; and we do the seaman no more than justice. His profession *must* engross his whole mind, otherwise he can never learn it. He possesses a prodigious deal of knowledge; but the honest tar cannot tell what he knows, or rather what he feels, for his science is really at his fingers' ends. We can say with confidence, that if a person of education, versed in mechanics, and acquainted with the structure of a ship, were to observe with attention the movements which are made on board a first or second rate ship of war during a shifting storm, under the direction of an intelligent officer, he would be rapt in admiration.

What a pity it is that an art so important, so difficult, and so intimately connected with the invariable laws of mechanical nature, should be so held by its possessors, that it cannot improve, but must die with each individual! Having no advantages of previous education, they cannot arrange their thoughts; they can hardly be said to think. They can far less express or communicate to others the intuitive knowledge which they possess; and their art, acquired by habit alone, is little different from an instinct. We are as little entitled to expect improvement here as in the architecture of the bee or the beaver. The species (pardon the allusion, ye generous hearts of oak) cannot improve. Yet a ship is a machine. We know the forces which act on it, and we know the results of its construction—all these are as fixed as the laws of motion. What hinders this to be reduced to a set of practical maxims, as well founded and as logically deduced as the working of a steam engine or a cotton mill? The stoker or the spinner acts only with his hands, and may "whistle as he works for want of thought;" but the mechanist, the engineer, thinks for him, improves his machine, and directs him to a better practice. May not the rough seaman look for the same assistance? and may not the ingenious speculatist in his closet unravel the intricate thread of mechanism which connects all the manual operations with the unchangeable laws of nature, and both furnish the seaman with a better machine and direct him to a more dexterous use of it?

We cannot help thinking that much may be done; nay, we may say that much has been done. We think highly of the progressive labours of Renaud, Pitot, Bouguer, Du Hamel, Groignard, Bernoulli, Euler, Romme, and others; and are both surprised and sorry that Britain has contributed so little in these attempts. Gordon is the only one of our countrymen who has given a professedly scientific treatise on a small branch of the subject. The government of France has always been strongly impressed with the notion of great improvements being attainable by systematic study of this art; and we are indebted to the endeavours of that ingenious nation for any thing of practical importance that has been obtained. M. Bouguer was professor of hydrology at one of the marine academies of France, and

was enjoined, as part of his duty, to compose dissertations both on the construction and the working of ships. His *Traité du Navire*, and his *Manœuvre des Vaisseaux*, are undoubtedly very valuable performances: So are those of Euler and Bernoulli, considered as mathematical dissertations, and they are wonderful works of genius, considered as the productions of persons who hardly ever saw a ship, and were totally unacquainted with the profession of a seaman. In this respect Bouguer had great superiority, having always lived at a sea-port, and having made many very long voyages. His treatises therefore are infinitely better accommodated to the demands of the seaman, and more directly instructive; but still the author is more a mathematician than an artist, and his performance is intelligible only to mathematicians. It is true, the academical education of the young gentlemen of the French navy is such, that a great number of them may acquire the preparatory knowledge that is necessary; and we are well informed that, in this respect, the officers of the British navy are greatly inferior to them.

But this very circumstance has furnished to many persons an argument against the utility of those performances. It is said that, "notwithstanding this superior mathematical education, and the possession of those boasted performances of M. Bouguer, the French are greatly inferior, in point of seamanship, to our countrymen, who have not a page in their language to instruct them, and who could not peruse it if they had it." Nay, so little do the French themselves seem sensible of the advantage of these publications, that no person among them has attempted to make a familiar abridgement of them, written in a way fitted to attract attention; and they still remain neglected in their original abstruse and uninteresting form.

We wish that we could give a satisfactory answer to this observation. It is just, and it is important. These very ingenious and learned dissertations are by no means so useful as we should expect. They are large books, and appear to contain much; and as their plan is logical, it seems to occupy the whole subject, and therefore to have done almost all that can be done. But, alas! they have only opened the subject, and the study is yet in its infancy. The whole science of the art must proceed on the knowledge of the impulsions of the wind and water. These are the forces which act on the machine; and its motions, which are the ultimatum of our research, whether as an end to be obtained or as a thing to be prevented, must depend on these forces. Now it is with respect to this fundamental point that we are as yet almost totally in the dark. And, in the performances of M. Bouguer, as also in those of the other authors we have named, the theory of these forces, by which their quantity and the direction of their action are ascertained, is altogether erroneous; and its results deviate so enormously from what is observed in the motions of a ship, that the person who should direct the operations on shipboard, in conformity to the maxims deducible from M. Bouguer's propositions, would be baffled in most of his attempts, and be in danger of losing the ship. The whole proceeds on the supposed truth of that theory which states the impulse of a fluid to be in the proportion of the square of the sine of the angle of incidence; and that its action on any small portion, such as a square foot of the sails or hull, is the same as if that portion were detached from the rest, and were exposed, single and alone, to the wind or water in the same angle. But we have shown, in the article Resistance *of Fluids*, both from theory and experience, that both of these principles are erroneous, and this to a very great degree, in cases which occur most frequently in practice, that is, in the small angles of inclination. When the wind falls nearly perpendicular on the sails, theory is not very erroneous; but in these cases, the circumstances of the ship's situation are generally such that the practice is easy, occurring almost without thought; and in this case, too, even considerable deviations from the very best practice are of no great moment. The interesting cases, where the intended movement requires or depends upon very oblique actions of the wind on the sails, and its practicability or impracticability depends on a very small variation of this obliquity; a mistake of the force, either as to intensity or direction, produces a mighty effect on the resulting motion. This is the case in sailing to windward; the most important of all the general problems of seamanship. The trim of the sails, and the course of the ship, so as to gain most on the wind, are very nice things; that is, they are confined within very narrow limits, and a small mistake produces a very considerable effect. The same thing obtains in many of the nice problems of tacking, box-hauling, wearing after lying-to in a storm, &c.

The error in the second assertion of the theory is still greater, and the action on one part of the sail or hull is so greatly modified by its action on another adjoining part, that a stay-sail is often seen hanging like a loose rag, although there is nothing between it and the wind; and this merely because a great sail in its neighbourhood sends off a lateral stream of wind, which completely hinders the wind from getting at it. Till the theory of the action of fluids be established, therefore, we cannot tell what are the forces which are acting on every point of the sail and hull. Therefore we cannot tell either the mean intensity or direction of the whole force which acts on any particular sail, nor the intensity and mean direction of the resistance to the hull; circumstances absolutely necessary for enabling us to say what will be their energy in producing a rotation round any particular axis. In like manner, we cannot, by such a computation, find the spontaneous axis of conversion (see Rotation), or the velocity of such conversion. In short, we cannot pronounce with tolerable confidence *à priori* what will be the motions in any case, or what dispositions of the sails will produce the movement we wish to perform. The experienced seaman learns by habit the general effects of every disposition of the sails; and though his knowledge is far from being accurate, it seldom leads him into any very blundering operation. Perhaps he seldom makes the best adjustment possible, but seldomer still does he deviate very far from it; and in the most general and important problems, such as working to windward, the result of much experience and many corrections has settled a trim of the sails which is certainly not far from the truth, but (it must be acknowledged) deviates widely and uniformly from the theories of the mathematician's closet. The honest tar, therefore, must be indulged in his joke on the useless labours of the mathematician, who can neither hand, reef, nor steer.

After this account of the theoretical performances in the art of seamanship, and what we have said in another place on the small hopes we entertain of seeing a perfect theory of the impulse of fluids, it will not be expected that we enter very minutely on the subject in this place; nor is it our intention. But let it be observed, that the theory is defective in one point only; and although this is a most important point, and the errors in it destroy the conclusions of the chief propositions, the reasonings remain in full force, and the *modus operandi* is precisely such as is stated in the theory. The *principles* of the art are therefore to be found in these treatises; but false inferences have been drawn, by computing from erroneous quantities. The rules and the practice of the computation, however, are still beyond controversy. Nay, since the process of investigation is legitimate, we may make use of it in order to discover the very circumstance in which we are at present mistaken; for, by inverting the proposition, instead of finding the motions by means of the supposed forces, combined with the known mechanism, we may discover the forces by means of this mechanism and the observed motions.

We shall therefore in this place give a very general view of the movements of a ship under sail, showing how they are produced

and modified by the action of the wind on her ſails, the water on her rudder and on her bows. We ſhall not attempt a preciſe determination of any of theſe movements; but we ſhall ſay enough to enable the curious landſman to underſtand how this mighty machine is managed amidſt the fury of the winds and waves; and, what is more to our wiſh, we hope to enable the uninſtructed but thinking ſeaman to generaliſe that knowledge which he poſſeſſes; to claſs his ideas, and give them a ſort of rational ſyſtem; and even to improve his practice, by making him ſenſible of the immediate operation of every thing he does, and in what manner it contributes to produce the movement which he has in view.

A ſhip may be conſidered at preſent as a maſs of inert matter in free ſpace, at liberty to move in every direction, according to the forces which impel or reſiſt her: and when ſhe is in actual motion, in the direction of her courſe. we may ſtill conſider her as at reſt in abſolute ſpace, but expoſed to the impulſe of a current of water moving equally faſt in the oppoſite direction: for in both caſes the preſſure of the water on her bows is the ſame; and we know that it is poſſible, and frequently happens in currents, that the impulſe of the wind on her ſails, and that of the water on her bows, balance each other ſo preciſely, that ſhe not only does not ſtir from the place, but alſo remains ſteadily in the ſame poſition, with her head directed to the ſame point of the compaſs. This ſtate of things is eaſily conceived by any perſon accuſtomed to conſider mechanical ſubjects, and every ſeaman of experience has obſerved it. It is of importance to conſider it in this point of view, becauſe it gives us the moſt familiar notion of the manner in which theſe forces of the wind and water are ſet in oppoſition, and made to balance or not to balance each other by the intervention of the ſhip, in the ſame manner as the goods and the weights balance each other in the ſcales by the intervention of a beam or ſteelyard.

When a ſhip proceeds ſteadily in her courſe, without changing her rate of ſailing, or varying the direction of her head, we muſt in the firſt place conceive the accumulated impulſes of the wind on all her ſails as preciſely equal, and directly oppoſite to the impulſe of the water on her bows. In the next place, becauſe the ſhip does not change the direction of her keel, ſhe reſembles the balanced ſteelyard, in which the energies of the two weights, which tend to produce rotations in oppoſite directions, and thus to change the poſition of the beam, mutually balance each other round the fulcrum; ſo the energies of the actions of the wind on the different ſails balance the energies of the water on the different parts of the hull.

The ſeaman has two principal taſks to perform. The firſt is to keep the ſhip ſteadily in that courſe which will bring her furtheſt on in the line of her intended voyage. This is frequently very different from that line, and the choice of the beſt courſe is ſometimes a matter of conſiderable difficulty. It is ſometimes poſſible to ſhape the courſe preciſely along the line of the voyage; and yet the intelligent ſeaman knows that he will arrive ſooner, or with greater ſafety, at his port, by taking a different courſe; becauſe he will gain more by increaſing his ſpeed than he loſes by increaſing the diſtance. Some principle muſt direct him in the ſelection of this courſe. This we muſt attempt to lay before the reader.

Having choſen ſuch a courſe as he thinks moſt advantageous, he muſt ſet ſuch a quantity of ſail as the ſtrength of the wind will allow him to carry with ſafety and effect, and muſt trim the ſails properly, or ſo adjuſt their poſitions to the direction of the wind, that they may have the greateſt poſſible tendency to impel the ſhip in the line of her courſe, and to keep her ſteadily in that direction.

His other taſk is to produce any deviations which he ſees proper from the preſent courſe of the ſhip; and to produce theſe in the moſt certain, the ſafeſt, and the moſt expeditious manner. It is chiefly in this movement that the mechanical nature of a ſhip comes into view, and it is here that the ſuperior addreſs and reſource of an expert ſeaman are to be perceived.

Under the article Sailing ſome notice has been taken of the firſt taſk of the ſeaman, and it was there ſhown how a ſhip, after having taken up her anchor and fitted her ſails, accelerates her motion, by degrees which continually diminiſh, till the increaſing reſiſtance of the water becomes preciſely equal to the diminiſhed impulſe of the wind, and then the motion continues uniformly the ſame ſo long as the wind continues to blow with the ſame force and in the ſame direction.

It is perfectly conſonant to experience that the impulſe of fluids is in the duplicate ratio of the relative velocity. Let it be ſuppoſed that when water moves one foot per ſecond its perpendicular preſſure or impulſe on a ſquare foot is m pounds. Then, if it be moving with the velocity V eſtimated in feet per ſecond, its perpendicular impulſe on a ſurface S, containing any number of ſquare feet, muſt be $m\,\mathrm{SV}^2$.

In like manner, the impulſe of air on the ſame ſurface may be repreſented by $n\,\mathrm{S}\,\mathrm{V}^2$; and the proportion of the impulſe of theſe two fluids will be that of m to n. We may expreſs this by the ratio of q to 1, making $\frac{m}{n} = q$.

M. Bouguer's computations and tables are on the ſuppoſition that the impulſe of ſea-water moving one foot per ſecond is 23 ounces on a ſquare foot, and that the impulſe of the wind is the ſame when it blows at the rate of 24 feet per ſecond. Theſe meaſures are all French. They by no means agree with the experiments of others; and what we have already ſaid, when treating of the Resistance *of Fluids*, is enough to ſhow us that nothing like preciſe meaſures can be expected. It was ſhown as the reſult of a rational inveſtigation, and confirmed by the experiments of Buat and others, that the impulſions and reſiſtances at the ſame ſurface, with the ſame obliquity of incidence and the ſame velocity of motion, are different according to the form and ſituation of the adjoining parts. Thus the total reſiſtance of a thin board is greater than that of a long priſm, having this board for its front or bow, &c.

We are greatly at a loſs what to give as abſolute meaſures of theſe impulſions.

1. With reſpect to water. The experiments of the French academy on a priſm two feet broad and deep and four feet long, indicate a reſiſtance of 0,973 pounds avoirdupois to a ſquare foot, moving with the velocity of one foot per ſecond at the ſurface of ſtill water.

Mr. Buat's experiments on a ſquare foot wholly immerſed in a ſtream were as follow:

A ſquare foot as a thin plate - -	1,81 pounds.
Ditto as the front of a box one foot long	1,42
Ditto as the front of a box three feet long	1,29

The reſiſtance of ſea-water is about $\frac{1}{23}$ greater.

2. With reſpect to air, the varieties are as great. The reſiſtance of a ſquare foot to air moving with the velocity of one foot per ſecond appears from Mr. Robins's experiments on 16

ſquare inches to be on a ſquare foot	0,001596 pounds,
Chevalier Borda's on 16 inches	0,001757
——— on 81 inches	0,002042
Mr. Rouſe's on large ſurfaces	0,002291

Preciſe meaſures are not to be expected, nor are they neceſſary in this inquiry. Here we are chiefly intereſted in their proportions, as they may be varied by their mode of action in the different circumſtances of obliquity and velocity.

We begin by recurring to the fundamental propoſition concerning the impulſe of fluids, viz. that the abſolute preſſure is always in a direction perpendicular to the impelled ſurface,

whatever may be the direction of the ſtream of fluids. We muſt therefore illuſtrate the doctrine, by always ſuppoſing a flat ſurface of ſail ſtretched on a yard, which can be braced about in any direction, and giving this ſail ſuch a poſition and ſuch an extent of ſurface that the impulſe on it may be the ſame both as to direction and intenſity with that on the real ſails. Thus the conſideration is greatly ſimplified. The direction of the impulſe is therefore perpendicular to the yard. Its intenſity depends on the velocity with which the wind meets the ſail, and the obliquity of its ſtroke. We ſhall adopt the conſtructions founded on the common doctrine, that the impulſe is as the ſquare of the ſine of the inclination, becauſe they are ſimple; whereas, if we were to introduce the values of the oblique impulſes, ſuch as they have been obſerved in the excellent experiments of the Academy of Paris, the conſtructions would be complicated in the extreme, and we could hardly draw any conſequences which would be intelligible to any but expert mathematicians. The concluſions will be erroneous, not in kind but in quantity only; and we ſhall point out the neceſſary corrections, ſo that the final reſults will be found not very different from real obſervation.

If a ſhip were a round cylindrical body like a flat tub, floating on its bottom, and fitted with a maſt and ſail in the centre, ſhe would always ſail in a direction perpendicular to the yard. This is evident. But ſhe is an oblong body, and may be compared to a cheſt, whoſe length greatly exceeds its breadth. She is ſo ſhaped, that a moderate force will puſh her through the water with the head or ſtern foremoſt; but it requires a very great force to puſh her ſidewiſe with the ſame velocity. A fine ſailing ſhip of war will require about 12 times as much force to puſh her ſidewiſe as to puſh her head foremoſt. In this reſpect therefore ſhe will very much reſemble a cheſt whoſe length is 12 times its breadth; and whatever be the proportion of theſe reſiſtances in different ſhips, we may always ſubſtitute a box which ſhall have the ſame reſiſtances headwiſe and ſidewiſe.

Let EFGH (plate 7. fig. 1.) be the horizontal ſection of ſuch a box, and AB its middle line, and C its centre. In whatever direction this box may chance to move, the direction of the whole reſiſtance on its two ſides will paſs through C. For, as the whole ſtream has one inclination to the ſide EF, the equivalent of the equal impulſes on every part will be in a line perpendicular to the middle of EF. For the ſame reaſon, it will be in a line perpendicular to the middle of FG. Theſe perpendiculars muſt croſs in C. Suppoſe a maſt erected at C, and YC y to be a yard hoiſted on it carrying a ſail. Let the yard be firſt conceived as braced right athwart at right angles to the keel, as repreſented by $Y'y'$. Then, whatever be the direction of the wind abaft this ſail, it will impel the veſſel in the direction CB. But if the ſail has the oblique poſition Y y, the impulſe will be in the direction CD perpendicular to CY, and will both puſh the veſſel ahead and ſidewiſe: for the impulſe CD is equivalent to the two impulſes CK and CI (the ſides of a rectangle of which CD is the diagonal). The force CI puſhes the veſſel ahead, and CK puſhes her ſidewiſe. She muſt therefore take ſome intermediate direction $a\ b$, ſuch that the reſiſtance of the water to the plane FG is to its reſiſtance to the plane EF as CI to CK.

The angle b CB between the real courſe and the direction of the head is called the Leeway; and in the courſe of this diſſertation we ſhall expreſs it by the ſymbol x. It evidently depends on the ſhape of the veſſel and on the poſition of the yard. An accurate knowledge of the quantity of leeway, correſponding to different circumſtances of obliquity of impulſe, extent of ſurface, &c. is of the utmoſt importance in the practice of navigation; and even an approximation is valuable. The ſubject is ſo very difficult that this muſt content us for the preſent.

Let V be the velocity of the ſhip in the direction C b, and let the ſurfaces FG and FE be called A' and B'. Then the reſiſtance to the lateral motion is $m\,V^2 \times B' \times \text{ſine}^2, b\,\text{CB}$, and that to the direct motion is $m\,V^2 \times A' \times \text{ſine}^2, b\,\text{CK}$, or $m\,V^2 \times A' \times \text{coſ.}^2, b\,\text{CB}$. Therefore theſe reſiſtances are in the proportion of $B' \times \text{ſine}^2, x$ to $A' \times \text{coſ.}^2, x$ (repreſenting the angle of leeway b C B by the ſymbol x).

Therefore we have CI : CK, or CI : ID $= A' \cdot \text{coſ.}^2\, x :$

$$B' \cdot \text{ſine}^2\, x, = A' : B' \cdot \frac{\text{ſine}^2\, x}{\text{coſ.}^2\, x} = A : B' \cdot \text{tangent}^2\, x.$$

Let the angle YCB, to which the yard is braced up, be called the Trim of the ſails, and expreſſed by the ſymbol b. This is the complement of the angle DCI. Now CI : ID = rad. : tan. DCI, = 1 : tan. DCI, = 1 : cotan. b. Therefore we have finally 1 : cotan. $b = A' : B' \cdot \text{tan.}^2\, x$, and $A' \cdot$ cotan. $b = B' \cdot \text{tangent}^2\, x$, and $\text{tan.}^2\, x = \frac{A}{B}\,\text{cot.}\, b$. This equation evidently aſcertains the mutual relation between the trim of the ſails and the leeway in every caſe where we can tell the proportion between the reſiſtances to the direct and broadſide motions of the ſhip, and where this proportion does not change by the obliquity of the courſe. Thus, ſuppoſe the yard braced up to an angle of 30° with the keel. Then cotan. 30° = 1,732 very nearly. Suppoſe alſo that the reſiſtance ſidewiſe is 12 times greater than the reſiſtance headwiſe. This gives $A' = 1$ and $B' = 12$. Therefore $1{,}732 = 12 \times \text{tangent}^2\, x$, and $\text{tangent}^2\, x = \frac{1{,}732}{12}, = 0,\ 14434$, and tan. $x = 0{,}3799$, and $x = 20°\ 48'$, very nearly two points of leeway.

This computation, or rather the equation which gives room for it, ſuppoſes the reſiſtances proportional to the ſquares of the ſines of incidence. The experiments of the academy of Paris, of which an abſtract is given in the article Resistance *of Fluids*, ſhow that this ſuppoſition is not far from the truth when the angle of incidence is great. In this preſent caſe the angle of incidence on the front FG is about 70°, and the experiments juſt now mentioned ſhow that the real reſiſtances exceed the theoretical ones only $\frac{1}{180}$. But the angle of incidence on EF is only 20° 48′. Experiment ſhows that in this inclination the reſiſtance is almoſt quadruple of the theoretical reſiſtances. Therefore the lateral reſiſtance is aſſumed much too ſmall in the preſent inſtance. Therefore a much ſmaller leeway will ſuffice for producing a lateral reſiſtance which will balance the lateral impulſe CK, ariſing from the obliquity of the ſail, viz. 30°. The matter of fact is, that a pretty good ſailing ſhip, with her ſails braced to this angle, at a medium, will not make above five or ſix degrees leeway in ſmooth water and eaſy weather; and yet in this ſituation the hull and rigging preſent a very great ſurface to the wind, in the moſt improper poſitions, ſo as to have a very great effect in increaſing her leeway. And if we compute the reſiſtances for this leeway of ſix degrees by the actual experiments of the French academy on that angle, we ſhall find the reſult not far from the truth; that is, the direct and lateral reſiſtances will be nearly in the proportion of CI to ID.

It reſults from this view of the matter, that the leeway is in general much ſmaller than what the uſual theory aſſigns.

We alſo ſee, that according to whatever law the reſiſtances change by a change of inclination, the leeway remains the ſame while the trim of the ſails is the ſame. The leeway depends only on the direction of the impulſe of the wind; and this depends ſolely on the poſition of the ſails with reſpect to the keel, whatever may be the direction of the wind. This is a very important obſervation, and will be frequently referred to in the progreſs of the preſent inveſtigation. Note, however, that we are here conſidering only the action on the ſails, and on the ſame ſails. We are not conſidering the action of the wind on the

hull and rigging. This may be very confiderable; and it is always in a lee direction, and augments the leeway; and its influence muft be fo much the more fenfible as it bears a greater proportion to the impulfe on the fails. A fhip under courfes, or clofe-reefed topfails and courfes, muft make more leeway than when under all her canvas trimmed to the fame angle. But to introduce this additional caufe of deviation here would render the inveftigation too complicated to be of any ufe.

This doctrine will be confiderably illuftrated by attending to the manner in which a lighter is tracked along a canal, or fwings to its anchor in a ftream. The track rope is made faft to fome ftaple or bolt E on the deck (fig. 2.), and is paffed between two of the timber-heads of the bow at D, and laid hold of at F on fhore. The men or cattle walk along the path FG, the rope keeps extended in the direction DF, and the lighter arranges itfelf in an oblique pofition AB, and is thus dragged along in the direction $a\,b$, parallel to the fide of the canal. Or if the canal has a current in the oppofite direction $b\,a$, the lighter may be kept fteady in its place by the rope DF made faft to a poft at F. In this cafe, it is always obferved that the lighter fwings in a pofition AB, which is oblique to the ftream $a\,b$. Now the force which retains it in this pofition, and which precifely balances the action of the ftream, is certainly exerted in the direction DF; and the lighter would be held in the fame manner if the rope were made faft at C amidfhip, without any dependence on the timberheads at D; and it would ftill be held in the fame pofition, if, inftead of the fingle rope CF, it were riding by two ropes CG and CH, of which CH is in a direction right ahead, but oblique to the ftream, and the other CG is perpendicular to CH or AB. And, drawing DI and DK perpendicular to AB and CG, the ftrain on the rope CH is to that on the rope CG as CI to CK. The action of the rope in thefe cafes is precifely analogous to that of the fail y Y; and the obliquity of the keel to the direction of the motion, or to the direction of the ftream, is analogous to the leeway. All this muft be evident to any perfon accuftomed to mechanical difquifitions.

A moft important ufe may be made of this illuftration. If an accurate model be made of a fhip, and if it be placed in a ftream of water, and ridden in this manner by a rope made faft at any point D of the bow, it will arrange itfelf in fome determined pofition AB. There will be a certain obliquity to the ftream, meafured by the angle B$o\,b$; and there will be a correfponding obliquity of the rope, meafured by the angle FCB. Let yCY be perpendicular to CF. Then CY will be the pofition of the yard, or trim of the fails correfponding to the leeway bCB. Then, if we fhift the rope to a point of the bow diftant from D by a fmall quantity, we fhall obtain a new pofition of the fhip, both with refpect to the ftream and the rope; and in this way may be obtained the relation between the pofition of the fails and the leeway, independent of all theory, and fufceptible of great accuracy; and this may be done with a variety of models fuited to the moft ufual forms of fhips.

In further thinking on this fubject, we are perfuaded that thefe experiments, inftead of being made on models, may with equal eafe be made on a fhip of any fize. Let the fhip ride in a ftream at a mooring D (fig. 3,) by means of a fhort hawfer BCD from her bow, having a fpring AC on it carried out from her quarter. She will fwing to her moorings, till fhe ranges herfelf in a certain pofition AB with refpect to the direction $a\,b$ of the ftream; and the direction of the hawfer DC will point to fome point E of the line of the keel. Now, it is plain to any perfon acquainted with mechanical difquifitions, that the deviation BEb is precifely the leeway that the fhip will make when the average pofition of the fails is that of the line GEH perpendicular to ED; at leaft this will give the leeway which is produced by the fails alone. By heaving on the fpring, the knot C may be brought into any other pofition we pleafe; and for every new pofition of the knot the fhip will take a new pofition with refpect to the ftream and to the hawfer. And we perfift in faying, that more information will be got by this train of experiments than from any mathematical theory: for all theories of the impulfes of fluids muft proceed on phyfical poftulates with refpect to the motions of the filaments, which are exceedingly conjectural.

And it muft now be further obferved, that the fubftitution which we have made of an oblong parallelopiped for a fhip, although well fuited to give us clear notions of the fubject, is of fmall ufe in practice: for it is next to impoffible (even granting the theory of oblique impulfions) to make this fubftitution. A fhip is of a form which is not reducible to equations; and therefore the action of the water on her bow or broadfide can only be had by a moft laborious and intricate calculation for almoft every fquare foot of its furface. (See *Bezout's Cours de Mathem.* vol. 5. p. 72, &c.) And this muft be different for every fhip. But, which is more unlucky, when we have got a parallelopiped which will have the fame proportion of direct and lateral refiftance for a particular angle of leeway, it will not anfwer for another leeway of the fame fhip; for, when the leeway changes, the figure actually expofed to the action of the water changes alfo. When the leeway is increafed, more of the lee-quarter is acted on by the water, and a part of the weather-bow is now removed from its action. Another parallelopiped muft therefore be difcovered, whofe refiftances fhall fuit this new pofition of the keel with refpect to the real courfe of the fhip.

We therefore beg leave to recommend this train of experiments to the notice of the Association for the Improvement of Naval Architecture as a very promifing method for afcertaining this important point. And we proceed, in the next place, to afcertain the relation between the velocity of the fhip and that of the wind, modified as they may be by the trim of the fails and the obliquity of the impulfe.

Let AB (fig. 4, 5, and 6.) reprefent the horizontal fection of a fhip. In place of all the drawing fails, that is, the fails which are really filled, we can always fubftitute one fail of equal extent, trimmed to the fame angle with the keel. This being fuppofed attached to the yard DCD, let this yard be firft of all at right angles to the keel, as reprefented in fig. 4. Let the wind blow in the direction WC, and let CE (in the direction WC continued) reprefent the velocity V of the wind. Let CF be the velocity v of the fhip. It muft alfo be in the direction of the fhip's motion, becaufe, when the fail is at right angles to the keel, the abfolute impulfe on the fail is in the direction of the keel, and there is no lateral impulfe, and confequently no leeway. Draw EF, and complete the parallelogram CFEe, producing eC through the centre of the yard to w. Then wC will be the relative or apparent direction of the wind, and Ce or FE will be its apparent or relative velocity. For, if the line Ce be carried along CF, keeping always parallel to its firft pofition, and if a particle of air move uniformly along CE (a fixed line in abfolute fpace) in the fame time, this particle will always be found in that point of CE where it is interfected at that inftant by the moving line Ce; fo that, if Ce were a tube, the particle of air, which really moves in the line CE, would always be found in the tube Ce. While CE is the real direction of the wind, Ce will be the pofition of the vane at the maft-head, which will therefore mark the apparent direction of the wind, or its motion relative to the moving fhip.

We may conceive this in another way. Suppofe a cannon-fhot fired in the direction CE at the paffing fhip, and that it paffes through the maft at C with the velocity of the wind. It will not pafs through the off-fide of the fhip at P, in the line CE: for, while the fhot moves from C to P, the point P has

gone forward, and the point p is now in the place where P was when the ſhot paſſed through the maſt. The ſhot will therefore paſs through the ſhip's ſide in the point p, and a perſon on board ſeeing it paſs through C and p will ſay that its motion was in the line C p.

Thus it happens, that when a ſhip is in motion the apparent direction of the wind is always ahead of its real direction. The line w C is always found within the angle WCB. It is eaſy to ſee from the conſtruction, that the difference between the real and apparent directions of the wind is ſo much the more remarkable as the velocity of the ſhip is greater: For the angle WC w or EC e depends on the magnitude of E e or CF, in proportion to CE. Perſons not much accuſtomed to attend to theſe matters are apt to think all attention to this difference to be nothing but affectation of nicety. They have no notion that the velocity of a ſhip can have any ſenſible proportion to that of the wind. "Swift as the wind" is a proverbial expreſſion; yet the velocity of a ſhip always bears a very ſenſible proportion to that of the wind, and even very frequently exceeds it. We may form a pretty exact notion of the velocity of the wind by obſerving the ſhadows of the ſummer clouds flying along the face of a country, and it may be very well meaſured by this method. The motion of ſuch clouds cannot be very different from that of the air below; and when the preſſure of the wind on a flat ſurface, while blowing with a velocity meaſured in this way, is compared with its preſſure when its velocity is meaſured by more unexceptionable methods, they are found to agree with all deſirable accuracy. Now obſervations of this kind frequently repeated, ſhow that what we call a pleaſant briſk gale blows at the rate of about 10 miles an hour, or about 15 feet in a ſecond, and exerts a preſſure of half a pound on a ſquare foot. Mr. Smeaton has frequently obſerved the ſails of a windmill, driven by ſuch a wind, moving faſter, nay much faſter, towards their extremities, ſo that the ſail, inſtead of being preſſed to the frames on the arms, was taken aback, and fluttering on them. Nay, we know that a good ſhip, with all her ſails ſet and the wind on the beam, will in ſuch a ſituation ſail above 10 knots an hour in ſmooth water. There is an obſervation made by every experienced ſeaman, which ſhows this difference between the real and apparent directions of the wind very diſtinctly. When a ſhip that is ſailing briſkly with the wind on the beam tacks about, and then ſails equally well on the other tack, the wind always appears to have ſhifted and come more ahead. This is familiar to all ſeamen. The ſeaman judges of the direction of the wind by the poſition of the ſhip's vanes.—Suppoſe the ſhip ſailing due weſt on the ſtarboard-tack, with the wind apparently N. N. W. the vane pointing S. S. E. If the ſhip puts about, and ſtands due eaſt on the larboard tack, the vane will be found no longer to point S. S. E. but perhaps S. S. W. the wind appearing N. N. E. and the ſhip muſt be nearly cloſe hauled in order to make an eaſt courſe. The wind appears to have ſhifted four points. If the ſhip tacks again, the wind returns to its old quarter. We have often obſerved a greater difference than this. The celebrated aſtronomer Dr. Bradley, taking the amuſement of ſailing in a pinnace on the river Thames, obſerved this, and was ſurpriſed at it, imagining that the change of wind was owing to the approaching to or retiring from the ſhore. The boatmen told him that it always happened at ſea, and explained it to him in the beſt manner they were able. The explanation ſtruck him, and ſet him a muſing on an aſtronomical phenomenon which he had been puzzled by for ſome years, and which he called THE ABERRATION OF THE FIXED STARS. Every ſtar changes its place a ſmall matter for half a year, and returns to it at the completion of the year. He compared the ſtream of light from the ſtar to the wind, and the teleſcope of the aſtronomer to the ſhip's vane, while the earth was like the ſhip, moving in oppoſite directions when in the oppoſite points of its orbit. The teleſcope muſt always be pointed ahead of the real direction of the ſtar, in the ſame manner as the vane is always in a direction ahead of the wind; and thus he aſcertained the progreſſive motion of light, and diſcovered the proportion of its velocity to the velocity of the earth in its orbit, by obſerving the deviation which was neceſſarily given to the teleſcope. Obſerving that the light ſhifted its direction about 40″, he concluded its velocity to be about 11,000 times greater than that of the earth; juſt as the intelligent ſeaman would conclude from this apparent ſhifting of the wind, that the velocity of the wind is about triple that of of the ſhip. This is indeed the beſt method for diſcovering the velocity of the wind. Let the direction of the vane at the maſthead be very accurately noticed on both tacks, and let the velocity of the ſhip be alſo accurately meaſured. The angle between the directions of the ſhip's head on theſe different tacks being halved, will give the real direction of the wind, which muſt be compared with the poſition of the vane in order to determine the angle contained between the real and apparent directions of the wind or the angle EC e; or half of the obſerved ſhifting of the wind will ſhow the inclination of its true and apparent directions. This being found, the proportion of EC to FC (fig. 6), is eaſily meaſured.

We have been very particular on this point, becauſe, ſince the mutual actions of bodies depend on their relative motions only, we ſhould make prodigious miſtakes if we eſtimated the action of the wind by its real direction and velocity, when they differ ſo much from the relative or apparent.

We now reſume the inveſtigation of the velocity of the ſhip (fig. 4,), having its ſail at right angles to the keel, and the wind blowing in the direction and with the velocity CE, while the ſhip proceeds in the direction of the keel with the velocity CF. Produce E e, which is parallel to BC, till it meet the yard in g, and draw FG perpendicular to E g. Let a repreſent the angle WCD, contained between the ſail and the real direction of the wind, and let b be the angle of trim DCB. CE the velocity of the wind was expreſſed by V, and CF the velocity of the ſhip by v.

The abſolute impulſe on the ſail is (by the uſual theory) proportional to the ſquare of the relative velocity, and to the ſquare of the ſine of the angle of incidence; that is, to $\text{FE}^2 \times \text{ſin.}^2\ w\,\text{CD}$. Now the angle GFE $= w$ C D, and E G is equal to F E $\times$ ſin. G F E; and E G is equal to E g — g G. But E g = EC $\times$ ſin. ECg, = V $\times$ ſin. a; and g G = CF, = v. Therefore E G = V $\times$ ſin. $a - v$, and the impulſe is proportional to $\overline{\text{V} \times \text{ſin.}\ a - v}^{\,2}$. If S repreſent the ſurface of the ſail, the impulſe, in pounds, will be n S (V $\times$ ſin. $a - v$)^2.

Let A be the ſurface which, when it meets the water perpendicularly with the velocity v, will ſuſtain the ſame preſſure or reſiſtance which the bows of the ſhip actually meet with. This impulſe, in pounds, will be $m\,\text{A}\,v^2$. Therefore, becauſe we are conſidering the ſhip's motion as in a ſtate of uniformity, the two preſſures balance each other; and therefore $m\,\text{A}\,v^2 = n\,\text{S}\,(\text{V} \times \text{ſin.}\ a - v)^2$, and $\frac{m}{n}\,\text{A}\,v^2 = \text{S}\,(\text{V} \times \text{ſin.}\ a - v)^2$; therefore $\sqrt{\frac{m}{n}}\sqrt{\text{A}} \times v = \sqrt{\text{S}} \times \text{V} \times \text{ſin.}\ a - v\sqrt{\text{S}}$, and $v =$

$$\frac{\sqrt{\text{S}} \times v \times \text{ſin.}\ a}{\sqrt{\frac{m}{n}\text{A}} + \sqrt{\text{S}}} = \frac{\text{V} \times \text{ſin.}\ a}{\sqrt{\frac{m\,\text{A}}{n\,\text{S}}} + 1} = \frac{\text{V} \times \text{ſin.}\ a}{\sqrt{\frac{\text{A}}{q\,\text{S}}} + 1}.$$

We ſee, in the firſt place, that the velocity of the ſhip is (*cæteris paribus*) proportional to the velocity of the wind, and to

the fine of its incidence on the fail jointly: for, while the furface of the fail S and the equivalent furface for the bows remain the fame, v increafes or diminifhes at the fame rate with V. fin. a —. When the wind is right aftern, the fine of a is unity, and then the fhip's velocity is $\dfrac{V}{\sqrt{\frac{m A}{n S}}+1}$.

Note, that the denominator of this fraction is a common number; for m and n are numbers, and A and S being quantities of one kind, $\frac{A}{S}$ is alfo a number.

It muft alfo be carefully attended to, that S expreffes a quantity of fail actually receiving wind with the inclination a. It will not always be true, therefore, that the velocity will increafe as the wind is more abaft, becaufe fome fails will then becalm others. This obfervation is not, however, of great importance; for it is very unufual to put a fhip in the fituation confidered hitherto, that is, with the yards fquare, unlefs fhe be right before the wind.

If we would difcover the relation between the velocity and the quantity of fail in this fimple cafe of the wind right aft, obferve that the equation $v=\dfrac{V}{\sqrt{\frac{m A}{n S}}+1}$ gives us $\sqrt{\frac{m A}{n S}}\,v+v=V$, and $\sqrt{\frac{m A}{n S}}\,v=V-v$, and $\frac{m A}{n S}v^2=\overline{V-v}^2$, and $\frac{n S}{mA}=\frac{v^2}{(V-v)^2}$; and becaufe n and m and A are conftant quantities, S is proportional to $\frac{v^2}{(V-v)^2}$, or the furface of fail is proportional to the fquare of the fhip's velocity directly, and to the fquare of the relative velocity inverfely. Thus, if a fhip be failing with $\frac{1}{8}$ of the velocity of the wind, and we would have her fail with $\frac{1}{4}$ of it, we muft quadruple the fails. This is more eafily feen in another way. The velocity of the fhip is proportional to the velocity of the wind; and therefore the relative velocity is alfo proportional to that of the wind, and the impulfe of the wind is as the fquare of the relative velocity. Therefore, in order to increafe the relative velocity by an increafe of fail only, we muft make this increafe of fail in the duplicate proportion of the increafe of velocity.

Let us, in the next place, confider the motion of a fhip whofe fails ftand oblique to the keel.

The conftruction for this purpofe differs a little from the former, becaufe, when the fails are trimmed to any oblique pofition DCB (fig. 5. and 6.), there muft be a deviation from the direction of the keel, or a leeway BC b. Call this x. Let CF be the velocity of the fhip. Draw, as before, E g perpendicular to the yard, and FG perpendicular to E g; alfo draw FH perpendicular to the yard: then, as before, EG, which is in the fubduplicate ratio of the impulfe on the fail, is equal to E g — G g. Now E g is, as before, $=$ V $\times$ fin. a, and G g is equal to FH, which is $=$ C F $\times$ fin. F C H, or $= v \times$ fin. $(b+x)$. Therefore we have the impulfe $= n$ S (V· fin. $a - v$· fin. $(b+x))^2$.

This expreffion of the impulfe is perfectly fimilar to that in the former cafe, its only difference confifting in the fubductive part, which is here $v \times$ fin. $\overline{b+x}$ inftead of v. But it expreffes the fame thing as before, viz. the diminution of the impulfe. The impulfe being reckoned folely in the direction perpendicular to the fail, it is diminifhed folely by the fail withdrawing itfelf *in that direction* from the wind; and as g E may be confidered as the real impulfive motion of the wind, G E muft be confidered as the relative and effective impulfive motion. The impulfe would have been the fame had the fhip been at reft, and had the wind met it perpendicularly with the velocity G E.

We muft now fhow the connection between this impulfe and the motion of the fhip. The fail, and confequently the fhip, is preffed by the wind in the direction CI perpendicular to the fail or yard with the force which we have juft now determined. This (in the ftate of uniform motion) muft be equal and oppofite to the action of the water. Draw IL at right angles to the keel. The impulfe in the direction CI (which we may meafure by CI) is equivalent to the impulfes CL and LI. By the firft the fhip is impelled right forward, and by the fecond fhe is driven fidewife. Therefore we muft have a leeway, and a lateral as well as a direct refiftance. We fuppofe the form of the fhip to be known, and therefore the proportion is known, or difcoverable, between the direct and lateral refiftances correfponding to every angle x of leeway. Let A be the furface whofe perpendicular refiftance is equal to the direct refiftance of the fhip correfponding to the leeway x, that is, whofe refiftance is equal to the refiftance really felt by the fhip's bows in the direction of the keel when fhe is failing with this leeway; and let B in like manner be the furface whofe perpendicular refiftance is equal to the actual refiftance to the fhip's motion in the direction LI, perpendicular to the keel. (*N. B.* This is not equivalent to A′ and B′ adapted to the rectangular box, but to A′· cof.$^2 x$ and B′· fin.$^2 x$.) We have therefore A : B $=$ CL : LI, and LI $=\frac{CL \cdot B}{A}$. Alfo, becaufe CI $=\sqrt{\overline{CL^2}+\overline{LI^2}}$, we have A : $\sqrt{A^2+B^2}=$ CL : CI, and CI $=\frac{CL \cdot \sqrt{A^2+B^2}}{A}$.

The refiftance in the direction LC is properly meafured by m A v^2, as has been already obferved. Therefore the refiftance in the direction IC muft be expreffed by $m\,\overline{\sqrt{A^2+B^2}}\,v^2$; or (making C the furface, which is equal to $\sqrt{A^2+B^2}$, and which will therefore have the fame perpendicular refiftance to the water having the velocity v) it may be expreffed by m C v^2.

Therefore, becaufe there is an equilibrium between the impulfe and refiftance, we have m C $v^2 = n$ S (V· fin. $a - v$· fin. $\overline{b+x})^2$ and $\frac{m}{n}$ C v^2, or q C $v^2=$ S (V· fin. $a - v$· fin. $\overline{b+x})^2$, and $\sqrt{q}\,\sqrt{C}\,v=\sqrt{S}$ (V· fin. $a - v$· fin. $\overline{b+x}$).

$$\text{Therefore } v=\frac{\sqrt{S}\cdot V\cdot \text{fin. } a}{\sqrt{q}\,\sqrt{C}+\sqrt{S}\cdot \text{fin. } \overline{b+x}},=\frac{V\cdot \text{fin. } a}{\sqrt{q}\frac{\sqrt{C}}{\sqrt{S}}+\text{fin. } \overline{b+x}},=V\frac{\text{Sin. } a}{\sqrt{q}\frac{\sqrt{C}}{\sqrt{S}}+\text{fin. } \overline{b+x}}.$$

Obferve that the quantity which is the coefficient of V in this equation is a common number; for fin. a is a number, being a decimal fraction of the radius 1. Sin. $\overline{b+x}$ is alfo a number, for the fame reafon. And fince m and n were numbers of pounds, $\frac{m}{n}$ or q is a common number. And becaufe C and S are furfaces, or quantities of one kind, $\frac{C}{S}$ is alfo a common number.

This is the fimpleft expreffion that we can think of for the velocity acquired by the fhip, though it muft be acknowledged to be too complex to be of very prompt ufe. Its complication arifes from the neceffity of introducing the leeway x. This affects the whole of the denominator; for the furface C de-

pends on it, becaufe C is $= \sqrt{A^2+B^2}$, and A and B are analogous to $A' \text{cof.}^2 x$ and $B' \text{fin.}^2 x$.

But we can deduce fome important confequences from this theorem.

While the furface S of the fail actually filled by the wind remains the fame, and the angle DCB, which in future we fhall call the TRIM of the fails, alfo remains the fame, both the leeway x and the fubftituted furface C remain the fame. The denominator is therefore conftant; and the velocity of the fhip is proportional to $\sqrt{S} \cdot V \cdot \text{fin.}\, a$; that is, directly as the velocity of the wind, directly as the abfolute inclination of the wind to the yard, and directly as the fquare root of the furface of the fails.

We alfo learn from the conftruction of the figure that FG parallel to the yard cuts CE in a given ratio. For CF is in a conftant ratio to Eg, as has been juft now demonftrated. And the angle DCF is conftant. Therefore CF · fin. b, or FH or Gg, is proportional to Eg, and OC to EC, or EC is cut in one proportion, whatever may be the angle ECD, fo long as the angle DCF is conftant.

We alfo fee that it is very poffible for the velocity of the fhip on an oblique courfe to exceed that of the wind. This will be the cafe when the number $\dfrac{\text{fin.}\, a}{\sqrt{q\dfrac{C}{S}+\text{fin.}\,\overline{b+x}}}$ exceeds unity, or when fin. a is greater than $\sqrt{q\dfrac{C}{S}+\text{fin.}\,\overline{b+x}}$.

Now this may eafily be by fufficiently enlarging S and diminifhing $b+x$. It is indeed frequently feen in fine failers with all their fails fet and not hauled too near the wind.

We remarked above that the angle of leeway x affects the whole denominator of the fraction which expreffes the velocity. Let it be obferved that the angle ICL is the complement of LCD, or of b. Therefore CL : LI, or A : B = 1 : tan. ICL, = 1 : cot. b, and $B = A \cdot \text{cotan.}\, b$. Now A is equivalent to $A' \cdot \text{cof.}^2 x$, and thus b becomes a function of x. C is evidently fo, being $= \sqrt{A^2+B^2}$. Therefore before the value of this fraction can be obtained, we muft be able to compute, by our knowledge of the form of the fhip, the value of A for every angle x of leeway. This can be done only by refolving her bows into a great number of elementary planes, and computing the impulfes on each and adding them into one fum. The computation is of immenfe labour, as may be feen by one example given by Bouguer. When the leeway is but fmall, not exceeding ten degrees, the fubftitution of the rectangular prifm of one determined form is abundantly exact for all leeways contained within this limit; and we fhall foon fee reafon for being contented with this approximation. We may now make ufe of the formula expreffing the velocity for folving the chief problems in this part of the feaman's tafk.

And firft let it be required to determine the beft pofition of the fail for ftanding on a given courfe ab, when C E the direction and velocity of the wind, and its angle with the courfe WCF, are given. This problem has exercifed the talents of the mathematicians ever fince the days of Newton. In the article PNEUMATICS we gave the folution of one very nearly related to it, namely, to determine the pofition of the fail which would produce the greateft impulfe in the direction of the courfe. The folution was to place the yard CD in fuch a pofition that the tangent of the angle FCD may be one half of the tangent of the angle DCW. This will indeed be the beft pofition of the fail for beginning the motion; but as foon as the fhip begins to move in the direction CF, the effective impulfe of the wind is diminifhed, and alfo its inclination to the fail.— The angle DCw diminifhes continually as the fhip accelerates; for CF is now accompanied by its equal eF, and by an angle ECe or WCw. CF increafes, and the impulfe on the fail diminifhes, till an equilibrium obtains between the refiftance of the water and the impulfe of the wind. The impulfe is now meafured by $Ce^2 \times \text{fin.}^2\, e\text{CD}$ inftead of $\text{CE}^2 \times \text{fin.}^2\, \text{ECD}$, that is, by EG^2 inftead of $\text{E}g^2$.

This introduction of the relative motion of the wind renders the actual folution of the problem extremely difficult. It is very eafily expreffed geometrically: Divide the angle wCF in fuch a manner that the tangent of DCF may be half of the tangent of DCw, and the problem may be conftructed geometrically as follows.

Let WCF (fig. 7.) be the angle between the fail and courfe. Round the centre C defcribe the circle WDFY; produce WC to Q, fo that $CQ = \frac{1}{3}WC$, and draw QY parallel to CF cutting the circle in Y; bifect the arch WY in D, and draw DC. DC is the proper pofition of the yard.

Draw the chord WY, cutting CD in V and CF in T; draw the tangent PD cutting CF in S and CY in R.

It is evident that WY, PR, are both perpendicular to CD, and are bifected in V and D; therefore (by reafon of the parallels QY, CF) 4 : 3 = QW : CW, = YW : TW, = RP : SP. Therefore PD : PS = 2 : 3, and PD : DS = 2 : 1. *Q. E. D.* But this divifion cannot be made to the beft advantage till the fhip has attained its greateft velocity, and the angle wCF has been produced.

We muft confider all the three angles, a, b, and x as variable in the equation which expreffes the value of v, and we muft make the fluxion of this equation $= o$: then, by means of the equation $B = A \cdot \text{cotan.}\, b$, we muft obtain the value of b and of $\dot{b}$ in terms of x and $\dot{x}$. With refpect to a, obferve, that if we make the angle WCF $= p$, we have $p = a + b + x$; and p being a conftant quantity, we have $\dot{a} + \dot{b} + \dot{x} = o$. Subftituting for a, b, $\dot{a}$, and $\dot{b}$, their values in terms of x and $\dot{x}$, in the fluxionary equation $= o$, we readily obtain x, and then a and b, which folves the problem.

Let it be required, in the next place, to determine the courfe and the trim of the fails moft proper for plying to windward.

In fig. 6. draw FP perpendicular to WC. CF is the motion of the fhip; but it is only by the motion CP that fhe gains to windward. Now CP is $=$ CF × cofin. WCF, or $v \cdot$ cofin. $(a+b+x)$. This muft be rendered a maximum, as follows.

By means of the equation which expreffes the value of v and the equation $B = A \cdot \text{cotan.}\, b$, we exterminate the quantities v and b; we then take the fluxion of the quantity into which the expreffion $v \cdot \text{cof.}\ (a+b+x)$ is changed by this operation — Making this fluxion $= o$, we get the equation which muft folve the problem. This equation will contain the two variable quantities a and x with their fluxions; then make the coefficient of $\dot{x}$ equal to o, alfo the coefficient of $\dot{a}$ equal to o. This will give two equations which will determine a and x, and from this we get $b = p - a - x$.

Should it be required, in the third place, to find the beft courfe and trim of the fails for getting away from a given line of coaft CM (fig. 6), the procefs perfectly refembles this laft, which is in fact getting away from a line of coaft which makes a right angle with the wind. Therefore, in place of the angle WCF, we muft fubftitute the angle WCM±WCF. Call this angle c. We muft make $v \cdot \text{cof.}\ (c \pm a \pm b \pm x)$ a maximum.— The analytical procefs is the fame as the former, only c is here a conftant quantity.

Thefe are the three principal problems which can be folved by means of the knowledge that we have obtained of the motion of the fhip when impelled by an oblique fail, and therefore making leeway; and they may be confidered as an abftract of this part of M. Bouguer's work. We have only pointed out the procefs for

this solution, and have even omitted some things taken notice of by M. Bezout in his very elegant compendium. Our reasons will appear as we go on. The learned reader will readily see the extreme difficulty of the subject, and the immense calculations which are necessary even in the simplest cases, and will grant that it is out of the power of any but an expert analyst to derive any use from them; but the mathematician can calculate tables for the use of the practical seaman. Thus he can calculate the best position of the sails for advancing in a course 90° from the wind, and the velocity in that course; then for 85°, 80°, 75°, &c. M. Bouguer has given a table of this kind; but to avoid the immense difficulty of the process, he has adapted it to the apparent direction of the wind. We have inserted a few of his numbers, suited to such cases as can be of service, namely, when all the sails draw, or none stand in the way of others.—Column 1st is the apparent angle of the wind and course; column 2d is the corresponding angle of the sails and keel; and column 3d is the apparent angle of the sails and wind.

1	2	3
w CF	DCB	*w* CD
103° 53′	42° 30′	61° 23′
99 13	40 —	59 13
94 25	37 30	56 55
89 28	35 —	54 28
84 23	32 30	51 53
79 06	30 —	49 06
73 39	27 30	46 09
68 —	25 —	43 —

In all these numbers we have the tangent of *w*CD double of the tangent of DCF.

But this is really doing but little for the seaman. The apparent direction of the wind is unknown to him till the ship is sailing with uniform velocity; and he is still uninformed as to the leeway. It is, however, of service to him to know, for instance, that when the angle of the vanes and yards is 56 degrees, the yard should be braced up to 37° 30′, &c.

But here occurs a new difficulty. By the construction of a square-rigged ship it is impossible to give the yards that inclination to the keel which the calculation requires. Few ships can have their yards braced up to 37° 30′; and yet this is required in order to have an incidence of 56°, and to hold a course 94° 25′ from the apparent direction of the wind, that is, with the wind apparently 4° 25′ abaft the beam. A good sailing ship in this position may acquire a velocity even exceeding that of the wind. Let us suppose it only one half of this velocity. We shall find that the angle WC*w* is in this case about 29°, and the ship is nearly going 123° from the wind, with the wind almost perpendicular to the sail; therefore this utmost bracing up of the sails is only giving them the position suited to a wind broad on the quarter. It is impossible therefore to comply with the demand of the mathematician, and the seaman must be contented to employ a less favourable disposition of his sails in all cases where his course does not lie at least eleven points from the wind.

Let us see whether this restriction, arising from necessity, leaves any thing in our choice, and makes one course preferable to another. We see that there are a prodigious number of courses, and these the most usual and the most important, which we must hold with one trim of the sails; in particular, sailing with the wind on the beam, and all cases of plying to windward, must be performed with this unfavourable trim of the sails. We are certain that the smaller we make the angle of incidence, real or apparent, the smaller will be the velocity of the ship; but it may happen that we shall gain more to windward, or get sooner away from a lee-coast, or any object of danger, by sailing slowly on one course than by sailing quickly on another.

We have seen that while the trim of the sails remains the same, the leeway and the angle of the yard and course remain the same, and that the velocity of the ship is as the sine of the angle of real incidence, that is, as the sine of the angle of the sail and the real direction of the wind.

Let the ship AB (fig. 8.) hold the course CF, with the wind blowing in the direction WC, and having her yards DCD braced up to the smallest angle BCD which the rigging can admit. Let CF be to CE as the velocity of the ship to the velocity of the wind; join FE and draw C*w* parallel to EF; it is evident that FE is the relative motion of the wind, and *w*CD is the relative incidence on the sail. Draw FO parallel to the yard DC, and describe a circle through the points COF; then we say that if the ship, with the same wind and the same trim of the same drawing sails be made to sail on any other course C*f*, her velocity along CF is to the velocity along C*f* as CF is to C*f*; or, in other words, the ship will employ the same time in going from C to any point of the circumference CFO.

Join *f*O. Then, because the angles CFO, *cf*O are on the same chord CO, they are equal, and *f*O is parallel to *d*C*d*, the new position of the yard corresponding to the new position of the keel *a b*, making the angle *d*C*b*=DCB. Also, by the nature of the circle, the line CF is to C*f* as the sine of the angle COF to the sine of the angle CO*f*, that is (on account of the parallels CD, OF, and C*d*, O*f*), as the sine of WCD to the sine of WC*d*. But when the trim of the sails remains the same, the velocity of the ship is as the sine of the angle of the sail with the direction of the wind; therefore CF is to C*f* as the velocity on CF to that on C*f*, and the proposition is demonstrated.

Let it now be required to determine the best course for avoiding a rock R lying in the direction CR, or for withdrawing as fast as possible from a line of coast PQ. Draw CM through R, or parallel to PQ, and let *m* be the middle of the arch C*m*M. It is plain that *m* is the most remote from CM of any point of the arch C*m*M, and therefore the ship will recede further from the coast PQ in any given time by holding the course C*m* than by any other course.

This course is easily determined; for the arch C*m*M=360° — (arch CO + arch OM), and the arch CO is the measure of twice the angle CFO, or twice the angle DCB, or twice $\overline{b+x}$, and the arch OM measures twice the angle ECM.

Thus, suppose the sharpest possible trim of the sails to be 35°, and the observed angle ECM to be 70°; then CO+OM is 70° +140° or 210°. This being taken from 360°, leaves 150°, of which the half M*m* is 75°, and the angle MC*m* is 37° 30′. This added to ECM makes EC*m* 107° 30′, leaving WC*m*=72° 30′, and the ship must hold a course making an angle of 72° 30′ with the real direction of the wind, and WCD will be 37° 30′.

This supposes no leeway. But if we know that under all the sail which the ship can carry with safety and advantage she makes 5 degrees of leeway, the angle DC*m* of the sail and course, or *b*+*x*, is 40°. Then CO+OM=220°, which being taken from 360° leaves 140°, of which the half is 70°,=M*m*, and the angle MC*m*=35°, and EC*m*=105°, and WC*m*=75°, and the ship must lie with her head 70° from the wind, making 5° degrees of leeway, and the angle WCD is 35°.

The general rule for the position of the ship is, *that the line on shipboard which bisects the angle* b+x *may also bisect the angle* WCM, or make the angle between the course and the line from which we wish to withdraw equal to the angle between the sail and the real direction of the wind.

It is plain that this problem includes that of plying to windward. We have only to suppose ECM to be 90°; then, taking our example in the same ship, with the same trim and the same

leeway, we have $b+x = 4[illegible]^{\circ}$. This taken from 90° leaves 50° and W$Cn = 90 - 25 = 65$, and the ſhip's head muſt lie 60° from the wind, and the yard muſt be 25° from it.

It muſt be obſerved here, that it is not always eligible to ſelect the courſe which will remove the ſhip faſteſt from the given line CM; it may be more prudent to remove from it more ſecurely though more ſlowly. In ſuch caſes the procedure is very ſimple, viz. to ſhape the courſe as near the wind as is poſſible.

The reader will alſo eaſily ſee that the propriety of theſe practices is confined to thoſe courſes only where the practicable trim of the ſails is not ſufficiently ſharp. Whenever the courſe lies ſo far from the wind that it is poſſible to make the tangent of the apparent angle of the wind and ſail double the tangent of the ſail and courſe, it ſhould be done.

Theſe are the chief practical conſequences which can be deduced from the theory. But we ſhould conſider how far this adjuſtment of the ſails and courſe can be performed. And here occur difficulties ſo great as to make it almoſt impracticable. We have always ſuppoſed the poſition of the ſurface of the ſail to be diſtinctly obſervable and meaſurable; but this can hardly be affirmed even with reſpect to a ſail ſtretched on a yard. Here we ſuppoſed the ſurface of the ſail to have the ſame inclination to the keel that the yard has. This is by no means the caſe; the ſail aſſumes a concave form, of which it is almoſt impoſſible to aſſign the direction of the mean impulſe.—We believe that this is always conſiderably to leeward of a perpendicular to the yard, lying between CI and CE (fig. 6.).—This is of ſome advantage, being equivalent to a ſharper trim. We cannot affirm this, however, with any confidence, becauſe it renders the impulſe on the weather-leech of the ſail ſo exceedingly feeble as hardly to have any effect. In ſailing cloſe to the wind the ſhip is kept ſo near that the weather-leech of the ſail is almoſt ready to receive the wind edgewiſe, and to flutter or ſhiver. The moſt effective or drawing ſails with a ſide-wind, eſpecially when plying to windward, are the ſtay-ſails. We believe that it is impoſſible to ſay, with any thing approaching to preciſion, what is the poſition of the general ſurface of a ſtayſail, or to calculate the intenſity and direction of the general impulſe; and we affirm with confidence that no man can pronounce on theſe points with any exactneſs. If we can gueſs within a third or a fourth part of the truth, it is all we can pretend to; and after all, it is but a gueſs. Add to this, the ſails coming in the way of each other, and either becalming them or ſending the wind upon them in a direction widely different from that of its free motion. All theſe points we think beyond our power of calculation, and therefore that it is in vain to give the ſeaman mathematical rules, or even tables of adjuſtment ready calculated; ſince he can neither produce that medium poſition of his ſails that is required, nor tell what is the poſition which he employs.

This is one of the principal reaſons why ſo little advantage has been derived from the very ingenious and promiſing diſquiſitions of Bouguer and other mathematicians, and has made us omit the actual ſolution of the chief problems, contenting ourſelves with pointing out the proceſs to ſuch readers as have a reliſh for theſe analytical operations.

But there is another principal reaſon for the ſmall progreſs which has been made in the theory of ſeamanſhip: This is the errors of the theory itſelf, which ſuppoſes the impulſions of a fluid to be in the duplicate ratio of the ſine of incidence. The moſt careful compariſon which has been made between the reſults of this theory and matter of fact is to be ſeen in the experiments made by the members of the Royal Academy of Sciences at Paris, mentioned in the article Resistance *of Fluids.*—We ſubjoin another abſtract of them in the following table; where col. 1ſt gives the angle of incidence; col. 2d gives the impulſions really obſerved; col. 3d the impulſes, had they followed the duplicate ratio of the ſines; and col. 4th the impulſes, if they were in the ſimple ratio of the ſines.

Angle of Incid.	Impulſion obſerv'd	Impulſe as Sine².	Impulſe as Sine.
90	1000	1000	1000
84	989	989	995
78	958	957	978
72	908	905	951
66	845	835	914
60	771	750	866
54	693	655	809
48	615	552	743
42	543	448	669
36	480	346	587
30	440	250	500
24	424	165	407
18	414	96	309
12	406	43	208
6	400	11	105

Here we ſee an enormous difference in the great obliquities. When the angle of incidence is only ſix degrees, the obſerved impulſe is forty times greater than the theoretical impulſe; at 12° it is ten times greater; at 18° it is more than four times greater; and at 24° it is almoſt three times greater.

No wonder then that the deductions from this theory are ſo uſeleſs, and ſo unlike what we familiarly obſerve. We took notice of this when we were conſidering the leeway of a rectangular box, and thus ſaw a reaſon for admitting an incomparably ſmaller leeway than what would reſult from the laborious computations neceſſary by the theory. This error in theory has as great an influence on the impulſions of air when acting obliquely on a ſail; and the experiments of Mr. Robins and of the Chevalier Borda on the oblique impulſions of air are perfectly conformable (as far as they go) to thoſe of the academicians on water. The oblique impulſions of the wind are therefore much more efficacious for preſſing the ſhip in the direction of her courſe than the theory allows us to ſuppoſe; and the progreſs of a ſhip plying to windward is much greater, both becauſe the oblique impulſes of the wind are more effective, and becauſe the leeway is much ſmaller, than we ſuppoſe. Were not this the caſe, it would be impoſſible for a ſquare-rigged ſhip to get to windward. The impulſe on her ſails when cloſe-hauled would be ſo trifling that ſhe would not have a third part of the velocity which we ſee her acquire: and this trifling velocity would be waſted in leeway; for we have ſeen that the diminution of the oblique impulſes of the water is accompanied by an increaſe of leeway. But we ſee that in the great obliquities the impulſions continue to be very conſiderable, and that even an incidence of ſix degrees gives an impulſe as great as the theory allows to an incidence of 40. We may therefore, on all occaſions, keep the yards more ſquare; and the loſs which we ſuſtain by the diminution of the very oblique impulſe will be more than compenſated by its more favourable direction with reſpect to the ſhip's keel. Let us take an example of this. Suppoſe the wind about two points before the beam, making an angle of 68° with the keel. The theory aſſigns 43° for the inclination of the wind to the ſail, and 25° for the trim of the ſail. The perpendicular impulſe being ſuppoſed 1000, the theoretical impulſe for 43° is 465. This reduced in the proportion of radius to the ſine of 25°, gives the impulſe in the direction of the courſe only 197.

But if we eaſe off the lee-braces till the yard makes an angle

of 50° with the keel, and allows the wind an incidence of no more than 18°, we have the experimented impulse 414, which, when reduced in the proportion of radius to the sine of 50°, gives an effective impulse 317. In like manner, the trim 56°, with the incidence 12°, gives an effective impulse 337; and the trim 62°, with the incidence only 6°, gives 353.

Hence it would at first sight appear that the angle DCB of 62° and WCD of 6° would be better for holding a course within six points of the wind than any more oblique position of the sails; but it will only give a greater initial impulse. As the ship accelerates, the wind apparently comes ahead, and we must continue to brace up as the ship freshens her way. It is not unusual for her to acquire half or two-thirds of the velocity of the wind; in which case the wind comes apparently ahead more than two points, when the yards must be braced up to 35°, and this allows an impulse no greater than about 7°. Now this is very frequently observed in good ships, which in a brisk gale and smooth water will go five or six knots close-hauled, the ship's head six points from the wind, and the sails no more than just full, but ready to shiver by the smallest luff. All this would be impossible by the usual theory; and in this respect these experiments of the French academy give a fine illustration of the seaman's practice. They account for what we should otherwise be much puzzled to explain; and the great progress which is made by a ship close-hauled being perfectly agreeable to what we should expect from the law of oblique impulsion deducible from these so often mentioned experiments, while it is totally incompatible with the common theory, should make us abandon the theory without hesitation, and strenuously set about the establishment of another, founded entirely on experiments. For this purpose the experiments should be made on the oblique impulsions of air on as great a scale as possible, and in as great a variety of circumstances, so as to furnish a series of impulsions for all angles of obliquity. We have but four or five experiments on this subject, viz. two by Mr. Robins and two or three by the Chevalier Borda. Having thus gotten a series of impulsions, it is very practicable to raise on this foundation a practical institute, and to give a table of the velocities of a ship suited to every angle of inclination and of trim; for nothing is more certain than the resolution of the impulse perpendicular to the sail into a force in the direction of the keel, and a lateral force.

We are also disposed to think that experiments might be made on a model very nicely rigged with sails, and trimmed in every different degree, which would point out the mean direction of the impulse on the sails, and the comparative force of these impulses in different directions of the wind. The method would be very similar to that for examining the impulse of the water on the hull. If this can also be ascertained experimentally, the intelligent reader will easily see that the whole motion of a ship under sail may be determined for every case. Tables may then be constructed by calculation, or by graphical operations, which will give the velocities of a ship in every different course, and corresponding to every trim of sail. And let it be here observed, that the trim of the sail is not to be estimated in degrees of inclination of the yards; because, as we have already remarked, we cannot observe nor adjust the lateen sails in this way. But, in making the experiments for ascertaining the impulse, the exact position of the tacks and sheets of the sails are to be noted; and this combination of adjustments is to pass by the name of a certain trim. Thus that trim of all the sails may be called 40, whose direction is experimentally found equivalent to a flat surface trimmed to the obliquity 40°.

Having done this, we may construct a figure for each trim similar to fig. 8. where, instead of a circle, we shall have a curve CCM′F′, whose chords CF′, cf', &c. are proportional to the velocities in these courses; and by means of this curve we can find the point m', which is most remote from any line CM from which we wish to withdraw: and thus we may solve all the principal problems of the art.

We hope that it will not be accounted presumption in us to expect more improvement from a theory founded on judicious experiments only, than from a theory of the impulse of fluids, which is found so inconsistent with observation, and of whose fallacy all its authors, from Newton to D'Alembert, entertained strong suspicions. Again, we beg leave to recommend this view of the subject to the attention of the SOCIETY FOR THE IMPROVEMENT OF NAVAL ARCHITECTURE. Should these patriotic gentlemen entertain a favourable opinion of the plan, and honour us with their correspondence, we will cheerfully impart to them our notions of the way in which both these trains of experiments may be prosecuted with success, and results obtained in which we may confide; and we content ourselves at present with offering to the public these hints, which are not the speculations of a man of mere science, but of one who, with a competent knowledge of the laws of mechanical nature, has the experience of several years service in the royal navy, where the art of working of ships was a favourite object of his scientific attention.

With these observations we conclude our discussion of the first part of the seaman's task, and now proceed to consider the means that are employed to prevent or to produce any deviations from the uniform rectilineal course which has been selected.

Here the ship is to be considered as a body in free space, convertible round her centre of inertia. For, whatever may be the point round which she turns, this motion may always be considered as compounded of a rotation round an axis passing through her centre of gravity or inertia. She is impelled by the wind and by the water acting on many surfaces differently inclined to each other, and the impulse on each is perpendicular to the surface. In order therefore that she may continue steadily in one course, it is not only necessary that the impelling forces, estimated in their mean direction, be equal and opposite to the resisting forces estimated in their mean direction; but also that these two directions may pass through one point: otherwise she will be affected as a log of wood is when pushed in opposite directions by two forces, which are equal indeed, but are applied to different parts of the log. A ship must be considered as a lever, acted on in different parts by forces in different directions, and the whole balancing each other round that point or axis where the equivalent of all the resisting forces passes. This may be considered as a point supported by this resisting force, and as a sort of fulcrum: therefore, in order that the ship may maintain her position, the energies or *momenta* of all the impelling forces round this point must balance each other.

When a ship sails right afore the wind, with her yards square, it is evident that the impulses on each side of the keel are equal, as also their mechanical *momenta* round any axis passing perpendicularly through the keel. So are the actions of the water on her bows. But when she sails on an oblique course, with her yards braced up on either side, she sustains a pressure in the direction CI (fig. 5) perpendicular to the sail. This, by giving her a lateral pressure LI, as well as a pressure CL ahead, causes her to make leeway, and to move in a line C b inclined to CB. By this means the balance of action on the two bows is destroyed; the general impulse on the lee-bow is increased; and that on the weather-bow is diminished. The combined impulse is therefore no longer in the direction BC, but (in the state of uniform motion) in the direction IC.

Suppose that in an instant the whole sails are annihilated, and the impelling pressure CI, which precisely balanced the resisting pressure on the bows, removed. The ship tends, by her inertia, to proceed in the direction C b. This tendency produces a continuation of the resistance in the opposite direction IC, which

is not directly opposed to the tendency of the ship in the direction Cb; therefore the ship's head would immediately come up to the wind. The experienced seaman will recollect something like this when the sails are suddenly lowered when coming to anchor. It does not happen solely from the obliquity of the action on the bows: It would happen to the parallelopiped of fig. 2. which was sustaining a lateral impulsion B. sin.$^2 x$, and a direct impulsion A· cos.$^2 x$. These are continued for a moment after the annihilation of the sail; but being no longer opposed by a force in the direction CD. but by a force in the direction C b, the force B· sin.$^2 x$ must prevail, and the body is not only retarded in its motion, but its head turns towards the wind. But this effect of the leeway is greatly increased by the curved form of the ship's bows. This occasions the centre of effort of all the impulsions of the water on the lee side of the ship to be very far forward, and this so much the more remarkably as she is sharper afore. It is in general not much abaft the foremast. Now the centre of the ship's tendency to continue her motion is the same with her centre of gravity, and this is generally but a little before the mainmast. She is therefore in the same condition nearly as if she were pushed at the mainmast in a direction parallel to C b, and at the foremast by a force parallel to IC. The evident consequence of this is a tendency to come up to the wind. This is independent of all situation of the sails, provided only that they have been trimmed obliquely.

This tendency of the ship's head to windward is called GRIPING in the seaman's language, and is greatest in ships which are sharp forward, as we have said already. This circumstance is easily understood. Whatever is the direction of the ship's motion, the absolute impulse on that part of the bow immediately contiguous to B is perpendicular to that very part of the surface. The more acute, therefore, that the angle of the bow is, the more will the impulse on that part be perpendicular to the keel, and the greater will be its energy to turn the head to windward.

Thus we are enabled to understand or to see the propriety of the disposition of the sails of a ship. We see her crowded with sails forward, and even many sails extended far before her bow, such as the spritsail, the bowsprit topsail, the fore-topmast staysail, the jib, and flying jib. The sails abaft are comparatively smaller. The sails on the mizen mast are much smaller than those on the foremast. All the staysails hoisted on the mainmast may be considered as headsails, because their centres of effort are considerably before the centre of gravity of the ship; and notwithstanding this disposition, it generally requires a small action of the rudder to counteract the windward tendency of the lee-bow. This is considered as a good quality when moderate; because it enables the seaman to throw the sails aback, and stop the ship's way in a moment, if she be in danger from any thing ahead; and the ship which does not carry a little of a weather helm, is always a dull sailer.

In order to judge somewhat more accurately of the action of the water and sails, suppose the ship AB (fig. 9.) to have its sails on the mizenmast D, the mainmast E, and the foremast F, braced up or trimmed alike, and that the three lines D i, E e, F f, perpendicular to the sails, are in the proportion of the impulses on the sails. The ship is driven ahead and to leeward, and moves in the path a C b. This path is so inclined to the line of the keel that the medium direction of the resistance of the water is parallel to the direction of the impulse. A line CI may be drawn parallel to the lines D i, E e, Ff, and equal to their sum: and it may be drawn from such a point C, that the actions on all the parts of the hull between C and B may balance the *momenta* of all the actions on the hull between C and A. This point may justly be called the *centre of effort*, or the *centre of resistance*. We cannot determine this point for want of a proper theory of the resistance of fluids. Nay, although experiments like those of the Parisian academy should give us the most perfect knowledge of the intensity of the oblique impulses on a square foot, we should hardly be benefited by them: for the action of the water on a square foot of the hull at p, for instance, is so modified by the intervention of the stream of water which has struck the hull about B, and glided along the bow B a p, that the pressure on p is totally different from what it would have been were it a square foot or surface detached from the rest, and presented in the same position to the water moving in the direction b C. For it is found, that the resistances given to planes joined so as to form a wedge, or to curved surfaces, are widely different from the accumulated resistances, calculated for their separate parts, agreeably to the experiments of the academy on single surfaces. We therefore do not attempt to ascertain the point C by theory; but it may be accurately determined by the experiments which we have so strongly recommended; and we offer this as an additional inducement for prosecuting them.

Draw through C a line perpendicular to CI, that is, parallel to the sails; and let the lines of impulse of the three sails cut it in the points i, k, and m. This line $i\,m$ may be considered as a lever, moveable round C, and acted on at the points i, k, and m, by three forces. The rotatory momentum of the sails on the mizenmast is D i × i C; that of the sails on the mainmast is E e × k C; and the momentum of the sails on the foremast is Ff × mC. The two first tend to press forward the arm C i, and then to turn the ship's head towards the wind. The action of the sails on the foremast tends to pull the arm C m forward, and produce a contrary rotation. If the ship under these three sails keep steadily in her course, without the aid of the rudder, we must have $\text{D}\,i \times i\,\text{C} + \text{E}\,e \times k\,\text{C} = \text{F}\,f \times m\,\text{C}$. This is very possible, and is often seen in a ship under her mizen-topsail, main-topsail, and fore-topsail, all parallel to one another, and their surfaces duly proportioned by reefing. If more sails are set, we must always have a similar equilibrium. A certain number of them will have their efforts directed from the larboard arm of the lever $i\,m$ lying to leeward of CI, and a certain number will have their efforts directed from the starboard arm lying to windward of CI. The sum of the products of each of the first set, by their distances from C, must be equal to the sum of the similar products of the other set. As this equilibrium is all that is necessary for preserving the ship's position, and the cessation of it is immediately followed by a conversion; and as these states of the ship may be had by means of the three square sails only, when their surfaces are properly proportioned, it is plain that every movement may be executed and explained by their means. This will greatly simplify our future discussions. We shall therefore suppose in future that there are only the three topsails set, and that their surfaces are so adjusted by reefing, that their actions exactly balance each other round that point C of the middle line AB, where the actions of the water on the different parts of her bottom in like manner balance each other.—This point C may be differently situated in the ship according to the leeway she makes, depending on the trim of the sails; and therefore although a certain proportion of the three surfaces may balance each other in one state of leeway, they may happen not to do so in another state. But the equilibrium is evidently attainable in every case, and we therefore shall always suppose it.

It must now be observed, that when this equilibrium is destroyed, as, for example, by turning the edge of the mizen-topsail to the wind, which the seamen call *shivering* the mizen-topsail, and which may be considered as equivalent to the removing the mizen-topsail entirely, it does not follow that the ship will round the point C, this point remaining fixed. The ship must be considered as a free body, still acted on by a number of forces, which no longer balance each other; and she must therefore

legin to turn round a spontaneous axis of conversion, which must be determined in the way set forth in the article ROTATION.—It is of importance to point out in general where this axis is situated. Therefore let G (fig. 10.) be the centre of gravity of the ship. Draw the line qGv parallel to the yards, cutting D d in q, E e in r, CI in t, and F f in v. While the three sails are set, the line qv may be considered as a lever acted on by four forces, *viz.* D d, impelling the lever forward perpendicularly in the point q; E e, impelling it forward in the point r; F f, impelling it forward in the point v; and CI, impelling it backward in the point t. These forces balance each other both in respect of progressive motion and of rotatory energy: for CI was taken equal to the sum of D d, Ee, and Ff; so that no acceleration or retardation of the ship's progress in her course is supposed.

But by taking away the mizen-topsail, both the equilibriums are destroyed. A part D d of the accelerating force is taken away; and yet the ship, by her inertia or inherent force, tends, for a moment, to proceed in the direction C p with her former velocity; and by this tendency exerts for a moment the same pressure CI on the water, and sustains the same resistance IC. She must therefore be retarded in her motion by the excess of the resistance IC over the remaining impelling forces E e and F f, that is, by a force equal and opposite to D d. She will therefore be retarded in the same manner as if the mizen-topsail were still set, and a force equal and opposite to its action were applied to G the centre of gravity and she would soon acquire a smaller velocity, which would again bring all things into equilibrium; and she would stand on in the same course, without changing either her leeway or the position of her head.

But the equilibrium of the lever is also destroyed. It is now acted on by three forces only, *viz.* Ee and Ff, impelling it forward in the points r and v, and I C impelling it backward in the point t. Make $rv : ro = Ee + Ff : Ff$, and make op parallel to CI and equal to $Ee \times Ff$. Then we know, from the common principles of mechanics, that the force op acting at o will have the same momentum or energy to turn the lever round *any* point whatever as the two forces E e and Ff applied at r and v; and now the lever is acted on by two forces, *viz.* IC, urging it backward in the point t, and op urging it forward in the point o. It must therefore turn round like a floating log, which gets two blows in opposite directions. If we now make $IC - op : op = to : tx$, or $IC - op : IC = to : ox$, and apply to the point x a force equal to $IC - op$ in the direction IC; we know, by the common principles of mechanics, that this force $IC - op$ will produce the same rotation round any point as the two forces IC and op applied in their proper directions at t and o. Let us examine the situation of the point x.

The force $IC - op$ is evidently $= Dd$, and op is $= EeF + f$. Therefore $ot : tx = Dd : op$. But because, when all the sails are filled, there was an equilibrium round C, and therefore round t, and because the force op acting at o is equivalent to Ee and Ff acting at r and v, we must still have the equilibrium; and therefore we have the momentum $Dd \times qt = op \times ot$. Therefore $ot : tq = Dd : op$, and $tq = tx$. Therefore the point x is the same with the point q.

Therefore when we shiver the mizen-topsail, the rotation of the ship is the same as if the ship were at rest, and a force equal and opposite to the action of the mizen-topsail were applied at q or at D, or at any point in the line D q.

This might have been shown in another and shorter way Suppose all sails filled, the ship is in equilibrio. This will be disturbed by applying to D a force opposite to Dd; and if the force be also equal to Dd, it is evident that these two forces destroy each other, and that this application of the force dD is equivalent to the taking away of the mizen-topsail. But we chose to give the whole mechanical investigation; because it gave us an opportunity of pointing out to the reader, in a case of very easy comprehension, the precise manner in which the ship is acted on by the different sails and by the water, and what share each of them has in the motion ultimately produced. We shall not repeat this manner of procedure in other cases, because a little reflection on the part of the reader will now enable him to trace the *modus operandi* through all its steps.

We now see that, in respect both of progressive motion and of conversion, the ship is affected by shivering the sail D, in the same manner as if a force equal and opposite to D d were applied at D, or at any point in the line D d. We must now have recourse to the principles established under the article ROTATION.

Let p represent a particle of matter, r its radius vector, or its distance p G from an axis passing through the centre of gravity G, and let M represent the whole quantity of matter of the ship. Then its momentum of inertia is $= \int p \cdot r^2$ (See ROTATION.) The ship, impelled in the point D by a force in the direction d D, will begin to turn round a spontaneous vertical axis, passing through a point S of the line q G, which is drawn through the centre of gravity G, perpendicular to the direction d D of the external force, and the distance GS of this axis from the centre of gravity is $= \frac{\int p \cdot r^2}{M \cdot Gq}$ (see ROTATION), and it is taken on the opposite side of G from q, that is, S and q are on opposite sides of G.

Let us express the external force by the symbol F. It is equivalent to a certain number of pounds, being the pressure of the wind moving with the velocity V and inclination a on the surface of the sail D; and may therefore be computed either by the theoretical or experimental law of oblique impulses. Having obtained this, we can ascertain the angular velocity of the rotation and the absolute velocity of any given point of the ship by means of the theorems established in the article ROTATION.

But before we proceed to this investigation, we shall consider the action of the rudder, which operates precisely in the same manner. Let the ship AB (fig. 11.) have her rudder in the position AD, the helm being hard a-starboard, while the ship sailing on the starboard tack, and making leeway, keeps on the course $a\,b$. The lee surface of the rudder meets the water obliquely. The very foot of the rudder meets in the direction DE parallel to $a\,b$. The parts further up meet it with various obliquities, and with various velocities, as it glides round the bottom of the ship and falls into the wake. It is absolutely impossible to calculate the accumulated impulse. We shall not be far mistaken in the deflection of each contiguous filament, as it quits the bottom and glides along the rudder; but we neither know the velocity of these filaments, nor the deflection and velocity of the filaments gliding without them. We therefore imagine that all computations on this subject are in vain. But it is enough for our purpose that we know the direction of the absolute pressure which they exert on its surface. It is in the direction D d, perpendicular to that surface. We also may be confident that this pressure is very considerable, in proportion to the action of the water on the ship's bows, or of the wind on the sails; and we may suppose it to be nearly in the proportion of the square of the velocity of the ship in her course; but we cannot affirm it to be accurately in that proportion, for reasons that will readily occur to one who considers the way in which the water falls in behind the ship.

It is observed, however, that a fine sailer always steers well, and that all movements by means of the rudder are performed with great rapidity when the velocity of the ship is great. We shall see by and by, that the speed with which the ship performs the angular movements is in the proportion of her progressive velocity: For we shall see that the squares of the times of per-

forming the evolution are as the impulses inversely, which are as the squares of the velocities. There is perhaps no force which acts on a ship that can be more accurately determined by experiment than this. Let the ship ride in a stream or tide-way whose velocity is accurately measured; and let her ride from two moorings, so that her bow may be a fixed point. Let a small tow-line be laid out from her stern or quarter at right angles to the keel, and connected with some apparatus fitted up on shore or on board another ship, by which the strain on it may be accurately measured; a person conversant with mechanics will see many ways in which this can be done. Perhaps the following may be as good as any: Let the end of the tow line be fixed to some point as high out of the water as the point of the ship from which it is given out, and let this be very high. Let a block with a hook be on the rope, and a considerable weight hung on this hook. Things being thus prepared, put down the helm to a certain angle, so as to cause the ship to sheer off from the point to which the far end of the tow-line is attached. This will stretch the rope, and raise the weight out of the water. Now heave upon the rope, to bring the ship back again to her former position, with her keel in the direction of the stream. When this position is attained, note carefully the form of the rope, that is, the angle which its two parts make with the horizon. Call this angle a. Every person acquainted with these subjects knows that the horizontal strain is equal to half the weight multiplied by the cotangent of a, or that two is to the cotangent of a as the weight to the horizontal strain. Now it is this strain which balances and therefore measures the action of the rudder, or D e in fig. 11. Therefore, to have the absolute impulse D d, we must increase D e in the proportion of radius to the secant of the angle b which the rudder makes with the keel. In a great ship sailing six miles in an hour, the impulse on the rudder inclined 30° to the keel is not less than 3000 pounds. The surface of the rudder of such a ship contains near 80 square feet. It is not, however, very necessary to know this absolute impulse D d, because it is its part D e alone which measures the energy of the rudder in producing a conversion. Such experiments, made with various positions of the rudder, will give its energies corresponding to these positions, and will settle that long disputed point, which is the best position for turning a ship. On the hypothesis that the impulsions of fluids are in the duplicate ratio of the sines of incidence, there can be no doubt that it should make an angle of 54° 44′ with the keel. But the form of a large ship will not admit of this, because a tiller of a length sufficient for managing the rudder in sailing with great velocity has not room to deviate above 30° from the direction of the keel; and in this position of the rudder the mean obliquity of the filaments of water to its surface cannot exceed 40° or 45°. A greater angle would not be of much service, for it is never for want of a proper obliquity that the rudder fails of producing a conversion.

A ship misses stays in rough weather for want of a sufficient progressive velocity, and because her bows are beat off by the waves: and there is seldom any difficulty in wearing the ship, if she has any progressive motion. It is, however, always desirable to give the rudder as much influence as possible. Its surface should be enlarged (especially below) as much as can be done consistently with its strength and with the power of the steersmen to manage it; and it should be put in the most favourable situation for the water to get at it with great velocity; and it should be placed as far from the axis of the ship's motion as possible. These points are obtained by making the stern-post very upright, as has always been done in the French dock-yards. The British ships have a much greater rake; but our builders are gradually adopting the French forms, experience having taught us that their ships, when in our possession, are much more obedient to the helm than our own. In order to ascertain the motion produced by the action of the rudder, draw from the centre of gravity a line G q perpendicular to D d (D d being drawn through the centre of effort of the rudder). Then, as in the consideration of the action of the sails, we may conceive the line q G as a lever connected with the ship, and impelled by a force D d acting perpendicularly at q. The consequence of this will be, an incipient conversion of the ship about a vertical axis passing through some point S in the line q G, lying on the other side of G from q; and we have, as in the former case, $GS = \frac{\int p \cdot r^2}{M \cdot Gq}$.

Thus the action and effects of the sails and of the rudder are perfectly similar, and are to be considered in the same manner. We see that the action of the rudder, though of a small surface in comparison of the sails, must be very great: For the impulse of water is many hundred times greater than that of the wind; and the arm q G of the lever, by which it acts, is incomparably greater than that by which any of the impulsions on the sails produces its effect; accordingly the ship yields much more rapidly to its action than she does to the lateral impulse of a sail.

Observe here, that if G were a fixed or supported axis, it would be the same thing whether the absolute force D d of the rudder acts in the direction D d, or its transverse part D e acts in the direction D e; both would produce the same rotation; but it is not so in a free body. The force D d both tends to retard the ship's motion and to produce a rotation: It retards it as much as if the same force D d had been immediately applied to the centre. And thus the real motion of the ship is compounded of a motion of the centre in a direction parallel to D d, and of a motion round the centre. These two constitute the motion round S.

As the effects of the action of the rudder are both more remarkable and somewhat more simple than those of the sails, we shall employ them as an example of the mechanism of the motions of conversion in general; and as we must content ourselves in a work like this with what is very general, we shall simplify the investigation by attending only to the motion of conversion. We can get an accurate notion of the whole motion, if wanted for any purpose, by combining the progressive or retrograde motion parallel to D d with the motion of rotation which we are about to determine.

In this case, then, we observe, in the first place, that the angular velocity (see ROTATION) is $\frac{D\,b \cdot q\,G}{\int p\,r^2}$; and, as was shown in that article, this velocity of rotation increases in the proportion of the time of the forces uniform action, and the rotation would be uniformly accelerated if the forces did really act uniformly. This, however, cannot be the case, because, by the ship's change of position and change of progressive velocity, the direction and intensity of the impelling force is continually changing. But if two ships are performing similar evolutions, it is obvious that the changes of force are similar in similar parts of the evolution. Therefore the consideration of the momentary evolution is sufficient for enabling us to compare the motions of ships actuated by similar forces, which is all we have in view at present.

The velocity v, generated in any time t by the continuance of an invariable momentary acceleration (which is all that we mean by saying that it is produced by the action of a constant accelerating force), is as the acceleration and the time jointly. Now what we call the *angular velocity* is nothing but this momentary acceleration. Therefore the velocity v generated in the time t is $= \frac{F \cdot q\,G}{\int p\,r^2}\,t$.

The expreffion of the angular velocity is alfo the expreffion of the velocity v of a point fituated at the diftance 1 from the axis G.

Let z be the fpace or arch of revolution defcribed in the time t by this point, whofe diftance from G is $= 1$. Then $\dot{z} = v\dot{t} = \frac{F \cdot q G}{\int p r^2} t \dot{t}$, and taking the fluent $z = \frac{F \cdot q G}{\int p r^2} t^2$. This arch meafures the whole angle of rotation accomplifhed in the time t. Thefe are therefore as the fquares of the times from the beginning of the rotation.

Thofe evolutions are equal which are meafured by equal arches. Thus two motions of 45 degrees each are equal.— Therefore becaufe z is the fame in both, the quantity $\frac{F \cdot q G}{\int p r^2} t^2$ is a conftant quantity, and t^2 is reciprocally proportional to $\frac{F \cdot q G}{\int p r^2}$, or is proportional to $\frac{\int p r^2}{F \cdot q G}$; and t is proportional to $\frac{\sqrt{\int p r^2}}{\sqrt{F \cdot q G}}$. That is to fay, the times of the fimilar evolutions of two fhips are as the fquare root of the momentum of inertia directly, and as the fquare root of the momentum of the rudder or fail inverfely. This will enable us to make the comparifon eafily. Let us fuppofe the fhips perfectly fimilar in form and rigging, and to differ only in length L and l; $\int P \cdot R^2$ is to $\int p r^2$ as L^5 to l^5. For the fimilar particles P and p contain quantities of matter which are as the cubes of their lineal dimenfions, that is, as L^3 to l^3. And becaufe the particles are fimilarly fituated, R^2 is to r^2 as L^2 to l^2. Therefore $P \cdot R^2 : p \cdot r^2 = L^5 : l^5$. Now F is to f as L^2 to l^2. For the furfaces of the fimilar rudders or fails are as the fquares of their lineal dimenfions, that is, as L^2 to l^2. And, laftly, G q is to $g\,q$ as L to l, and therefore $F \cdot G q : f \cdot g q = L^3 : l^3$. Therefore we have $T^2 : t^2 = \frac{\int P \cdot R}{F \cdot G q} : \frac{\int p \cdot r^2}{f \cdot g q} = \frac{L^5}{L^3} : \frac{l^5}{l^3} = L^2 : l^2$, and $T : t = L : l$.

Therefore the times of performing fimilar evolutions with fimilar fhips are proportional to the lengths of the fhips when both are failing equally faft; and fince the evolutions are fimilar, and the forces vary fimilarly in their different parts, what is here demonftrated of the fmalleft incipient evolutions is true of the whole. They therefore not only defcribe equal angles of revolution, but alfo fimilar curves.

A fmall fhip, therefore, works in lefs time and in lefs room than a great fhip, and this in the proportion of its length. This is a great advantage in all cafes, particularly in wearing, in order to fail on the other tack clofe-hauled. In this cafe fhe will always be to windward and ahead of the large fhip, when both are got on the other tack. It would appear at firft fight that the large fhip will have the advantage in tacking. Indeed the large fhip is further to windward when again trimmed on the other tack, than the fmall fhip when fhe is juft trimmed on the other tack. But this happened before the large fhip had completed her evolution, and the fmall fhip, in the mean time, has been going forward on the other tack, and going to windward. She will therefore be before the large fhip's beam, and perhaps as far to windward.

We have feen that the velocity of rotation is proportional, *cæteris paribus*, to $F \times G q$. F means the abfolute impulfe on the rudder or fail, and is always perpendicular to its furface. This abfolute impulfe on a fail depends on the obliquity of the wind to its furface. The ufual theory fays, that it is as the fquare of the fine of incidence: but we find this is not true. We muft content ourfelves with expreffing it by fome as yet unknown function φ of the angle of incidence a, and call it φa; and if S be the furface of the fail, and V the velocity of the wind, the abfolute impulfe is $n V^2 S \times \varphi a$. This acts (in the cafe of the mizen-topfail, fig. 10.) by the lever q G, which is equal to DG × cof. DG q, and DG q is equal to the angle of the yard and keel; which angle we formerly called b. Therefore its energy in producing a rotation is $n V^2 S \times \varphi a \times DG \times$ cof. b. Leaving out the conftant quantities n, V^2, S, and DG, its energy is proportional to $\varphi a \times$ cof. b. In order, therefore, that any fail may have the greateft power to produce a rotation round G, it muft be fo trimmed that $\varphi a \times$ cof. b may be a maximum. Thus, if we would trim the fails on the foremaft, fo as to pay the fhip off from the wind right ahead with the greateft effect, and if we take the experiments of the French academicians as proper meafures of the oblique impulfes of the wind on the fail, we will brace up the yard to an angle of 48 degrees with the keel. The impulfe correfponding to 48° is 615, and the cofine of 48° is 669. Thefe give a product of 411435. If we brace the fail to 54.44, the angle affigned by the theory, the effective impulfe is 405274. If we make the angle 45°, the impulfe is 408774. It appears then that 48° is preferable to either of the others. But the difference is inconfiderable, as in all cafes of maximum a fmall deviation from the beft pofition is not very detrimental. But the difference between the theory and this experimental meafure will be very great when the impulfes of the wind are of neceffity very oblique. Thus, in tacking fhip, as foon as the headfails are taken aback, they ferve to aid the evolution, as is evident: But if we were now to adopt the maxim inculcated by the theory, we fhould immediately round-in the weather-braces, fo as to increafe the impulfe on the fail, becaufe it is then very fmall; and although we by this means make the yard more fquare, and therefore diminifh the rotatory momentum of this impulfe, yet the impulfe is more increafed (by the theory) than its vertical lever is diminifhed. Let us examine this a little more particularly, becaufe it is reckoned one of the niceft points of feamanfhip to aid the fhip's coming round by means of the headfails; and experienced feamen differ in their practice in this manœuvre. Suppofe the yard braced up to 40°, which is as much as can be ufually done, and that the fail fhivers (the bowlines are ufually let go when the helm is put down), the fail immediately takes aback, and in a moment we may fuppofe an incidence of 6 degrees. The impulfe correfponding to this is 400 (by experiment) and the cofine of 40° is 766. This gives 306400 for the effective impulfe. To proceed according to the theory, we fhould brace the yard to 70°, which would give the wind (now 34° on the weather-bow) an incidence of nearly 36°, and the fail an inclination of 20°, to the intended motion, which is perpendicular to the keel. For the tangent of 20° is about ½ of the tangent of 36°. Let us now fee what effective impulfe the experimental law of oblique impulfions will give for this adjuftment of the fails. The experimental impulfe for 36° is 480; the cofine of 70° is 342; the product is 164160, not much exceeding the half of the former. Nay, the impulfe for 36°, calculated by the theory, would have been only 346, and the effective impulfe only 118332. And it muft be further obferved, that this theoretical adjuftment would tend greatly to check the evolution, and in moft cafes would entirely mar it, by checking the fhip's motion ahead, and confequently the action of the rudder, which is the moft powerful agent in the evolution; for here would be a great impulfe directed almoft aftern.

We were juftifiable, therefore, in faying, in the beginning of this article, that a feaman would frequently find himfelf baffled if he were to work a fhip according to the rules deduced from M. Bouguer's work; and we fee by this inftance of what im-

portance it is to have the oblique impulsions of fluids ascertained experimentally. The practice of the most experienced seaman is directly the opposite to this theoretical maxim, and its success greatly confirms the usefulness of these experiments of the academicians so often praised by us.

We return again to the general consideration of the rotatory motion. We found the velocity $v=\frac{F \cdot qG}{\int p r^2}$. It is therefore proportional, *cæteris paribus*, to q G. We have seen in what manner q G depends on the position and situation of the sail or rudder when the point G is fixed. But it also depends on the position of G. With respect to the action of the rudder, it is evident that it is so much the more powerful as it is more remote from G. The distance from G may be increased either by moving the rudder further aft or G further forward. And as it is of the utmost importance that a ship answer her helm with the greatest promptitude, those circumstances have been attended to which distinguished fine steering ships from such as had not this quality; and it is in a great measure to be ascribed to this, that, in the gradual improvement of naval architecture, the centre of gravity has been placed far forward. Perhaps the notion of a centre of gravity did not come into the thoughts of the rude builders in early times; but they observed that those boats and ships steered best which had their extreme breadth before the middle point, and consequently the bows not so acute as the stern. This is so contrary to what one would expect, that it attracted attention more forcibly; and, being somewhat mysterious, it might prompt to attempts of improvement, by exceeding in this singular maxim. We believe that it has been carried as far as is compatible with other essential requisites in a ship.

We believe that this is the chief circumstance in what is called the trim of a ship; and it were greatly to be wished that the best place for the centre of gravity could be accurately ascertained. A practice prevails, which is the opposite of what we are now advancing. It is usual to load a ship so that her keel is not horizontal, but lower abaft. This is found to improve her steerage. The reason of this is obvious. It increases the acting surface of the rudder, and allows the water to come at it with much greater freedom and regularity; and it generally diminishes the griping of the ship forward, by removing a part of the bows out of the water. Is has not always this effect; for the form of the harping aloft is frequently such, that the tendency to gripe is diminished by immersing more of the bow in the water.

But waving these circumstances, and attending only to the rotatory energy of the rudder, we see that it is of advantage to carry the centre of gravity forward. The same advantage is gained to the action of the after sails. But on the other hand, the action of the head sails is diminished by it; and we may call every sail a headsail whose centre of gravity is before the centre of gravity of the ship; that is, all the sails hoisted on the bowsprit and foremast, and the staysails hoisted on the mainmast; for the centre of gravity is seldom far before the mainmast.

Suppose that when the rudder is put into the position AD (fig. 11.), the centre of gravity could be shifted to g, so as to increase q G, and that this is done without increasing the sum of the products $p r^2$. It is obvious that the velocity of conversion will be increased in the proportion of q G to $q g$. This is very possible, by bringing to that side of the ship parts of her loading which were situated at a distance from G on the other side. Nay, we can make this change in such a manner that $\int p r^2$ shall even be less than it was before, by taking care that every thing which we shift shall be nearer to g than it was formerly to G. Suppose it all placed in one spot m, and that m is the quantity of matter so shifted, while M is the quantity of matter in the whole ship. It is only necessary that $m \cdot g$-G^2 shall be less than the sum of the products $p r^2$ corresponding to the matter which has been shifted. Now, although the matter which is easily moveable is generally very small in comparison to the whole matter of the ship, and therefore can make but a small change in the place of the centre of gravity, it may frequently be brought from places so remote, that it may occasion a very sensible diminution of the quantity $\int p r^2$, which expresses the whole momentum of inertia.

This explains a practice of the seamen in small wherries or skiffs, who in putting about are accustomed to place themselves to leeward of the mast. They even find that they can aid the quick motions of these light boats by the way in which they rest on their two feet, sometimes leaning all on one foot, and sometimes on the other. And we have often seen this evolution very sensibly accelerated in a ship of war, by the crew running suddenly, as the helm is put down, to the lee-bow. And we have heard it asserted by very expert seamen, that after all attempts to wear ship (after lying-to in a storm) have failed, they have succeeded by the crew collecting themselves near the weather fore-shrouds the moment the helm was put down. It must be agreeable to the reflecting seaman to see this practice supported by undoubted mechanical principles.

It will appear paradoxical to say that the evolution may be accelerated even by an addition of matter to the ship; and though it is only a piece of curiosity, our readers may wish to be made sensible of it. Let m be the addition, placed in some point m lying beyond G from q. Let S be the spontaneous centre of conversion before the addition. Let v be the velocity of rotation round g, that is, the velocity of a point whose distance from g is 1, and let ρ be the radius vector, or distance of a particle from g. We have $v=\frac{F \cdot q g}{\int p \rho^2 + m \cdot m g^2}$. But we know that $\int p \rho^2 = \int p r^2 + M \cdot G g^2$. Therefore $v = \frac{F \cdot q g}{\int p r^2 + M \cdot G g^2 + m \cdot m g^2}$. Let us determine G g and $m g$ and $q g$.

Let m G be called z. Then, by the nature of the centre of gravity, $M+m : M = Gm : gm = z : gm$, and $gm = \frac{M}{M+m} z$, and $m \cdot g m^2 = \frac{m M^2}{\overline{M+m}^2} z^2$. In like manner, $M \cdot G g^2 = \frac{M m^2}{\overline{M+m}^2} z^2$. Now $m M^2 + M m^2 = M m \times \overline{M+m}$. Therefore $M \cdot G g^2 + m \cdot g m^2 = \frac{M m \times (M+m)}{\overline{M+m}^2} z^2, = \frac{M m}{M+m} z^2$. Let n be $= \frac{m}{M+m}$, then $M\, G g^2 + m \cdot gm = M n z^2$. Also G g = $n z$, being $= \frac{m}{M+n} z$. Let q G be called c: then $qg = c + nz$. Also let S G be called e.

We have now for the expression of the velocity $v = \frac{F\,(c+nz)}{\int p r^2 + M\, n\, z^2}$, or $v = \frac{F}{M} \times \frac{c+n z}{\frac{\int p r^2}{M} + nz^2}$. But $\frac{\int p r^2}{M} = ce$. Therefore, finally, $v = \frac{F}{M} \times \frac{c+n z}{ce + n z^2}$. Had there been no addition of matter made, we should have had $v = \frac{F}{M} \times \frac{c}{c e}$. It remains to show, that z may be so taken that $\frac{c}{ce}$ may be

lefs than $\frac{c+nz}{ce+nz^2}$. Now, if c be to z as ce to z^2, that is, if z be taken equal to c, the two fractions will be equal. But if z be lefs than c, that is, if the additional matter is placed anywhere between S and G, the complex fraction will be greater than the fraction $\frac{c}{ce}$, and the velocity of rotation will be increafed. There is a particular diftance which will make it the greateft poffible, namely, when z is made $= \frac{1}{n}\left(\sqrt{c^2+nce}-c\right)$, as will eafily be found by treating the fraction $\frac{c+nz}{ce+nz^2}$, with z, confidered as the variable quantity, for a maximum. In what we have been faying on this fubject, we have confidered the rotation only in as much as it is performed round the centre of gravity, although in every moment it is really performed round a fpontaneous axis lying beyond that centre. This was done becaufe it afforded an eafy inveftigation, and any angular motion round the centre of gravity is equal to the angular motion round any other point. Therefore the extent and the time of the evolution are accurately defined.—From obferving that the energy of the force F is proportional to q G, an inattentive reader will be apt to conceive the centre of gravity as the centre of motion, and the rotation as taking place becaufe the momenta of the fails and rudder, on the oppofite fides of the centre of gravity, do not balance each other. But we muft always keep in mind that this is not the caufe of the rotation. The caufe is the want of equilibrium round the point C (fig. 10.), where the actions of the water balance each other. During the evolution, which confifts of a rotation combined with a progreffive motion, this point C is continually fhifting, and the unbalanced momenta which continue the rotation always refpect the momentary fituation of the point C. It is neverthelefs always true that the energy of a force F is proportional (*cæteris paribus*) to q G, and the rotation is always made in the fame direction as if the point G were really the centre of converfion. Therefore the mainfail acts always (when oblique) by pufhing the ftern away from the wind, although it fhould fometimes act on a point of the vertical lever through C, which is a-head of C.

Thefe obfervations on the effects of the fails and rudder in producing a converfion, are fufficient for enabling us to explain any cafe of their action which may occur. We have not confidered the effects which they tend to produce by inclining the fhip round a horizontal axis, viz. the motions of rolling and pitching. See ROLLING and PITCHING. To treat this fubject properly would lead us into the whole doctrine of the equilibrium of floating bodies, and it would rather lead to maxims of conftruction than to maxims of manœuvre. M. Bouguer's *Traité du Navire* and Euler's *Scientia Navalis* are excellent performances on this fubject, and we are not here obliged to have recourfe to any erroneous theory.

It is eafy to fee that the lateral preffure both of the wind on the fails and of the water on the rudder tends to incline the fhip to one fide. The fails alfo tend to prefs the fhip's bows into the water, and if fhe were kept from advancing, would prefs them down confiderably. But by the fhip's motion, and the prominent form of her bows, the refiftance of the water to the fore part of the fhip produces a force which is directed upwards. The fails alfo have a fmall tendency to raife the fhip, for they conftitute a furface which in general feparates from the plumb-line below. This is remarkably the cafe in the ftayfails, particularly the jib and fore-topmaft ftayfail. And this helps greatly to foften the plunges of the fhip's bows into the head feas. The upward preffure alfo of the water on her bows, which we juft now mentioned, has a great effect in oppofing the immerfion of the bows which the fails produce by acting on the long levers furnifhed by the mafts. M. Bouguer gives the name of *point velique* to the point V (fig. 12.) of the maft, where it is cut by the line CV, which marks the mean place and direction of the whole impulfe of the water on the bows. And he obferves, that if the mean direction of all the actions of the wind on the fails be made to pafs alfo through this point there will be a perfect equilibrium, and the fhip will have no tendency to plunge into the water or to rife out of it; for the whole action of the water on the bows, in the direction CV, is equivalent to, and may be refolved into the action CE, by which the progreffive motion is refifted, and the vertical action CD, by which the fhip is raifed above the water. The force CE muft be oppofed by an equal force VD, exerted by the wind on the fails, and the force CD is oppofed by the weight of the fhip. If the mean effort of the fails paffes above the point V, the fhip's bows will be preffed into the water; and if it pafs below V, her ftern will be preffed down. But, by the union of thefe forces fhe will rife and fall with the fea, keeping always in a parallel pofition. We apprehend that it is of very little moment to attend to the fituation of this point. Except when the fhip is right afore the wind, it is a thoufand chances to one that the line CV of mean refiftance does not pafs through any maft; and the fact is, that the fhip cannot be in a ftate of uniform motion on any other condition but the perfect union of the line of mean action of the fails, and the line of mean action of the refiftance. But its place fhifts by every change of leeway or of trim; and it is impoffible to keep thefe lines in one conftant point of interfection for a moment, on account of the inceffant changes of the furface of the water on which fhe floats. M. Bouguer's obfervations on this point are, however, very ingenious and original. We conclude this differtation, by defcribing fome of the chief movements or evolutions. What we have faid hitherto is intended for the inftruction of the artift, by making him fenfible of the mechanical procedure. The defcription is rather meant for the amufement of the landfman, enabling him to underftand operations that are familiar to the feaman. The latter will perhaps fmile at the awkward account given of his bufinefs by one who cannot hand, reef, nor fteer.

To tack Ship.

THE fhip muft firft of all be kept full, that is, with a very fenfible angle of incidence on the fails, and by no means hugging the wind. For, as this evolution is chiefly performed by the rudder, it is neceffary to give the fhip a good velocity. When the fhip is obferved to luff up of herfelf, that moment is to be catched for beginning the evolution, becaufe fhe will by her inherent force continue this motion. The helm is then put down. When the officer calls out Helm's a-lee, the fore fheet, fore-top bowline, jib, and flag fail fheets forward are let go. The jib is frequently hauled down. Thus the obftacles to the fhip's head coming up to the wind by the action of the rudder are removed. If the mainfail is fet, it is not unufual to clue up the weather fide, which may be confidered as a headfail, becaufe it is before the centre of gravity. The mizen muft be hauled out, and even the fail braced to windward. Its power in paying off the ftern from the wind confpires with the action of the rudder. It is really an aerial rudder. The fails are immediately taken aback. In this ftate the effect of the mizen-topfail would be to obftruct the movement, by preffing the ftern the contrary way to what it did before. It is therefore either immediately braced about fharp on the other tack, or lowered. Bracing it about evidently tends to pay round the ftern from the wind, and thus affift in bringing the head up to the wind. But in this pofition it checks the progreffive motion of the fhip, on which the evolution chiefly depends. For a rapid evolution, therefore, it is as well to lower the mizen-topfail. Meantime, the headfails are

all aback, and the action of the wind on them tends greatly to pay the ship round. To increase this effect, it is not unusual to haul the fore-top bowline again. The sails on the mainmast are now almost becalmed; and therefore when the wind is right ahead, or a little before, the mainsail is hauled round and braced up sharp on the other tack with all expedition. The staysail sheets are now shifted over to their places for the other tack. The ship is now entirely under the power of the headsails and of the rudder, and their actions conspire to promote the conversion. The ship has acquired an angular motion, and will preserve it, so that now the evolution is secured, and she falls off apace from the wind on the other tack. The further action of the rudder is therefore unnecessary, and would even be prejudicial, by causing the ship to fall off too much from the wind before the sails can be shifted and trimmed for sailing on the other tack. It is therefore proper to right the helm when the wind is right ahead, that is, to bring the rudder into the direction of the keel. The ship continues her conversion by her inherent force and the action of the headsails.

When the ship has fallen off about four points from the wind, the headsails are hauled round, and trimmed sharp on the other tack with all expedition; and although this operation was begun with the wind four points on the bow, it will be six before the sails are braced up, and therefore the headsails will immediately fill. The after-sails have filled already, while the headsails were inactive, and therefore immediately check the further falling off from the wind. All sails now draw, for the staysail sheets have been shifted over while they were becalmed or shaking in the wind. The ship now gathers way, and will obey the smallest motion of the helm to bring her close to the wind.

We have here supposed, that during all this operation the ship preserves her progressive motion. She must therefore have described a curve line, advancing all the while to windward. Fig. 13. is a representation of this evolution when it is performed in the completest manner. The ship standing on the course E a, with the wind blowing in the direction WF, has her helm put hard a lee when she is in the position A. She immediately deviates from her course, and describing a curve, comes to the position B, with the wind blowing in the direction WF of the yards, and the square sails now shiver. The mizen topsail is here represented braced sharp on the other tack, by which its tendency to aid the angular motion (while it checks the progressive motion) is distinctly seen. The main and foresails are now shivering, and immediately after are taken aback. The effect of this on the headsails is distinctly seen to be favourable to the conversion, by pushing the point F in the direction F i; but for the same reason it continues to retard the progressive motion. When the ship has attained to the position C, the mainsail is hauled round and trimmed for the other tack. The impulse in the direction F i still aids the conversion and retards the progressive motion. When the ship has attained a position between C and D, such that the main and mizen topsail yards are in the direction of the wind, there is nothing to counteract the force of the headsails to pay the ship's head off from the wind. Nay, during the progress of the ship to this intermediate position, if any wind gets at the main or mizen topsails, it acts on their anterior surfaces, and impels the after parts of the ship away from the curve $a\ b\ c\ d$, and thus aids the revolution. We have therefore said, that when once the sails are taken fully aback, and particularly when the wind is brought right ahead, it is scarce possible for the evolution to fail; as soon therefore as the main-topsail (trimmed for the other tack) shivers, we are certain that the headsails will be filled by the time they are hauled round and trimmed. The staysails are filled before this, because their sheets have been shifted, and they stand much sharper than the square sails; and thus every thing tends to check the falling off from the wind on the other tack, and this no sooner than it should be done. The ship immediately gathers way, and holds on in her new course d G.

But it frequently happens, that in this conversion the ship loses her whole progressive motion. This sometimes happens while the sails are shivering before they are taken fully aback. It is evident, that in this case there is little hope of success, for the ship now lies like a log, and neither sails nor rudder have any action. The ship drives to leeward like a log, and the water acting on the lee-side of the rudder checks a little the driving of the stern. The head therefore falls off again, and by and by the sails fill, and the ship continues on her former tack. This is called MISSING STAYS, and it is generally owing to the ship's having too little velocity at the beginning of the evolution. Hence the propriety of keeping the sails well filled for some little time before. Rough weather, too, by raising a wave which beats violently on the weather-bow, frequently checks the first lulling of the ship, and beats her off again.

If the ship loses all her motion after the headsails have been fully taken aback, and before we have brought the wind right ahead, the evolution becomes uncertain, but by no means desperate; for the action of the wind on the headsails will presently give her stern-way. Suppose this to happen when the ship is in the position C. Bring the helm over hard to windward, so that the rudder shall have the position represented by the small dotted line $o f$. It is evident, that the resistance of the water to the stern-way of the rudder acts in a favourable direction, pushing the stern outwards. In the mean time, the action of the wind on the headsails pushes the head in the opposite direction. These actions conspire therefore in promoting the evolution; and if the wind is right ahead, it cannot fail, but may even be completed speedily, because the ship gathers stern-way, and the action of the rudder becomes very powerful; and as soon as the wind comes on the formerly lee-bow, the action of the water on the now lee-quarter will greatly accelerate the conversion. When the wind therefore has once been brought nearly right ahead, there is no risk of being baffled.

But should the ship have lost all her head-way considerably before this, the evolution is very uncertain: for the action of the water on the rudder may not be nearly equal to its contrary action on the lee quarter; in which case, the action of the wind on the headsails may not be sufficient to make up the difference. When this is observed, when the ship goes astern without changing her position, we must immediately throw the headsails completely aback, and put the helm down again, which will pay off the ship's head from the wind enough to enable us to fill the sails again on the same tack, to try our fortune again; or we must BOXHAUL the ship, in the manner to be described by and by.

Such is the ordinary process of tacking ship; a process in which all the different modes of action of the rudder and sails are employed. To execute this evolution in the most expeditious manner, and so as to gain as much on the wind as possible, is considered as the test of an expert seaman. We have described the process which is best calculated for *ensuring* the movement. But if the ship be sailing very briskly in smooth water, so that there is no danger of missing stays, we may gain more to windward considerably by keeping fast the fore top-bowline and the jib and staysail sheets till the square-sails are all shivering: For these sails, continuing to draw with considerable force, and balancing each other tolerably fore and aft, keep up the ship's velocity very much, and thus maintain the power of the rudder. If we now let all fly when the square-sails are shivering, the ship may be considered as without sails, but exposed to the action of the water on the lee bow; from which arises a strong pressure of the bow to windward, which conspires with the action of the rudder to aid the conversion. It evidently leaves all that tendency of the bow to windward which arises from leeway, and even what was

counteracted by the formerly unbalanced action of the head-ſtay ſails. This method lengthens the whole time of the evolution, but it advances the ſhip to windward. Obſerve, too, that keeping faſt the fore top bowline till the ſail ſhivers, and then letting it go, inſures the taking aback of that ſail, and thus inſtantly produces an action that is favourable to the evolution.

The moſt expert ſeamen, however, differ among themſelves with reſpect to theſe two methods, and the firſt is the moſt generally practiſed in the Britiſh navy, becauſe the leaſt liable to fail. The forces which oppoſe the converſion are ſooner removed, and the production of a favourable action by the backing of the fore-topſail is alſo ſooner obtained, by letting go the fore-top bowline at the firſt.

Having entered ſo minutely into the deſcription and rationale of this evolution, we have ſufficiently turned the reader's attention to the different actions which co-operate in producing the motions of converſion. We ſhall therefore be very brief in our deſcription of the other evolutions.

To wear Ship.

When the ſeaman ſees that his ſhip will not go about head to wind, but will miſs ſtays, he muſt change his tack the other way; that is, by turning her head away from the wind, going a little way before the wind, and then hauling the wind on the other tack. This is called wearing or veering ſhip. It is moſt neceſſary in ſtormy weather with little ſail, or in very faint breezes, or in a diſabled ſhip.

The proceſs is exceedingly ſimple; and the mere naration of the procedure is ſufficient for ſhowing the propriety of every part of it.

Watch for the moment of the ſhip's falling off, and then haul up the mainſail and mizen, and ſhiver the mizen-topſail, and put the helm a-weather. When the ſhip falls off ſenſibly (and not before), let go the bowlines. Eaſe away the fore-ſheet, raiſe the fore-tack, and gather aft the weather fore-ſheet, as the lee-ſheet is eaſed away. Round in the weather-braces of the fore and main maſts, and keep the yards nearly biſecting the angle of the wind and keel, ſo that when the ſhip is before the wind the yards may be ſquare. It may even be of advantage to round in the weather-braces of the main-topſail more than thoſe of the headſails; for the mainmaſt is abaft the centre of gravity. All this while the mizen-topſail muſt be kept ſhivering by rounding in the weather-braces as the ſhip pays off from the wind. Then the main-topſail will be braced up for the other tack by the time that we have brought the wind on the weather-quarter. After this it will be full, and will aid the evolution. When the wind is right aft, ſhift the jib and ſtay-ſail ſheets. The evolution now goes on with great rapidity; therefore briſkly haul on board the fore and main tacks, and haul out the mizen, and ſet the mizen-ſtayſail as ſoon as they will take the wind the right way. We muſt now check the great rapidity with which the ſhip comes to the wind on the other tack, by righting the helm before we bring the wind on the beam; and all muſt be trimmed ſharp fore and aft by this time, that the headſails may take and check the coming-to. All being trimmed, ſtand on cloſe by the wind.

We cannot help loſing a great deal of ground in this movement. Therefore, though it be very ſimple, it requires much attention and rapid execution to do it with as little loſs of ground as poſſible. One is apt to imagine at firſt that it would be better to keep the headſails braced up on the former tack, or at leaſt not to round in the weather-braces ſo much as is here directed. When the ſhip is right afore the wind, we ſhould expect aſſiſtance from the obliquity of the headſails; but the rudder being the principal agent in the evolution, it is found that more is gained by increaſing the ſhip's velocity, than by a ſmaller impulſe on the headſails more favourably directed. Experienced ſeamen differ, however, in their practice in reſpect of this particular.

To loxhaul a Ship.

This is a proceſs performed only in critical ſituations, as when a rock, a ſhip, or ſome danger, is ſuddenly ſeen right ahead, or when a ſhip miſſes ſtays. It requires the moſt rapid execution.

The ſhip being cloſe hauled on a wind, haul up the mainſail and mizen, and ſhiver the topſails, and put up the helm hard a-lee altogether. Raiſe the fore tack, let go the head bowlines, and brace about the head ſails ſharp on the other tack. The ſhip will quickly loſe her way, get ſtern-way, and then fall off, by the joint action of the headſails and of the inverted rudder. When ſhe has fallen off eight points, brace the after-ſails ſquare, which have hitherto been kept ſhivering. This will at firſt increaſe the power of the rudder, by increaſing the ſtern-way, and at the ſame time it makes no oppoſition to the converſion which is going on. The continuation of her circular motion will preſently cauſe them to take the wind on their after ſurfaces. This will check the ſtern-way, ſtop it, and give the ſhip a little head-way. Now ſhift the helm, ſo that the rudder may again act in conjunction with the headſails in paying her off from the wind. This is the critical part of the evolution, becauſe the ſhip has little or no way through the water, and will frequently remain long in this poſition, But as there are no counteracting forces, the ſhip continues to fall off. Then the weather-braces of the after ſails may be gently rounded in, ſo that the wind acting on their hinder ſurfaces may both puſh the ſhip a little ahead and her ſtern laterally in conjunction with the rudder. Thus the wind is brought upon the quarter, and the head ſails ſhiver. By this time the ſhip has acquired ſome headway. A continuation of the rotation would now fill the head ſails, and their action would be contrary to the intended evolution. They are therefore immediately braced the other way, nearly ſquare, and the evolution is now completed in the ſame manner with wearing ſhip.

Some ſeamen brace all the ſails aback the moment that the helm is put hard a-lee, but the after-ſails no more aback than juſt to ſquare the yards. This quickly gives the ſhip ſtern-way, and brings the rudder into action in its inverted direction; and they think that the evolution is accelerated by this method.

There is another problem of ſeamanſhip deſerving of our attention, which cannot properly be called an evolution. This is lying-to. This is done in general by laying ſome ſails aback, ſo as to ſtop the head-way produced by others. But there is a conſiderable addreſs neceſſary for doing this in ſuch a way that the ſhip ſhall lie eaſily, and under command, ready to proceed in her courſe, and eaſily brought under weigh.

To bring-to with the fore or main-topſail to the maſt, brace that ſail ſharp aback, haul out the mizen, and clap the helm hard a-lee.

Suppoſe the fore-topſail to be aback; the other ſails ſhoot the ſhip ahead, and the lee-helm makes the ſhip come up to the wind, which makes it come more perpendicularly on the ſail which is aback. Then its impulſe ſoon exceeds thoſe on the other ſails, which are now ſhivering, or almoſt ſhivering. The ſhip ſtands ſtill awhile, and then falls off, ſo as to fill the after-ſails, which again ſhoot her ahead, and the proceſs is thus repeated. A ſhip lying-to in this way goes a good deal ahead and alſo to leeward. If the main-topſail be aback, the ſhip ſhoots ahead, and comes up till the diminiſhed impulſe of the drawing ſails in the direction of the keel is balanced by the increaſed impulſe on the main-topſail. She lies a long while in this poſition, driving ſlowly to leeward; and ſhe at laſt falls off by the beating of the water on her weather bow. She falls off but little, and ſoon comes up again.

Thus a ſhip lying-to is not like a mere log, but has a certain motion which keeps her under command. To get under weigh again, we muſt watch the time of falling off; and when this is juſt about to finiſh, brace about briſkly, and fill the ſail which was aback. To aid this operation, the jib and fore-topmaſt ſtayſail may

be hoiſted, and the mizen brailed up: or, when the intended courſe is before the wind or large, back the fore-topſail ſharp, brail up the mizen, and hoiſt the jib and fore-topmaſt ſtayſails altogether.

In a ſtorm with a contrary wind, or on a lee ſhore, a ſhip is obliged to lie-to under a very low ſail. Some ſail is abſolutely neceſſary, in order to keep the ſhip ſteadily down, otherwiſe ſhe would kick about like a cork, and roll ſo deep as to ſtrain and work herſelf to pieces. Different ſhips behave beſt under different ſails. In a very violent gale, the three lower ſtayſails are in general well adapted for keeping her ſteady, and diſtributing the ſtrain. This mode ſeems alſo well adapted for wearing, which may be done by hauling down the mizen-ſtayſail. Under whatever ſail the ſhip is brought-to in a ſtorm, it is always with a fitted ſail, and never with one laid aback. The helm is laſhed down hard a-lee; therefore the ſhip ſhoots ahead, and comes up till the ſea on her weather-bow beats her off again. Getting under weigh is generally difficult; becauſe the ſhip and rigging are lofty abaſt, and hinder her from falling off readily when the the helm is put hard a weather. We muſt watch the falling off, and aſſiſt the ſhip by ſome ſmall headſail. Sometimes the crew get up on the weather fore-ſhrowds in a crowd, and thus preſent a ſurface to the wind.

Theſe examples of the three chief evolutions will enable thoſe who are not ſeamen to underſtand the propriety of the different ſteps, and alſo to underſtand the other evolutions as they are deſcribed by practical authors. We are not acquainted with any performance in our language where the whole are conſidered in a connected and ſyſtematic manner. There is a book on this ſubject in French; called *Le Manœuvrier*, by M. Bourdé de Ville-Huet, which is in great reputation in France. A tranſlation into Engliſh was publiſhed ſome years ago, ſaid to be the performance of the Chevalier de Sauſeuil a French officer. But this appears to be a bookſeller's puff; for it is undoubtedly the work of ſome perſon who did not underſtand either the French language, or the ſubject, or the mathematical principles which are employed in the ſcientific part. The blunders are not ſuch as could poſſibly be made by a Frenchman not verſant in the Engliſh language, but natural for an Engliſhman ignorant of French. No French gentleman or officer would have tranſlated a work of this kind (which he profeſſes to think ſo highly of) to ſerve the rivals and foes of his country. But indeed it can do no great harm in this way; for the ſcientific part of it is abſolutely unintelligible for want of ſcience in the tranſlator; and the practical part is full of blunders for want of knowledge of the French language.

We offer this account of the ſubject with all proper reſpect and diffidence. We do not profeſs to teach: but by pointing out the defects of the celebrated works of M. Bouguer, and the courſe which may be taken to remove them, while we preſerve much valuable knowledge which they contain, we may perhaps excite ſome perſons to apply to this ſubject, who, by a combination of what is juſt in M. Bouguer's theory, with an experimental doctrine of the impulſes of fluids, may produce a treatiſe of ſeamanſhip which will not be confined to the libraries of mathematicians, but become a manual for ſeamen by profeſſion.

SEA

SEAMEN, ſuch perſons as ſerve the king or others at ſea by navigation and fighting ſhips, &c. See Maritime *State*. Seamen fighting, quarrelling, or making any diſturbance, may be puniſhed by the commiſſioners of the navy with fine and impriſonment. Regiſtered ſeamen are exempted from ſerving in any pariſh, office, &c. and are allowed bounty-money beſide their pay. By the law of merchants, the ſeamen of a veſſel are accountable to the maſter or commander, the maſter to the owners, and the owners to the merchants, for damage ſuſtained either by negligence or otherwiſe. Where a ſeamen is hired for a voyage, and he deſerts before it is ended, he ſhall loſe his wages; and in caſe a ſhip be loſt in a ſtorm, the ſeamen loſe their wages, as well as the owners their freight.

Means of Preſerving the Health of Seamen. The following valuable obſervations on this ſubject we have meet with in the ſixth volume of the Memoirs of the Royal Society of Medicine at Paris for the years 1784 and 1785. In 1783, the marſhal de Caſtries, intending to make ſome changes in the regulations of the navy, particularly with regard to diet, propoſed to the ſociety the two following queſtions: 1. "What are the moſt wholeſome aliments for ſeamen, conſidering the impoſſibility of procuring them freſh meat? And what kinds of ſalt meat, or fiſh, of pulſe, and of drink, are moſt proper for them, and in what quantity, not omitting to inquire into the regimens in uſe amongſt other maritime nations for what may be adopted by us, and into what experience has evinced the utility of, from the accounts of the moſt celebrated navigators?" 2. "A number of patients labouring under different diſeaſes being aſſembled in naval hoſpitals, and different conſtitutions affected by the ſame diſeaſe requiring difference of diet, what general dietetic rules for an hoſpital would be beſt adapted to every exigence, dividing the patients into three claſſes; the firſt in which liquids alone are proper, the ſecond in which we begin to give ſolids in ſmall quantities, and the ſtate of convaleſcence in which a fuller diet is neceſſary?" A committee was appointed to draw up an anſwer to theſe, who inveſtigated the ſubject very minutely. The reſult of their labours is there given at large. The obſervations moſt worthy of notice are, that the ſcurvy of the Engliſh ſeamen, who live chiefly on ſalt meat, is a putrid diſeaſe; whilſt that of the Dutch, who uſe farinaceous vegetables and dried pulſe in large quantities, has more of a hydropical tendency. A mixture of both, even at the ſame meal, is recommended. This is ſupported by philoſophical reaſoning, and the example of Captain Cook, who was partly indebted to this mixed regimen for the preſervation of his crew. Salt fiſh ſhould never be uſed: ſalt beef grows hard, and after boiling its fibrous parts only remain, which are more calculated to load the ſtomach than recruit the ſtrength. Salt bacon may be kept at ſea 18 months; it does not loſe its moiſt and nutrimental parts, and unites better with pulſe, but ſhould not be uſed when rancid. Live animals kept on board ſhips tend to produce diſeaſes amongſt the crew. Rice ſhould be uſed largely. Our puddings are bad food: the flour would be much better made into bread, which might be done at ſea with no great troubles Sour crout ſhould be uſed freely. Muſtard, vinegar, ſugar, melaſſes, and honey, are good antiſcorbutics. Of drinks, wine is the beſt: wort, ſpruce-beer, or the Ruſſian *quas*, are good ſubſtitutes. Spirits are only to be uſed in cold climates, and in ſmall quantity. The greater part of the excellent memoir in anſwer to the ſecond queſtion, perfectly coincides with M. Duhamel du Monceaux's "Means of Preſerving the Health of Seamen," and M. Poiſſonnier des Perrieres's treatiſes "On the Diſeaſes of Seamen," and "On the advantages of changing the diet of Seamen," and his "Examination of Pringle's Diſſertation."

SEAPOYS, or Sepoys, natives of Indoſtan ſerving in a a military capacity under the European powers, and diſciplined after the European manner. The Seapoys of the Engliſh Eaſt India company compoſe perhaps the moſt numerous, regular, and beſt diſciplined body of black troops in the world. They are raiſed from among the natives of the country, and conſiſt of Moors or Mahometans, Raja-poots, Hindoos, Pariars, beſides

many intermediate caſts peculiar to themſelves; the whole modelled in all correſponding particulars, and diſciplined in every reſpect as the army of Great Britain.

The military eſtabliſhments of Bengal, Madras, and Bombay, have each their reſpective numbers, that of Bengal exceeding the reſt. The Seapoys are formed into complete, uniform, and regular battalions, as our marching regiments at home, being intended to repreſent and anſwer fully to every purpoſe in India to the like troops in Europe. A battalion conſiſts of 700 men, of complete effective ſtrength. In each there are eight companies, including two flank ones or grenadiers. They are reſpectively commanded by their own black and European officers; to each company there is attached a ſubaltern, who takes the command, under whom are two native commiſſioned officers, bearing the rank of ſubidar and jimindar; of eight ſubalterns, ſix are lieutenants, the other enſigns: excluſive is a ſtaff, of adjutant and ſurgeon. The black non-commiſſioned officers anſwer to our ſerjeants and corporals, and are called *havildars* and *naigues*: There is alſo to each corps an Engliſh ſerjeant-major, drill and ſtore ſerjeant: to each battalion is a band of drums and fifes, and to each a pair of colours. A captain commands the whole.

Their jackets, which are made entirely after the European faſhion, are of a red colour with yellow facings (as worn by all the infantry of the company on the Coromandel coaſt). The remaining part of their attire reſembles more the country or Indian habit, and conſiſts of a dark blue turban, broad and round at top, deſcending deep to the bottom, the ſides of which, of a concave form, are croſſed by a white band, running in front, faſtened under a roſe above. As an under garment, they have a jacket of linen. A dark blue ſaſh girding, to anſwer the turban, goes round their middle. On the thighs they have ſhort drawers, faſtened by a ſcolloped band. Their legs are bare, which renders them more ready for action or ſervice. Their arms are a firelock and bayonet; their accoutrements or croſs belts black leather, with pouches the ſame.

A battalion drawn out cannot but ſtrike the ſpectators with a lively and fanciful military impreſſion, as they unite in their exterior traits reſpectively Indian and European. They are brought to the utmoſt exactneſs of diſcipline; go through their evolutions and manœuvres with a regularity and preciſion equal to, and not ſurpaſſed by, European troops. In action they are brave and ſteady, and have been known to ſtand where Europeans have given way. Their diſcipline puts them on a footing with European troops, with whom they are always ready to act in concert. Their utility and ſervices are evident: they ſecure to the company the internal good order and preſervation of their territorial diſtricts, which, though poſſible to be enforced with a ſtrong hand by Europeans, requires numbers, and can only be conducted with that eaſe and addreſs peculiar to the native forces of the country.

They are conſidered with reſpect in the eyes of the other natives, though they ſufficiently, and with a good grace, feel and aſſert their own conſequence. In large garriſons, where the duty is great, as Madras, Pondicherry, Trichinopoly, Vellore, &c. two or three battalions might be preſent together, excluſive of Europeans. If ſent ſingly up the country, they are liable to be detached. ſometimes by one or more companies being ſent to a ſtation dependant on the chief garriſon or head quarters, otherwiſe they are diſperſed through the diſtricts, four or five together, with a non-commiſſioned officer (this is a part of the ſervice which is called *going on command)*, on hills, or in villages, to preſerve order, convey intelligence, and aſſiſt the taſi'dar, renter, or cutwall of the place, in caſes of emergency. They alſo enforce the police, and prevent in ſuch caſes the country from being infeſted with thieves, which otherwiſe have combined, forming a banditti, to rob paſſengers and plunder cattle, of which there are ſo many inſtances upon record. As for ſuch Britiſh officers in the company's ſervice as are attached to battalions, they are obliged to follow the fortunes and deſtinations of their men, with their reſpective corps, leading a life often replete with adventures of a peculiar nature. An individual in ſuch caſes is frequently ſecluded from thoſe of his own colour when up the country, or detached upon command, where in a frontier garriſon or hill fort in the interior parts of India none but natives are to be found. Here he might live as he pleaſes, being perfectly abſolute within his juriſdiction. Such ſtations being lucrative, with management may produce great fortunes. Neither is the condition hard to a perſon converſant in the language of the country, or that of the Seapoys called *Moors* (which moſt officers in the company's ſervice acquire); otherwiſe the loſs of ſociety is not recompenſed by other advantages, as you forget your own language, grow melancholy, and paſs your days without comfort.

The peace eſtabliſhment at Madras conſiſts of 30 Seapoy battalions, but in time of war is augmented as occaſion requires; or frequently each corps is ſtrengthened by the addition of two companies, which are reduced again in time of peace, the officers remaining ſupernumeraries in the ſervice. In garriſon they are quartered in barracks: they live agreeably to the uſage of the country, ſleep on the ground on a mat or thin carpet. In their perſons they are cleanly, but appear to beſt advantage in their uniform. Off duty they go as the other natives in poor circumſtances; and have only a cloth round their middle and over their ſhoulders. As to the different caſts, the Moormen or Muſſulmen aſſert pre-eminence, as coming into the country by conqueſt. In their perſons they are rather robuſt, and in their tempers vindictive. Their religion and dreſs is diſtinct from the Hindoos, who are mild and paſſive in their tempers, faithful, ſteady, and good ſoldiers. The Pariars are inferior to the others, live under different circumſtances, dwell in huts, and aſſociate not on equal terms with the reſt; they do all menial offices, are ſervants to Europeans, and think themſelves happy when by them employed, though they are equally good Seapoys.

Having thus treated of the company's Seapoys, we ſhall obſerve that they are kindly attentive to their officers when often in circumſtances requiring their aſſiſtance; are guilty of few vices; and have a ſtrong attachment for thoſe who have commanded them. That acute hiſtorian Dr. Robertſon has remarked, as a proof that the ingenuity of man has recourſe in ſimilar ſituations to the ſame expedients, that the European powers have, in forming the eſtabliſhment of theſe native troops, adopted the ſame maxims, and, probably without knowing it, have modelled their battalions of Seapoys upon the ſame principles as Alexander the Great did his phalanx of Perſians.

SEARCH-WARRANT, in law, a kind of general warrant iſſued by juſtices of peace or magiſtrates of towns for ſearching all ſuſpected places for ſtolen goods. In Scotland this was often done formerly; and in ſome Engliſh law-books there are precedents requiring the conſtable to ſearch all ſuſpected places as he and the party complaining ſhould think convenient; but ſuch practice is condemned by Lord Hale, Mr. Hawkins, and the beſt authorities both among the Engliſh and Scotch lawyers. However, in caſe of a complaint, and oath made of goods ſtolen, and that the party ſuſpects that thoſe goods are in a particular houſe, and ſhows the cauſe of ſuch ſuſpicion, the juſtice may grant a warrant to ſearch not only that houſe but other ſuſpected places; and to attach the goods, and the party in whoſe cuſtody they are found, and bring them before him or ſome other juſtice, to give an account how he came by them, and to abide ſuch order as to law ſhall appertain; which warrant ſhould be directed to the conſtable or other public officer, who may enter a ſuſpected houſe and make ſearch.

SEARCHER, an officer in the cuſtoms, whoſe buſineſs it is to ſearch and examine ſhips outward bound, if they have any

prohibited goods on board, &c. (12 Car. II.) There are alſo ſearchers of leather, &c. See ALNAGER.

SEARCHER, in ordnance, is an iron ſocket with branches, from four to eight in number, a little bent outwards, with ſmall points at their ends; to this ſocket is fixed a wooden handle, from eight to twelve feet long, of about an inch and a quarter diameter. After the gun has been fired, this ſearcher is introduced into it, and turned round, in order to diſcover the cavities within. The diſtances of theſe cavities, if any be found, are then marked on the outſide with chalk, when another ſearcher that has only one point, about which a mixture of wax and tallow is put, is introduced to take the impreſſion of the holes; and if there be any hole, a quarter of an inch deep, or of any conſiderable length, the gun is rejected as unſerviceable.

SEARCLOTH, or CERECLOTH, in ſurgery, a form of external remedy ſomewhat harder than an unguent, yet ſofter than an emplaſter, though it is frequently uſed both for the one and the other. The cerecloth is always ſuppoſed to have wax in its compoſition, which diſtinguiſhes and even denominates it. In effect, when a liniment or unguent has wax enough in it, it does not differ from a cerecloth.

SEASIN, in a ſhip, the name of a rope by which the boat rides by the ſhip's ſide when in harbour, &c.

SEASONING, the firſt illneſs to which perſons habituated to colder climates are ſubject on their arrival in the Weſt Indies. This ſeaſoning, unleſs they live very temperately, or are in a proper habit of body (tho' ſome people are unmoleſted for many months), ſeldom ſuffers them to remain long before it makes its appearance in ſome mode or other; particularly if at firſt they expoſe themſelves in a ſhower of rain, or too long in the ſun, or in the night-air; or when the body is much heated, if they drink large draughts of cold liquors, or bathe in cold water; or uſe much exerciſe; or commit exceſs in drinking wine or ſpirits; or by heating the body and inflaming the blood; or by ſubjecting themſelves to any cauſe that may ſuddenly check perſpiration, which at firſt is generally exceſſive.

Some people, from a favourable ſtate of body, have no ſeaſoning. Thin people, and very young people, are moſt likely to eſcape it. Women generally do from their temperance, and perhaps their menſtruation contributes to their ſecurity; indeed hot climates are favourable to the delicacy of their habits, and ſuitable to their modes of life. Some eſcape by great regularity of living; ſome, by the breaking out of the raſh, called the *prickly heat*; ſome by a great degree of perſpiration; and ſome by obſerving a cooling regimen. The diſorders are various that conſtitute this ſeaſoning of *new comers* as they are called; depending on age, conſtitution, and habit of body. But all ſeaſoning diſeaſes are of the inflammatory kind; and yield to antiphlogiſtic treatment proportioned to their violence. When all precaution to guard againſt ſickneſs has failed, and prudence proved abortive to new-comers, they will have this comfort at leaſt for their pains, that their diſorders will ſeldom be ſevere or expenſive, and will generally have a ſpeedy termination; and that their ſeaſoning, as it is emphatically called, will be removed by bleeding, a doſe of ſalts, reſt, and a cooling regimen.

SEASONING *of Timber*. See TIMBER.

SEASONS, in coſmography, certain portions or quarters of the year, diſtinguiſhed by the ſigns which the ſun then enters, or by the meridian altitudes of the ſun; conſequent on which are different temperatures of the air, different works in tillage, &c. See WEATHER. The year is divided into four ſeaſons, ſpring, ſummer, autumn, and winter. The beginnings and endings of each, whereof, ſee under its proper article. It is to be obſerved, the ſeaſons antiently began differently from what they now do: witneſs the old verſes,

Dat Clemens hyemem; dat Petrus ver cathedratus;
Æſtuat Urbanus; autumnat Bartholomæus.

SEAT, in the manege, is the poſture or ſituation of a horſeman upon the ſaddle.

SEATON, a ſmall fiſhing town on the ſouth coaſt of Devon, between Lyme and Sidmouth. Riſdon ſays "our learned antiquarians would have it to be that *Maridunum* whereof Antonine ſpake, placed between Dunnovaria and Iſca; for *Maridunum* in Britiſh is the ſame with *Seaton* in Engliſh, 'a town upon a hill by the ſea ſide." This place is memorable for the Daniſh princes landing there in the year 937.

SEBACIC ACID, the acid procured from fat. To obtain it, let ſome ſuet be melted in a ſkillet over the fire, along with ſome quicklime in fine powder, and conſtantly ſtirred, raiſing the fire towards the end of the operation, and taking care to avoid the vapours, which are very offenſive. By this proceſs the ſebacic acid unites with the lime into a ſebat of lime, which is difficultly ſoluble in water; it is, however, ſeparated from the fatty matters with which it is mixed by ſolution in a large quantity of boiling water. From this the neutral ſalt is ſeparated by evaporation; and, to render it pure, is calcined, rediſſolved, and again cryſtallized. After this we pour on a proper quantity of ſulphuric acid, and the ſebacic acid paſſes over by diſtillation. See FAT and CHEMISTRY.

ST. SEBASTIAN, a handſome, populous, and ſtrong town of Spain, in the province of Guipuſcoa, with a good and well frequented harbour. It is ſeated at the foot of a mountain; and the harbour ſecured by two moles, and a narrow entrance for the ſhips. The town is ſurrounded with a double wall, and to the ſea-ſide is fortified with baſtions and half moons. The ſtreets are long, broad, and ſtraight, and paved with white flagſtones. At the top of the mountain is a citadel, with a garriſon well furniſhed with cannon. The town carries on a conſiderable trade, the greateſt part of which conſiſts of iron and ſteel, which ſome reckon to be the beſt in Europe. They alſo deal in wool, which comes from Old Caſtile. W. lon. 1. 59. N. lat. 43. 23. The capital of Braſil in South America is likewiſe called *Sebaſtian.*

SEBASTIANO, called *Del Piombo*, from an office in the lead mines given him by pope Clement VII. was an eminent Venetian painter, born in 1485. He was firſt a diſciple of old Giovanni Bellino; continued his ſtudies under Giorgione; and, having attained an excellent manner of colouring, went to Rome, where he inſinuated himſelf into the favour of Michael Angelo. He has the name of being the firſt who invented the art of preparing plaſter-walls for oil-painting; but was ſo ſlow and lazy in his work, that other hands were often employed to finiſh what he began. He died in 1547.

SEBESTEN, in botany. See CORDIA.

SEBUÆI, a ſect among the antient Samaritans, whom St. Epiphanius accuſes of changing the time expreſſed in the law, for the celebration of the great annual feaſts of the Jews.

SEBURAI, SEBURÆI, a name which the Jews give to ſuch of their rabbins or doctors as lived and taught ſome time after the finiſhing of the Talmud.

SECACUL, in the materia medica of the antients, a name given by Avicenna, Serapion, and others, to a root which was like ginger, and was brought from the Eaſt Indies, and uſed as a provocative to venery. The interpreters of their works have rendered this word *iringo*; and hence ſome have ſuppoſed that our *eryngium* or *eryngo* was the root meant by it: but this does not appear to be the caſe on a ſtrict inquiry, and there is ſome reaſon to believe that the famous root at this time called *ginſeng* was what they meant.

SECALE, RYE, in botany: a genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order, *Gramina.* The calyx is a glume of two leaves, which are oppoſite to one another, erect, linear, pointed, and leſs than the corolla. The corolla conſiſts of two valves, the exterior of which ends in a beard. There are

four ſpecies: the *villoſum*, *orientale*, *creticum*, and *cereale*. The *villoſum*, or wood rye graſs, is diſtinguiſhed by a calyx with wedge-ſhaped ſcales, and by the fringe of the glume being woolly. The glumes of the *orientale* are ſhaggy, and the ſcales of the calyx ſhaped like an awl. The glumes of the *creticum* are fringed on the outſide. The *cereale*, or common rye, has glumes with rough fringes. It is a native of the iſland of Candia, was introduced into England many ages ago, and is the only ſpecies of rye cultivated in this kingdom. There are, however, two varieties, the winter and ſpring rye.

The winter rye, which is larger in the grain than the ſpring rye, is ſown in autumn at the ſame time with wheat, and ſometimes mixed with it; but as the rye ripens ſooner than the wheat, this method muſt be very exceptionable. The ſpring rye is ſown along with the oats, and uſually ripens as ſoon as the winter rye; but the grain produced is lighter, and it is therefore ſeldom ſown except where the autumnal crop has failed.

Rye is commonly ſown on poor, dry, limeſtone, or ſandy ſoils, where wheat will not thrive. By continuing to ſow it on ſuch a ſoil for two or three years, it will at length ripen a month earlier than that which has been raiſed for years on ſtrong cold ground.

Rye is commonly uſed for bread either alone or mixed with wheat. This mixture is called *meſlin*, and was formerly a very common crop in ſome parts of Britain. Mr. Marſhall tells us, that the farmers in Yorkſhire believe that this mixed crop is never affected by mildew, and that a ſmall quantity of rye ſown among wheat will prevent this deſtructive diſeaſe. Rye is much uſed for bread in ſome parts of Sweden and Norway by the poor people. About a century ago rye-bread was alſo much uſed in England; but being made of a black kind of rye, it was of the ſame colour, clammy, very detergent, and conſequently not ſo nouriſhing as wheat.

Rye is ſubject to a diſeaſe which the French call *ergot*, and the Engliſh *horned rye*; which ſometimes happens when a very hot ſummer ſucceeds a rainy ſpring. According to Tiſſot, horned rye is ſuch as ſuffers an irregular vegetation in the middle ſubſtance between the grain and the leaf, producing an excreſcence of a browniſh colour, about an inch and a half long, and two-tenths of an inch broad. Bread made of this kind of rye has a nauſeous acrid taſte, and produces ſpaſmodic and gangrenous diſorders. In 1596, an epidemic diſeaſe prevailed in Heſſe, which the phyſicians aſcribed to bread made of horned rye. Some, we are told, were ſeized with an epilepſy, and theſe ſeldom ever recovered; others became lunatic, and continued ſtupid the reſt of their lives: thoſe who apparently recovered had annual returns of their diſorder in January and February; and the diſeaſe was ſaid to be contagious at leaſt in a certain degree. The facts which we have now mentioned are taken from a work of Tiſſot, which was never printed. The ſame diſeaſe was occaſioned by the uſe of this bread in ſeveral parts of the continent in the years 1648, 1675, 1702, 1716, 1722, and 1736; and has been very minutely deſcribed by Hoffman, A. O. Goelicke, Vater Burghart, and J. A. Srink.

In the year 1709, one fourth part of all the rye raiſed in the province of Solonia in France was horned, and the ſurgeon to the hoſpital of Orleans had no leſs than 500 patients under his care that were diſtempered by eating it. They were called *ergot's*, from *ergot**, the French name for horned rye; they conſiſted chiefly of men and boys, the number of women and girls being very ſmall. The firſt ſymptom was a kind of drunkenneſs, then the local diſorder began in the toes, and thence extended ſometimes to the thigh, and the trunk itſelf, even after amputation; which is a good argument againſt that operation before the gangrene is ſtopped.

In the year 1710, the celebrated Fontenelle deſcribes a caſe in the Hiſtory of the Academy of Sciences of France, which exactly reſembles that of the poor family at Wattiſham. A peaſant at Blois, who had eaten horned rye in bread, was ſeized with a mortification, which firſt cauſed all the toes of one foot to fall off, then the toes of the other, afterwards the remainder of the feet, and, laſtly, it ate off the fleſh of both his legs and thighs, leaving the bones bare.

Horned rye is not only hurtful to man, but to other animals; it has been known to deſtroy even the flies that ſettled upon it; ſheep, dogs, deer, geeſe, ducks, ſwine, and poultry, that were fed with it for experiment, died miſerably, ſome convulſed, others mortified and ulcerated.

SECANT, in geometry, a line that cuts another or divides it into parts. The ſecant of a circle is a line drawn from the circumference on one ſide to a point without the circumference on the other; and it is demonſtrated by geometers, that of ſeveral ſecants drawn to the ſame point, that is the longeſt which paſſes through the centre of the circle. The portions, however, of theſe ſeveral ſecants that are without the circle are ſo much the greater as they recede from the centre, and the leaſt external portion is of that ſecant which paſſes through it.

Secant, in trigonometry, denotes a right line drawn from the centre of a circle, which, cutting the circumference, proceeds till it meets with a tangent to the ſame circle. See Geometry.

Line of Secants, one of thoſe lines or ſcales which are uſually put upon ſectors. How ſuch a ſcale is formed will be ſeen by a bare inſpection of fig. 53. plate 32.; for C 10, C 20, C 30, &c. drawn from the centre C to the line of tangents BE, being the real ſecants of the arches B 10, B 20, B 30, it is obvious that by marking off the diſtances B 10, B 20, B 30, upon any other line, we make that line a ſcale of ſecants.

SECEDERS, a ſect of Preſbyterians, who diſſented from the eſtabliſhed church of Scotland in the year 1733. The following circumſtance gave riſe to this ſect. Meſſrs. Erſkine, Wilſon, Moncrieff, and Fiſher, miniſters of the church of Scotland, obſtinately refuſed, for ſeveral years, to obey the deciſions of the General Aſſembly with regard to the ſettlement of miniſters agreeably to the law of patronage: For this open contempt of authority, the aſſembly, after many and repeated admonitions, were at laſt obliged to eject them from their reſpective charges. Theſe four clergymen, when they ſaw matters carried this length, immediately complained of perſecution; profeſſed uncommon ſanctity and auſterity of manners; and cried out that the church was over-run with various errors, ſuch as, a compliance with the law of patronage; the tenderneſs of the aſſembly to profeſſors Simpſon and Campbell, who were accuſed of Arian and Arminian hereſies; and a number of practical deviations from the covenanted reformation of Scotland. They even inveighed againſt the conduct of the government for their ready admiſſion of malignant and wicked men into places of truſt in the army and ſtate; for the looſe and unlimited reſtoration of Charles II. to the throne; for the reſtoration of prelacy in England, which had been ſolemnly abjured: for reſtoring the ſuperſtitious Chriſtmas vacance; for the repeal of the penal laws againſt witches, &c. &c. Theſe things, joined to the popular talents of ſome of the above miniſters, alarmed the minds of many well-meaning people, and in a few years procured a numerous train of followers. Elated with this unexpected ſucceſs, they ſoon ſplit into two parties. The chief point of conteſt among the leaders of this ſect was concerning the lawfulneſs of what is called the *burgeſs-oath*; and hence the one party have ever ſince been called *Burghers*, and the other *Antiburghers*.

SECHIUM, in botany: a genus of the ſyngeneſia order, belonging to the monœcia claſs of plants; and in the natural

* *Ergot* is French for a cock's ſpur, and horned rye was called *ergot* from the reſemblance of its excreſcence to that part.

method ranking under the 34th order, *Cucurbitaceæ*. The male calyx is quinquedentate and monophyllous; the corolla monopetalous; the five filaments are united in an erect tube. In the female flower the piſtillum is cylindrical and erect; the ſtigma large, peltated, and reflected; the pericarpium large, oval, unequal, fleſhy, and unilocular, containing one ſeed, which is ſmooth, compreſſed, and fleſhy. Of this there is only one ſpecies, viz. the *Edulis*, or Chocho vine.—This is cultivated and grows very luxuriantly in many places in Jamaica. The vines run and ſpread very much. The fruit is boiled, and ſerved up at table by way of greens; and the root of the old vine is ſomewhat like a yam *(Dioſcorea)*, and on being boiled or roaſted taſtes farinaceous and wholeſome.

SECKENDORF (Guy Lewis de), a very learned German, deſcended from an antient and noble family, was born at Aurach in Franconia in 1626. He was a good linguiſt, learned in law, hiſtory, and divinity; and is ſaid to have been a tolerable painter and engraver. He was honourably employed by ſeveral of the German princes; and died counſellor of ſtate to Frederic III. elector of Brandenburg, and chancellor of the univerſity of Halle, in 1692. He wrote many books, particularly "A hiſtory and defence of the Lutheran religion," 2 vols. folio, Frankfort, 1602, in Latin.

SECKER (Thomas), a prelate of very conſiderable eminence, was born at a ſmall village called Sibthorpe, near Newark, Nottinghamſhire, in 1693. His father was a Proteſtant Diſſenter, and, having a ſmall patrimony of his own, followed no profeſſion. He was ſent to ſchool, firſt at Cheſterfield in Derbyſhire, which he left about the year 1708, and went to a diſſenting academy in Yorkſhire, from which, in about a year's time, he removed to another in Glouceſterſhire. Here he ſtayed about three years, and contracted an acquaintance with Mr. Butler, afterwards biſhop of Durham. Beſides making a conſiderable progreſs in claſſical learning, he applied himſelf very early to critical and theological ſubjects, particularly to the controverſy betwixt the church of England and the Diſſenters. About the year 1716, he applied himſelf to the ſtudy of phyſic. This he purſued in London till 1719, when he went to Paris, and there attended lectures on all the various branches of the medical art, yet never wholly diſcontinued his application to divinity. Foreſeeing at this time many obſtacles in his way to the practice of phyſic, and having an unexpected offer made to him by Mr. Edward Talbot (through Mr. Butler) of being provided for by his father, the biſhop of Durham, if he choſe to take orders in the church of England; he took ſome months to conſider of it. After mature deliberation, he reſolved to embrace the propoſal; and came over to England in 1720, when he was introduced by Mr. Butler to Mr. Edward Talbot, to whom he was before unknown. To facilitate his obtaining a degree at Oxford, he went in Jan. 1721 to Leyden, where he took the degree of M. D. and publiſhed his exerciſe, a Diſſertation "de Medicina Statica." He left Leyden after about three months reſidence, and entered himſelf a gentleman-commoner in Exeter-college, Oxford, and was ſoon after admitted to the degree of B. A. He was ordained deacon in St. James's Church, Weſtminſter, by Biſhop Talbot, Dec. 23, 1721, and prieſt in the ſame church by the ſame biſhop, March 10, 1722; and immediately became his lordſhip's domeſtic chaplain. On Feb. 12, 1723-4, he was inſtituted to the rectory of Houghton-le-Spring in the county of Durham; and in the ſame year was admitted to the degree of M. A. In Oct. 1725, he married the ſiſter of his friend Dr. Martin Benſon; and, on account of her health principally, he exchanged Houghton for the third prebend in the church of Durham, and the living of Ryton, near Newcaſtle, to both which he was inſtituted June 3, 1727. His degrees of B. and D. LL. he took at the regular times. In July 1732, he was made chaplain to the king; in May 1733, he reſigned the living of Ryton for that of St. James's, Weſtminſter; and, on the fifth of July in the ſame year, he preached his celebrated ſermon before the univerſity of Oxford at the public act. He was conſecrated biſhop of Briſtol, Jan. 19, 1734-5, and tranſlated to Oxford, May 14, 1737. His inceſſant labouring in the care of his pariſh growing rather too great for his health and ſtrength, he accepted, in Dec. 1750, the deanery of St. Paul's, for which he reſigned his prebend of Durham, and the rectory of St. James's. He was without his knowledge recommended to the king by the duke of Newcaſtle for the ſee of Canterbury, and was confirmed archbiſhop at Bow Church, in April 1758. He died Aug. 3, 1768, and was buried, purſuant to his own directions, in the paſſage from the garden-door of his palace to the north-door of the pariſh-church at Lambeth: he forbade any monument or epitaph to be placed for him any where.

SECOMIÆ, in natural hiſtory, the name of a genus of foſſils of the claſs of ſeptariæ; the characters of which are, That they are bodies of a duſky hue; divided, by ſepta or partitions of a ſparry matter, into ſeveral more or leſs regular portions; of a moderately firm texture; not giving fire with ſteel; but fermenting with acid menſtrua, and eaſily calcining. The ſeptariæ of this genus are of all others the moſt common, and are what have been known by the little expreſſive or miſtaken names of the waxen vein, or ludus Helmontii. We have many ſpecies of theſe bodies common among us. Of the whitiſh or browniſh we have thirteen; of the yellowiſh five; and of the ferruginous ones four.

SECOND, in geometry, chronology, &c. the 60th part of a prime or minute, whether of a degree or of an hour.

Second, in muſic, one of the muſical intervals; being only the difference between any ſound and the next neareſt ſound, whether above or below it.

Second *Major*, in muſic. See Interval.

Second *Minor*, in muſic. See Interval.

Second *Sight*, in Erſe called *Taiſch*, is a mode of ſeeing ſuperadded to that which nature generally beſtows. This gift or faculty, which is neither voluntary nor conſtant, is in general rather troubleſome than agreeable to the poſſeſſors of it, who are chiefly found among the inhabitants of the Highlands of Scotland, thoſe of the Weſtern Iſles, of the Iſle of Man, and of Ireland. It is an impreſſion made either by the mind upon the eye, or by the eye upon the mind, by which things diſtant or future are perceived, and ſeen as if they were preſent. A man on a journey far from home falls from his horſe; another, who is perhaps at work about the houſe, ſees him bleeding on the ground, commonly with a landſcape of the place where the accident befals him. Another ſeer, driving home his cattle, or wandering in idleneſs, or muſing in the ſunſhine, is ſuddenly ſurpriſed by the appearance of a bridal ceremony, or funeral proceſſion, and counts the mourners or attendants, of whom, if he knows them, he relates the names; if he knows them not, he can deſcribe the dreſſes. Things diſtant are ſeen at the inſtant when they happen.

Of things future, Johnſon ſays that he knows no rule pretended to for determining the time between the ſight and the event; but we are informed by Mr. Groſe, that in general the time of accompliſhment bears ſome relation to the time of the day in which the impreſſions are received. Thus, viſions ſeen early in the morning (which ſeldom happens) will be much ſooner accompliſhed than thoſe appearing at noon; and thoſe ſeen at noon will take place in a much ſhorter time than thoſe happening at night; ſometimes the accompliſhment of the laſt does not fall out within a year or more.

Theſe viſions are not confined to ſolemn or important events; nor is it true, as is commonly reported, that to the ſeer [illegible] ſight nothing is preſented but phantoms of evil. The future viſit of

a mountebank, or piper; a plentiful draught of fish; the arrival of common travellers; or, if possible, still more trifling matters than these,—are foreseen by the seers. A gentleman told Dr. Johnson, that when he had once gone far from his own island one of his labouring servants predicted his return, and described the livery of his attendant, which he had never worn at home; and which had been, without any previous design, occasionally given him.

These visions, such as they are, may reasonably enough be ascribed to a distempered fancy. And that in them, as well as in our ordinary dreams, certain appearances should, on some rare occasions, resemble certain events, is to be expected from the laws of chance; and seems to have in it nothing more marvellous or supernatural, than that the parrot, who deals out his scurrilities at random, should sometimes happen to salute the passenger by his right appellation.

SECOND *Terms*, in algebra, those where the unknown quantity has a degree of power less than it has in the term where it is raised to the highest. The art of throwing these second terms out of an equation, that is, of forming a new equation where they have no place, is one of the most ingenious and useful inventions in all algebra.

SECONDARY, in general, something that acts as second or in subordination to another.

SECONDARY, or *Secundary*, an officer who acts as second or next to the chief officer. Such are the secondaries of the courts of king's bench and common pleas; the secondaries of the compters, who are next the sheriffs of London in each of the two compters; two secondaries of the pipe; secondaries to the remembrancers, &c.

SECONDARY *Circles of the Ecliptic* are circles of longitude of the stars; or circles which, passing through the poles of the ecliptic, are at right angles to the ecliptic. See CIRCLES *of Latitude*.

SECONDARY *Qualities of Bodies*. See METAPHYSICS.

SECONDAT. See MONTESQUIEU.

SECRETARIES BIRD, the falco serpentarius and sagittarius of Linnæus, but classed by Latham under the genus VULTUR; which see.

SECRETARY, an officer who, by his master's direction or orders, writes letters, memorials, dispatches, and other instruments, which he renders authentic by his signet. Of these there are several kinds; as, 1. Secretaries of state, who are officers that have under their management and direction the most important affairs of the kingdom, and are obliged constantly to attend on the king: they receive and dispatch whatever comes to their hands, either from the crown, the church, the army, private grants, pardons, dispensations, &c. as likewise petitions to the sovereign, which, when read, are returned to them; all which they dispatch according to the king's direction. They have authority to commit persons for treason, and other offences against the state, as conservators of the peace at common law, or as justices of the peace throughout the kingdom. They are members of the privy-council, which is seldom or never held without one of them being present. As to the business and correspondence in all parts of this kingdom, it is managed by either of the secretaries without any distinction; but with respect to foreign affairs, the business is divided into two provinces or departments, the southern and the northern, comprehending all the kingdoms and states that have any intercourse with Great Britain; each secretary receiving all letters and addresses from, and making all dispatches to, the several princes and states comprehended in his province. Ireland and the Plantations are under the direction of the elder secretary, who has the southern province, which also comprehends France, Italy, Switzerland, Spain, Portugal, and Turkey; the northern province includes the Low Countries, Germany, Denmark, Sweden, Poland, and Muscovy. Each of the secretaries has an apartment in all the royal houses, both for their own accommodation and their officers; they have also a table at the king's charge, or else board-wages. The two secretaries for Britain have each two under secretaries, and one chief clerk; with an uncertain number of other clerks and translators, all wholly depending on them. To the secretaries of state belong the custody of that seal properly called the *signet*, and the direction of two other offices, one called the *paper-office*, and the other the *signet-office*. In addition to these, there is at present (1795) a secretary for the war department, whose office must be temporary. 2. Secretary of an embassy, a person attending an ambassador, for writing dispatches relating to the negotiation. There is a great difference between the secretary of an embassy and the ambassador's secretary; the last being a domestic or menial of the ambassador, and the first a servant or minister of the prince. 3. The secretary of war, an officer of the war-office, who has two chief clerks under him, the last of which is the secretary's messenger. There are also secretaries in most of the other offices.

SECRETION, in the animal œconomy. See PHYSIOLOGY.

SECT, a collective term, comprehending all such as follow the doctrines and opinions of some famous divine, philosopher, &c.

SECTION, in general, denotes a part of a divided thing, or the division itself. Such, particularly, are the subdivisions of a chapter; called also *paragraphs* and *articles*: the mark of a section is §.

SECTION, in geometry, denotes a side or surface of a body or figure cut off by another; or the place where lines, planes, &c. cut each other.

SECTOR, in geometry, is a part of a circle comprehended between two radii and the arch; or it is a mixed triangle, formed by two radii and the arch of a circle.

SECTOR, is also a mathematical instrument, of great use in finding the proportion between quantities of the same kind: as between lines and lines, surfaces and surfaces, &c. whence the French call it the *compass of proportion*. The great advantage of the sector above the common scales, &c. is, that it is made so as to fit all radii and all scales. By the lines of chords, sines, &c. on the sector, we have lines of chords, sines, &c. to any radius betwixt the length and breadth of the sector when open.

The real inventor of this valuable instrument is unknown; yet of so much merit has the invention appeared, that it was claimed by Galileo, and disputed by nations.

The sector is founded on the fourth proposition of the sixth book of Euclid; where it is demonstrated, that similar triangles have their homologous sides proportional. An idea of the theory of its construction may be conceived thus. Let the lines AB, AC (Plate 13. fig. 5.) represent the legs of the sector; and AD, AE, two equal sections from the centre: if now the points CB and DE be connected, the lines CB and DE will be parallel; therefore the triangles ADE, ACB will be similar; and consequently the sides AD, DE, AB, and BC, proportional; that is, as AD : DE : : AB : BC : whence, if AD be the half, third, or fourth part of AB; DE will be a half, third, or fourth part of CB: and the same holds of all the rest. If, therefore, AD be the chord, sine, or tangent, of any number of degrees to the radius AB; DE will be the same to the radius BC.

Description of the Sector. The instrument consists of two rulers or legs, of brass or ivory, or any other matter, representing the radii, moveable round an axis or joint, the middle of which expresses the centre; whence are drawn on the faces of the rulers several scales, which may be distinguished into single and double.

The double scales, or lines graduated upon the faces of the

inftrument, and which are to be ufed as fectoral lines, proceed from the centre; and are, 1. Two fcales of equal parts, one on each leg, marked LIN. or L. each of thefe fcales, from the great extenfivenefs of its ufe, is called the *line of lines*. 2. Two lines of chords marked CHO. or C. 3. Two lines of fecants marked SEC. or S. A line of polygons marked POL. Upon the other face the fectoral lines are, 1. Two lines of fines marked SIN. or S. 2. Two lines of tangents marked TAN. or T. 3. Between the line of tangents and fines there is another line of tangents to a leffer radius, to fupply the defect of the former, and extending from 45° to 75°, marked *t*.

Each pair of thefe lines (except the line of polygons) is fo adjufted as to make equal angles at the centre; and confequently at whatever diftance the fector be opened, the angles will be always refpectively equal. That is, the diftance between 10 and 10 on the line of lines, will be equal to 60 and 60 on the line of chords, 90 and 90 on the line of fines, and 45 and 45 on the line of tangents.

Befides the fectoral fcales, there are others on each face, placed parallel to the outward edges, and ufed as thofe of the common plane fcale. 1. Thefe are a line of inches. 2. A line of latitudes. 3. A line of hours. 4. A line of inclination of meridians. 5. A line of chords. Three logarithmic fcales, namely, one of numbers, one of fines, and one of tangents; thefe are ufed when the fector is fully opened, the legs forming one line *.

The values of the divifions on moft of the lines are determined by the figures adjacent to them; thefe proceed by tens, which conftitute the divifions of the firft order, and are numbered accordingly; but the value of the divifions on the line of lines, that are diftinguifhed by figures, is entirely arbitrary, and may reprefent any value that is given to them; hence the figures 1, 2, 3, 4, &c. may denote either 10, 20, 30, 40, or 100, 200, 300, 400, and fo on.

The line of lines is divided into ten equal parts, numbered 1, 2, 3, to 10; thefe may be called *divifions of the firft order;* each of thefe are again fubdivided into 10 other equal parts, which may be called *divifions of the fecond order;* each of thefe is divided into two equal parts, forming *divifions of the third order*. The divifions on all the fcales are contained between four parallel lines; thofe of the firft order extend to the moft diftant; thofe of the third to the leaft; thofe of the fecond to the intermediate parallel.

When the whole line of lines reprefents 100, the divifions of the firft order, or thofe to which the figures are annexed, reprefent tens; thofe of the fecond order units; thofe of the third order the halves of thefe units. If the whole line reprefent ten, then the divifions of the firft order are units; thofe of the fecond tenths; the thirds twentieths.

In the line of tangents, the divifions to which the numbers are affixed, are the degrees expreffed by thofe numbers. Every fifth degree is denoted by a line fomewhat longer than the reft; between every number and each fifth degree, there are four divifions, longer than the intermediate adjacent ones, thefe are whole degrees; the fhorter ones, or thofe of the third order, are 30 minutes.

From the centre, to 60 degrees, the line of fines is divided like the line of tangents, from 60 to 70; it is divided only to every degree, from 70 to 80, to every two degrees, from 80 to 90; the divifion muft be eftimated by the eye.

The divifions on the line of chords are to be eftimated in the fame manner as the tangents.

The leffer line of tangents is graduated every two degrees, from 45 to 50; but from 50 to 60 to every degree; from 60 to the end, to half degrees.

The line of fecants from 0 to 10 is to be eftimated by the eye; from 20 to 50, it is divided to every two degrees; from 50 to 60, to every degree; from 60 to the end, to every half degree.

Ufe of the Line of Equal Parts on the SECTOR. 1. To divide a given line into any number of equal parts, fuppofe feven.—Take the given line in your compaffes; and fetting one foot in a divifion of equal parts, that may be divided by feven, for example 70, whofe feventh part is ten, open the fector till the other point fall exactly on 70, in the fame line on the other leg. In this difpofition, applying one point of the compaffes to 10 in the fame line; fhut them till the other fall in 10 in the fame line on the other leg, and this opening will be the feventh part of the given line. Note, if the line to be divided be too long to be applied to the legs of the fector, divide only one half or one fourth by feven, and the double or quadruple thereof will be the feventh part of the whole.

2. To meafure the lines of the perimeter of a polygon, one of which contains a given number of equal parts. Take the given line in your compaffes, and fet it parallel, upon the line of equal parts, to the number on each leg expreffing its length. The fector remaining thus, fet off the length of each of the other lines parallel to the former, and the number each of them falls on will exprefs its length.

3. A right line being given, and the number of parts it contains, fuppofe 120, to take from it a fhorter line, containing any number of the fame parts, fuppofe 25. Take the given line in your compaffes, open the fector till the two feet fall on 120, on each leg; then will the diftance between 25 on one leg, and the fame number on the other, give the line required.

4. To multiply by the line of equal parts on the fector. Take the lateral diftance from the centre of the line to the given multiplicator; open the fector till you fit that lateral diftance to the parallel of 1 and 1, or 10 and 10, and keep the fector in that difpofition; then take in the compaffes the parallel diftance of the multiplicand, which diftance, meafured laterally on the fame line, will give the product required. Thus, fuppofe it were required to find the product of 8 multiplied by 4: take the lateral diftance from the centre of the line to 4 in your compaffes, *i. e.* place one foot of the compaffes in the beginning of the divifions, and extend the other along the line to 4. Open the fector till you fit this lateral diftance to the parallel of 1 and 1, or 10 and 10. Then take the parallel diftance of 8, the multiplicand; *i. e.* extend the compaffes from 8, in this line, on one leg, to 8 in the fame line on the other; and that extent, meafured laterally, will give the product required.

5. To divide by the line of equal parts on the fector. Extend the compaffes laterally from the beginning of the line to 1, and open the fector till you fit that extent to the parallel of the divifor; then take the parallel diftance of the dividend, which extent, meafured in a lateral direction, will give the quotient required. Thus, fuppofe it was required to divide 36 by 4; extend the compaffes laterally, the beginning of the line to 1, and fit to that extent the parallel of 4, the divifor; then extend the compaffes parallel, from 36 on one leg to 36 on the other, and that extent, meafured laterally, will give 9, the quotient required.

6. Proportion by the line of equal parts. Make the lateral diftance of the fecond term the parallel diftance of the firft term, the parallel diftance of the third term is the fourth proportional. *Example.* To find a fourth proportional to 8, 4, and 6, take the lateral diftance of 4, and make it the parallel diftance of 8; then the parallel diftance of 6, extended from the centre, fhall reach to the fourth proportional 3.

In the fame manner, a third proportional is found to two numbers. Thus, to find a third proportional to 8 and 4, the fector remaining as in the former example, the parallel diftan e

* The lines are placed in different orders on different fectors, but they may eafily be found by thefe general directions.

of 4, extended from the centre, shall reach to the third proportional 2. In all these cases, if the number to be made a parallel distance be too great for the sector, some aliquot part of it is to be taken, and the answer is to be multiplied by the number by which the first number was divided.

Use of the Line of Chords on the SECTOR. 1. To open the sector so as the two lines of chords may make an angle or number of degrees, suppose 40. Take the distance from the joint to 40, the number of the degrees proposed, on the line of chords; open the sector till the distance from 60 to 60, on each leg, be equal to the given distance of 40; then will the two lines on the sector form an angle of 40 degrees, as was required.

2. The sector being opened, to find the degrees of its aperture. Take the extent from 60 to 60, and lay it off on the line of chords from the centre; the number whereon it terminates will show the degrees, &c. required.

3. To lay off any number of degrees upon the circumference of a circle. Open the sector till the distance between 60 and 60 be equal to the radius of the given circle; then take the parallel extent of the chord of the number of degrees on each leg of the sector, and lay it off on the circumference of the given circle. Hence any regular polygon may be easily inscribed in a given circle.

Use of the Line of Polygons on the SECTOR. 1. To inscribe a regular polygon in a given circle. Take the semidiameter of the given circle in the compasses, and adjust it to the number 6, on the line of polygons, on each leg of the sector; then, the sector remaining thus opened, take the distance of the two equal numbers, expressing the number of sides the polygon is to have; *e. gr.* the distance from 5 to 5 for a pentagon, from 7 to 7 for a heptagon, &c. These distances carried about the circumference of the circle, will divide it into so many equal parts.

2. To describe a regular polygon, *e. gr.* a pentagon, on a given right line. Take the length of the line in the compasses, and apply it to the extent of the number 5, 5, on the lines of polygons. The sector thus opened, upon the same lines take the extent from 6 to 6; this will be the semidiameter of the circle the polygon is to be inscribed in. If then, with this distance, from the ends of the given line, you describe two arches of a circle, their intersection will be the centre of the circle.

3. On a right line, to describe an isosceles triangle, having the angles at the base double that at the vertex. Open the sector, till the ends of the given line fall on 10 and 10 on each leg; then take the distance from 6 to 6. This will be the length of the two equal sides of the triangle.

Use of the Lines of Sines, Tangents, and Secants, on the SECTOR. By the several lines disposed on the sector, we have scales to several radii; so that having a length or radius given, not exceeding the length of the sector when opened, we find the chord, sine, &c. thereto: *e. gr.* Suppose the chord, sine, or tangent, of 10 degrees, to a radius of 3 inches required; make 3 inches the aperture, between 60 and 60, on the lines of chords of the two legs; then will the same extent reach from 45 to 45 on the line of tangents, and from 90 to 90 on the line of the sines on the other side; so that to whatever radius the line of chords is set, to the same are all the others set. In this disposition, therefore, if the aperture between 10 and 10, on the lines of chords, be taken with the compasses, it will give the chord of 10 degrees. If the aperture of 10 and 10 be in like manner taken on the lines of sines, it will be the sine of 10 degrees.— Lastly, if the aperture of 10 and 10 be in like manner taken on the lines of tangents, it gives the tangent of 10 degrees.

If the chord, or tangent, of 70 degrees were required; for the chord, the aperture of half the arch, viz. 35, must be taken, as before; which distance, repeated twice, gives the chord of 70 degrees. To find the tangent of 70 degrees to the same radius, the small line of tangents must be used, the other only reaching to 45: making, therefore, 3 inches the aperture between 45 and 45 on the small line; the extent between 70 and 70 degrees on the same, will be the tangent of 70 degrees to 3 inches radius.

To find the secant of an arch, make the given radius the aperture between 0 and 0 on the lines of secants: then will the aperture of 10 and 10, or 70 and 70, on the said lines, give the tangent of 10° or 70°.

If the converse of any of these things were required, that is, if the radius be required, to which a given line is the sine, tangent, or secant, it is but making the given line, if a chord, the aperture on the line of chords, between 10 and 10, and then the sector will stand at the radius required; that is, the aperture between 60 and 60 on the said line is the radius. If the given line were a sine, tangent, or secant, it is but making it the aperture of the given number of degrees; then will the distance of 90 and 90 on the sines, of 45 and 45 on the tangents, of 0 and 0 on the secants, be the radius.

Astronomical SECTOR. See ASTRONOMICAL *Sector*.

Dialing SECTOR. See DIALING.

SECULAR, that which relates to affairs of the present world, in which sense the word stands opposed to *spiritual, ecclesiastical*: thus we say secular power, &c.

SECULAR, is more peculiarly used for a person who lives at liberty in the world, not shut up in a monastery, nor bound by vows, or subjected to the particular rules of any religious community; in which sense it stands opposed to *regular*. The Romish clergy are divided into secular and regular, of which the latter are bound by monastic rules, the former not.

SECULAR *Games*, in antiquity, solemn games held among the Romans once in an age. These games lasted three days and as many nights; during which time sacrifices were performed, theatrical shows exhibited, with combats, sports, &c. in the Circus. The occasion of these games, according to Valerius Maximus, was to stop the progress of a plague. Valerius Publicola was the first who celebrated them at Rome in the year of the city 245. The solemnity was as follows: The whole world was invited by a herald to a feast which they had never seen already, nor ever should see again. Some days before the games began, the quindecemviri in the Capitol and the Palatine temple distributed to the people purifying compositions, of various kinds, as flambeaus, sulphur, &c. From hence the populace passed to Diana's temple on the Aventine mount, with wheat, barley, and oats, as an offering. After this, whole nights were spent in devotion to the Destinies. When the time of the games was fully come, the people assembled in the Campus Martius, and sacrificed to Jupiter, Juno, Apollo, Latona, Diana, the Parcæ, Ceres, Pluto, and Proserpine. On the first night of the feast the emperor, with the quindecemviri, caused three altars to be erected on the banks of the Tiber, which they sprinkled with the blood of three lambs, and then proceeded to regular sacrifice. A space was next marked out for a theatre, which was illuminated with innumerable flambeaus and fires. Here they sung hymns, and celebrated all kinds of sports. On the day after, having offered victims at the Capitol, they went to the Campus Martius, and celebrated sports to the honour of Apollo and Diana. These lasted till next day, when the noble matrons, at the hour appointed by the oracle, went to the Capitol to sing hymns to Jupiter. On the third day, which concluded the solemnity, twenty-seven boys, and as many girls, sung in the temple of Palatine Apollo hymns and verses in Greek and Latin, to recommend the city to the protection of those deities whom they designed particularly to honour by their sacrifices.

The inimitable Carmen Seculare of Horace was composed for this last day, in the Secular Games held by Augustus.

It has been much disputed whether these games were held every hundred, or every hundred and ten years. Valerius

Antius, Varro, and Livy, are quoted in support of the former opinion: In favour of the latter may be produced the quindecemviral regifters, the edicts of Auguftus, and the words of Horace in the Secular poem, "*Cætus undenos decies per annos.*"

It was a general belief, that the girls who bore a part in the fong fhould be fooneft married; and that the children who did not dance and fing at the coming of Apollo, fhould die unmarried, and at an early period of life.

SECULAR *Poem*, a poem fung or rehearfed at the fecular games; of which kind we have a very fine piece among the works of Horace, being a fapphic ode at the end of his epodes.

SECULARIZATION, the act of converting a regular perfon, place, or benefice, into a fecular one. Almoft all the cathedral churches were antiently regular, that is, the canons were to be religious; but they have been fince fecularized. For the fecularization of a regular church, there is required the authority of the pope, that of the prince, the bifhop of the place, the patron, and even the confent of the people. Religious that want to be releafed from their vow, obtain briefs of fecularization from the pope.

SECUNDINES, in anatomy, the feveral coats or membranes wherein the fœtus is wrapped up in the mother's womb; as the chorion and amnios, with the placenta, &c.

SECUNDUS (John), a celebrated modern Latin poet of Holland, was born at the Hague in 1511, and died at Utrecht in 1536. Though he lived only five and-twenty years, he left abundance of Latin poems: three books of "Elegies;" one of "Epigrams;" two of "Epiftles;" one of "Odes;" one of "Sylvæ," or mifcellaneous pieces; one of "Funeral Infcriptions;" befides fome very gay, but very elegant poems, called "Bafia." He alfo cultivated painting and engraving, but did not live to figure in thefe.

SECURIDACA, a plant belonging to the clafs of diadelphia, and to the order of octandria. The calyx has three leaves, which are fmall, deciduous, and coloured. The corolla is papilionaceous. The vexillum, confifting of two petals, is oblong, ftraight, and conjoined to the carina at the bafe. The carina is of the fame length with the alæ. The legumen is ovated, unilocular, monofpermous, and ending in a ligulated ala. There are two fpecies, the *erecta* and *volubilis*. The erecta has an upright ftem: the volubilis or fcandens is a climbing plant, and is a native of the Weft Indies.

SECUTORES, a fpecies of gladiators among the Romans, whofe arms were a helmet, a fhield, and a fword or a leaden bullet. They were armed in this manner, becaufe they had to contend with the retiarii, who were dreffed in a fhort tunic, bore a three-pointed lance in their left hand, and a net in their right. The retiarius attempted to caft his net over the head of the fecutor; and if he fucceeded, he drew it together and flew him with his trident: but if he miffed his aim, he immediately betook himfelf to flight till he could find a fecond opportunity of intangling his adverfary with his net. He was purfued by the fecutor, who endeavoured to difpatch him in his flight. *Secutores* was alfo a name given to fuch gladiators who took the place of thofe killed in the combat, or who engaged the conqueror. This poft was ufually taken by lot.

SEDAN, a ftrong town of France, in the department of the Ardennes, and late province of Champagne. It is one of the moft important keys in the kingdom; and has a ftrong caftle, an arfenal, a foundry of cannon, and a manufacture of black cloths of a fuperior quality. The famous marfhal Turenne was born in the caftle. Sedan is feated on the Maefe, 26 miles S. E. of Charlemont, and 135 N. E. of Paris. E. lon. 5. 2. N. lat. 49 42.

SEDAN-chair is a covered vehicle for carrying a fingle perfon, fufpended by two poles, and borne by two men, hence denominated *chairmen*. They were firft introduced in London in 1634, when Sir Sanders Duncomb obtained the fole privilege to ufe, let, and hire a number of the faid covered chairs for fourteen years.

SEDITION, among civilians, is ufed for a factious commotion of the people, or an affembly of a number of citizens without lawful authority, tending to difturb the peace and order of the fociety. This offence is of different kinds: fome feditions more immediately threatening the fupreme power, and the fubverfion of the prefent conftitution of the ftate; others tending only towards the redrefs of private grievances. Among the Romans, therefore, it was varioufly punifhed, according as its end and tendency threatened greater mifchief. See lib. i. *Cod. de Seditiofis*, and *Mat. de Crimin.* lib ii. n. 5. *de Læfa Majeftate*. In the punifhment, the authors and ringleaders were juftly diftinguifhed from thofe who, with lefs wicked intention, joined and made part of the multitude.

The fame diftinction holds in the law of England and in that of Scotland. Some kinds of fedition in England amount to high treafon, and come within the ftat. 25 Edw. III. as levying war againft the king. And feveral feditions are mentioned in the Scotch acts of parliament as treafonable. *Boyne's Crim. Law of Scotland*, p. 33, 34. The law of Scotland makes riotous and tumultuous affemblies a fpecies of fedition. But the law there, as well as in England, is now chiefly regulated by the riot act, made 1 Geo. I. only it is to be obferved, that the proper officers in Scotland, to make the proclamation thereby enacted, are fheriffs, ftewards, and bailies of regalities, or their deputies; magiftrates of royal boroughs, and all other inferior judges and magiftrates; high and petty conftables, or other officers of the peace, in any county, ftewartry, city, or town. And in that part of the ifland, the punifhment of the offence is any thing fhort of death which the judges, in their difcretion, may appoint.

SEDATIVES, in medicine, a general name for fuch medicines as weaken the powers of nature, fuch as blood-letting, cooling falts, purgatives, &c.

SE DEFENDENDO, in law, a plea ufed for him that is charged with the death of another, by alleging that he was under a neceffity of doing what he did in his own defence: as, that the other affaulted him in fuch a manner, that, if he had not done what he did, he muft have been in hazard of his own life. See Homicide and Murder.

SEDIMENT, the fettlement or dregs of any thing, or that grofs heavy part of a fluid body which finks to the bottom of the veffel when at reft.

SEDLEY (Sir Charles), an Englifh poet and great wit, was the fon of Sir John Sedley, of Aylesford in Kent, by a daughter of Sir Henry Savile; and was born about 1639. At feventeen, he became a fellow-commoner of Wadham-College in Oxford; but, taking no degree, retired to his own country, without either travelling or going to the inns of court. As foon as the Reftoration was effected, he came to London, in order to join the general jubilee; and then commenced wit, courtier, poet, and gallant. He was fo much admired and applauded, that he began to be a kind of oracle among the poets; and no performance was approved or condemned, till Sir Charles Sedley had given judgment.

While he thus grew in reputation for wit, and in favour with the king, he grew poor and debauched: his eftate was impaired, and his morals much corrupted. June 1663, Sir Charles Sedley, Lord Buckhurft, Sir Thomas Ogle, and others, being indicted for a riot before Sir Robert Hyde, they were all feverely fined: Sir Charles 500l. After this, his mind took a more ferious turn; and he began to apply himfelf to politics. He had been chofen to ferve for Romney in Kent, in the long parliament, which began May 8, 1661; and continued to fit for feveral parliaments after. He was extremely active for the Re-

volution, which was thought the more extraordinary, as he had received feveral favours from James II. That prince had an amour with a daughter of Sir Charles, who was not very handfome, James being remarkable for not fixing upon beauties; and had created her countefs of Dorchefter. This honour, far from pleafing, fhocked Sir Charles; for, as great a libertine as he had been himfelf, he could not bear his daughter's difhonour, which he confidered as made more confpicuous by this exaltation; and accordingly became James's enemy: he lived to the beginning of queen Anne's reign. His works were printed in 2 vols. 8vo. in 1719; and confift of plays, tranflations, fongs, prologues, epilogues, and little occafional pieces.

SEDR, or SEDRE, the high-prieft of the fect of Ali among the Perfians. The fedre is appointed by the emperor of Perfia, who ufually confers the dignity on his neareft relation. The jurifdiction of the fedre extends over all effects deftined for pious purpofes, over all mofques, hofpitals, colleges, fepulchres, and monafteries. He difpofes of all ecclefiaftical employments, and nominates all the fuperiors of religious houfes. His decifions in matters of religion are received as fo many infallible oracles; he judges of all criminal matters in his own houfe without appeal. His authority is balanced by that of the mudfitehid, or firft theologue of the empire.

SEDUCTION, is the act of tempting and drawing afide from the right path, and comprehends every endeavour to corrupt any individual of the human race. This is the import of the word in its largeft and moft general fenfe; but it is commonly employed to exprefs the act of tempting a virtuous woman to part with her chaftity.

The *feducer* of female innocence practifes the fame ftratagems of fraud to get poffeffion of a woman's perfon, that the *fwindler* employs to get poffeffion of his neighbour's goods or money; yet the law of honour, which pretends to abhor *deceit*, and which impels its votaries to *murder* every man who prefumes, however juftly, to fufpect them of fraud, or to queftion their veracity, applauds the addrefs of a fuccefsful intrigue, though it be well known that the feducer could not have obtained his end without fwearing to the truth of a thoufand falfehoods, and calling upon God to witnefs promifes which he never meant to fulfil.

The law of honour is indeed a very capricious rule, which accommodates itfelf to the pleafures and conveniencies of higher life; but the law of the land, which is enacted for the equal protection of high and low, may be fuppofed to view the guilt of feduction with a more impartial eye. Yet for this offence, even the laws of this kingdom have provided no other punifhment than a pecuniary fatisfaction to the injured family; which, in England, can be obtained only by one of the quainteft fictions in the world, by the father's bringing his action againft the feducer for the lofs of his daughter's fervice during her pregnancy and nurturing. See Paley's *Moral Philofophy*, Book III. Part iii. Chap. 3.

The feduction of married women, indeed, has of late years been punifhed in a more exemplary way by large damages awarded in our Courts of Juftice; and efforts have alfo been made, though as yet unfuccefsfully, by fome well meaning individuals, to add to the punifhments inflicted on adulterers by the exifting ftatutes.

SEDUM, ORPINE, in botany: A genus of the pentagynia order, belonging to the decandria clafs of plants; and in the natural method ranking under the 13th order, *Succulentæ*. The calyx is quinquefid; the corolla is pentapetalous, pointed, and fpreading; there are five nectariferous fquamæ or fcales at the bafe of the germen. The capfules are five.

The *fpecies* are 20 in number. 1. The Verticillatum; 2. Telephium; 3. Anacampferos; 4. Aizoon; 5. Hybridum; 6. Populifolium; 7. Stellatum; 8. Cepaea; 9. Libanoticum; 10. Dafyphyllum; 11. Reflexum; 12. Rupeftre; 13. Lineare; 14. Hifpanicum; 15. Album; 16. Acre; 17. Sexangulare; 18. Annuum; 19. Villofum; 20. Atratum. The following fpecies are the moft remarkable.

1. The *telephium*, common orpine, or live-long, hath a perennial root, compofed of many knobbed tubercles, fending up erect, round, fucculent ftalks, branching half a yard or two feet high, garnifhed with oblong, plane, ferrated, fucculent leaves, and the ftalks terminated by a leafy corymbus of flowers, of different colours in the varieties. This fpecies is an inhabitant of woods and dry places in England, &c. but has been long a refident of gardens for variety and medical ufe. 2. The *anacampferos*, or decumbent evergreen Italian orpine, hath a fibrous perennial root, decumbent or trailing ftalks, wedge-fhaped entire leaves, and the ftalks terminated by a corymbus of purple flowers. 3. The *rupeftre*, rock fedum, or ftone-crop of St. Vincent's rock, hath flender, trailing, purple ftalks; fhort, thick, awl-fhaped, fucculent, glaucous leaves in clufters, quinquefarioufly imbricated round the ftalks, and the ftalks terminated by roundifh cymofe bunches of bright yellow flowers. It grows naturally on St. Vincent's rock near Briftol, and other rocky places in Europe. 4. The *aizoon*, or Siberian yellow orpine, hath a tuberculate, fibrous, perennial root; many upright, round, fucculent ftalks, a foot high; lanceolated, plane, ferrated, thickifh leaves; and the ftalks terminated by a clofe-fitting cymofe clufter of bright yellow flowers. 5. The *reflexum*, reflexed fmall yellow fedum, or prick-madam, hath a flender fibrous perennial root; fmall trailing fucculent ftalks, garnifhed with thick, awl-fhaped, fucculent leaves fparfedly, the lower ones recurved, and the ftalks terminated by reflexed fpikes of bright yellow flowers. It grows naturally on old walls and buildings in England, &c. 6. The *acre*, acrid fedum, common ftone-crop of the wall, or wall-pepper, hath fmall fibry roots, very flender fucculent ftalks four or five inches high, very fmall, fuboval, gibbous, erect, alternate leaves, clofe together, and the ftalks terminated by trifid-cymofe bunches of fmall yellow flowers. This fort grows abundantly on rocks, old walls, and tops of buildings, almoft everywhere, which often appear covered with the flowers in fummer. 7. The *fexangulare*, or fexangular ftone-crop, hath a fibry perennial root; thick, fhort, fucculent ftalks; fmall, fuboval, gibbous, erect leaves clofe together, arranged fix ways imbricatim, and the ftalks terminated by bunches of yellow flowers. It grows on rocky and other dry places in England, &c. 8. The *album*, or white ftone-crop, hath fibry perennial roots; trailing flender ftalks, fix or eight inches long; oblong, obtufe, feffile, fpreading leaves; and the ftalks terminated by branchy cymofe bunches of white flowers. This grows on old walls, rocks, and buildings, in England, &c. 9. The *hifpanicum*, or Spanifh fedum, hath fibrous perennial roots, crowned with clufters of taper, acute, fucculent leaves; flender fucculent ftalks, four or five inches high, garnifhed alfo with taper leaves, and terminated by downy cymofe clufters of white flowers.

All thefe fpecies of fedum are hardy herbaceous fucculent perennials, durable in root, but moftly annual in ftalk, &c. which, rifing in fpring, flower in June, July, and Auguft, in different forts; the flowers confifting univerfally of five fpreading petals, generally crowning the ftalks numeroufly in corymbofe and cymofe bunches and fpikes, appearing tolerably confpicuous, and are fucceeded by plenty of feeds in autumn, by which they may be propagated, alfo abundantly by parting the roots, and by flips or cuttings of the ftalks in fummer; in all of which methods they readily grow and fpread very faft into tufted bunches: being all of fucculent growth, they confequently delight moft in dry foils, or in any dry rubbifhy earth.

As flowering plants, they are moftly employed to embellifh rock-work, ruins, and the like places, planting either the roots,

or cuttings of the ſhoots in a little mud or any moiſt ſoil at firſt, placing it in the crevices, where they will ſoon root and fix themſelves, and ſpread about very agreeably. For œconomical purpoſes, the reflexum and rupeſtre are cultivated in Holland and Germany, to mix with lettuce in ſallads. The wall-pepper is ſo acrid, that it bliſters the ſkin when applied externally. Taken inwardly, it excites vomiting. In ſcorbutic caſes and quartan agues, it is ſaid to be an excellent medicine under proper management. Goats eat it; cows, horſes, ſheep, and ſwine, refuſe it.

SEED, in phyſiology, a ſubſtance prepared by nature for the reproduction and conſervation of the ſpecies both in animals and plants. See BOTANY and PHYSIOLOGY.

SEEDLINGS, among gardeners, denote ſuch roots of gilliflowers, &c. as come from ſeed ſown. Alſo the young tender ſhoots of any plants that are newly ſown.

SEEDY, in the brandy trade, a term uſed by the dealers to denote a fault that is found in ſeveral parcels of French brandy, which renders them unſaleable. The French ſuppoſe that theſe brandies obtain the flavour which they expreſs by this name, from weeds that grow among the vines from whence the wine of which this brandy is preſſed was made.

SEEING, the perceiving of external objects by means of the eye. For an account of the organs of ſight, and the nature of viſion, ſee ANATOMY and OPTICS.

SEEKS, a religious ſect ſettled at Patna, and ſo called from a word contained in one of the commandments of their founder, which ſignifies *learn thou*. In books giving an account of oriental ſects and oriental cuſtoms, we find mention made both of *Seeks* and *Seiks*; and we are ſtrongly inclined to think that the ſame tribe is meant to be denominated by both words. If ſo, different authors write very differently of their principles and manners. We have already related what we then knew of the *Seiks* under the article HINDOOS; but in the Aſiatic Reſearches, Mr. Wilkins gives a much more amiable account of them, to which we refer our readers.

SEGEBERG, a town of Germany, in the duchy of Holſtein, and in Wagria; with a caſtle ſtanding on a high mountain, conſiſting of lime-ſtone, large quantities of which are carried to Hamburg and Lubeck. It belongs to Denmark, and is ſeated on the river Treve, in E. lon. 10. 9. N. lat. 54. 0.

SEGEDIN, a ſtrong town of Lower Hungary, in the county of Czongrad, with a caſtle. The Imperialiſts took it from the Turks in 1686. It is ſeated at the confluence of the rivers Teſſe and Maſioch, in E. lon 20. 35. N. lat. 46. 28.

SEGMENT *of a* CIRCLE, in geometry, is that part of the circle contained between a chord and an arch of the ſame circle.

SEGNA, a city of Croatia, belonging to the houſe of Auſtria, and ſeated on the coaſt of the Gulph of Venice. It was formerly a place of ſtrength and great importance; but it has ſuffered many calamities, and its inhabitants at preſent do not amount to 7000. In the beginning of this century it ſent 50 merchant ſhips to ſea; but the inconveniency of its ſituation and badneſs of its harbour, in which the ſea is never calm, diſcouraged navigation, and Segna has now very few ſhips belonging to it. Among the cuſtoms of the Segnans, Mr. Fortis mentions one relative to the dead, which for its ſingularity may be worthy of notice. "All the relations and friends of the family go to kiſs the corpſe, by way of taking leave, before burial. Each of them uncovers the face, over which a handkerchief is ſpread, more or leſs rich according to the family: having kiſſed the dead perſon, every one throws another handkerchief over the face; all which remain to the heirs, and ſometimes there are 20, 30, and more at this ceremony. Some throw all theſe handkerchiefs into the grave with the corpſe; and this, in former times, was the general cuſtom; but then they were rich. This ſeems to have been brought into uſe as a ſubſtitute for the antient *vaſi lacbrymatorii*." E. lon. 15. 21. N. lat. 45. 22.

SEGNI, an antient town of Italy, in the Campagna of Rome, with a biſhop's ſee, and the title of duchy. It is ſaid that organs were firſt invented here. It is ſeated on a mountain. E. lon. 13. 15. N. lat. 41. 50.

SEGORBE, a town of Spain, in the kingdom of Valencia, with the title of a duchy, and a biſhop's ſee. It is ſeated on the ſide of a hill, between the mountains, in a ſoil very fertile in corn and wine, and where there are quarries of fine marble. It was taken from the Moors in 1245; and the Romans thought it worth their while to carry ſome of the marble to Rome. W. lon. 0. 3. N. lat. 39. 48.

SEGOVIA, an antient and populous city of Spain, in Old Caſtile, with a biſhop's ſee, and a caſtle called Alcazar. It is ſurrounded by a ſtrong wall, flanked with towers and ramparts; and is ſupplied with water by a Roman aqueduct, 3000 paces in length, and ſupported by 177 arches of a prodigious height, conſiſting of two rows, one placed above the other. Here the beſt cloth in Spain is made, from the fine Spaniſh wool ſo much eſteemed in other countries. This is one part of their trade, and another is, very fine paper. The cathedral ſtands on one ſide of the great ſquare, and contains the ſtatue of the Virgin in maſſy ſilver. The Alcazar is ſeated in the higheſt part of the town, and has 16 rooms richly adorned with tapeſtry, and ornaments of marble and porphyry. The royal chapel is magnificently gilded, and embelliſhed with very fine paintings. The moſt remarkable ſtructure is the Mint, ſeated in a valley, ſurrounded by a river, on which are mills employed in coining. Segovia is ſeated on a mountain, near the river Arayadda, 45 miles N. W. of Madrid. W. lon. 3. 44. N. lat. 40. 57.

SEGOVIA (New), a town of North America, in New Spain, and in the audience of Guatimala; ſeated on the river Yare, on the confines of the province of Honduras. W. lon. 84. 30. N. lat. 13. 25.

SEGOVIA, a town of America, in Terra Firma, and in the province of Venezuela, ſeated on a river, near a very high mountain, where there are mines of gold. W. lon. 65. 30. N. lat. 8. 20.

SEGOVIA, a town of Aſia, in the iſland of Manila, and one of the largeſt of the Philippines, ſeated at the north end of the iſland, 240 miles north of Manila; and ſubject to Spain. E. lon. 120 59. N. lat. 18. 36.

SEGREANT, is the herald's word for a griffin when drawn in a leaping poſture and diſplaying his wings as if ready to fly.

SEGUE, in the Italian muſic, is often found before *aria*, *alleluja*, *amen*, &c. to ſhow that thoſe portions or parts are to be ſung immediately after the laſt note of that part over which it is written; but if theſe words *ſi place*, or *ad libitum*, are joined therewith, it ſignifies, that theſe portions may be ſung or not at pleaſure.

SEGUIERIA, in botany; a plant belonging to the claſs of polyandria, and the order of monogynia. The calyx is pentaphyllous; the phylla are oblong, concave, coloured, and permanent; there is no corolla. The capſule is oblong and monoſpermous, the large ala terminating in ſmall lateral alæ. There is only one ſpecies, the *americana*.

SEJANT, a term uſed in heraldry, when a lion, or other beaſt, is drawn in an eſcutcheon ſitting like a cat with his fore-feet ſtraight.

SEIGNIOR, is, in its general ſignification, the ſame with *lord*; but is particularly uſed for the lord of the fee, as of a manor, as *ſeigneur* among the feudiſts is he who grants a fee or benefit out of the land to another; and the reaſon is, becauſe, having granted away the uſe and profit of the land, the property or dominion he ſtill retains in himſelf.

SEIGNIORAGE, is a royalty or prerogative of the king, whereby he claims an allowance of gold and silver bought in the mass to be exchanged for coin. As seigniorage, out of every pound weight of gold, the king had for his coin 5s. of which he paid to the master of the mint sometimes 1 s. and sometimes 1 s. and 6 d. Upon every pound weight of silver, the seigniorage allowed to the king in the time of Edward III. was 18 penny-weights, which then amounted to about 1 s. out of which he sometimes paid 8d. at others 9d. to the master. In the reign of king Henry V. the king's seigniorage of every pound of silver was 1 s d &c.

SEIGNIORY, is borrowed from the French *seigneurie*, i. e. *dominatus, imperium, principatus*; and signifies with us a manor or lordship, *seigniory de sokemans*. *Seigniory in gross*, seems to be the title of him who is not lord by means of any manor, but immediately in his own person; as *tenure in capite*, whereby one holds of the king as of his crown, is *seigniory in gross*.

SEIKS. See the article SEEKS.

SEISIN, in law, signifies possession. In this sense we say, *premier seisin*, for the first possession, &c. Seisin is divided into that *in deed* or *in fact*, and that *in law*. A seisin in *deed* is where a possession is actually taken: but a seisin in *law* is, where lands descend, and the party has not entered thereon; or, in other words, it is where a person has a right to lands, &c. and is by wrong disseised of them. A seisin in law is held to be sufficient to avow on; though to the bringing of an assize, actual seisin is required; and where seisin is alleged, the person pleading it must show of what estate he is seised, &c. Seisin of a superior service is deemed to be a seisin of all superior and casual services that are incident thereto; and seisin of a lessee for years, is sufficient for him in reversion.

Livery of SEISIN, in law, an essential ceremony in the conveyance of landed property; being no other than the pure feodal investiture, or delivery of corporal possession of the land or tenement. This was held absolutely necessary to complete the donation; *Nam feudam sine investitura nullo modo constitui potuit:* and an estate was then only perfect when, as Fleta expresses it in our law, *fit juris et seisinæ conjunctio*. See FEOFFMENT.

Investitures, in their original rise, were probably intended to demonstrate in conquered countries the actual possession of the lord; and that he did not grant a bare litigious right, which the soldier was ill qualified to prosecute, but a peaceable and firm possession. And, at a time when writing was seldom practised, a mere oral gift, at a distance from the spot that was given, was not likely to be either long or accurately retained in the memory of bystanders, who were very little interested in the grant. Afterwards they were retained as a public and notorious act, that the country might take notice of and testify the transfer of the estate; and that such as claimed title by other means might know against whom to bring their actions.

In all well-governed nations, some notoriety of this kind has been ever held requisite, in order to acquire and ascertain the property of lands. In the Roman law, *plenum dominium* was not said to subsist unless where a man had both the *right* and the *corporal possession;* which possession could not be acquired without both an actual intention to possess, and an actual seisin, or entry into the premisses, or part of them in the name of the whole. And even in ecclesiastical promotions, where the freehold passes to the person promoted, corporal possession is required at this day to vest the property completely in the new proprietor; who, according to the distinction of the canonists, acquires the *jus ad rem*, or inchoate and imperfect right, by nomination and institution; but not the *jus in re*, or complete and full right, unless by corporal possession. Therefore in dignities possession is given by instalment; in rectories and vicarages by induction; without which no temporal rights accrue to the minister, though every ecclesiastical power is vested in him by institution. So also even in descents of lands, by our law, which are cast on the heir by act of the law itself, the heir has not *plenum dominium*, or full and complete ownership, till he has made an actual corporal entry into the lands: for, if he dies before *entry* made, *his* heir shall not be intitled to take the possession, but the heir of the person who was last actually seised. It is not therefore only a mere right to enter, but the actual entry, that makes a man complete owner; so as to transmit the inheritance to his own heirs: *non jus, sed seisina, facit stipitem*.

Yet the corporal tradition of lands being sometimes inconvenient, a symbolical delivery of possession was in many cases antiently allowed; by transferring something near at hand, in the presence of credible witnesses, which by agreement should serve to represent the very thing designed to be conveyed; and an occupancy of this sign or symbol was permitted as equivalent to occupancy of the land itself. Among the Jews we find the evidence of a purchase thus defined in the book of Ruth: "Now this was the manner in former time in Israel, concerning redeeming and concerning changing, for to confirm all things: a man plucked off his shoe, and gave it to his neighbour; and this was a testimony in Israel." Among the antient Goths and Swedes, contracts for the sale of lands were made in the presence of witnesses, who extended the cloak of the buyer, while the seller cast a clod of the land into it, in order to give possession; and a staff or wand was also delivered from the vender to the vendee, which passed through the hands of the witnesses. With our Saxon ancestors the delivery of a turf was a necessary solemnity to establish the conveyance of lands. And, to this day, the conveyance of our copyhold estates is usually made from the seller to the lord or his steward by delivery of a rod or verge, and then from the lord to the purchaser by re-delivery of the same in the presence of a jury of tenants.

Conveyances in writing were the last and most refined improvement. The mere delivery of possession, either actual or symbolical, depending on the ocular testimony and remembrance of the witnesses, was liable to be forgotten or misrepresented, and became frequently incapable of proof. Besides, the new occasions and necessities introduced by the advancement of commerce, required means to be devised of charging and incumbering estates, and of making them liable to a multitude of conditions and minute designations, for the purposes of raising money, without an absolute sale of the land; and sometimes the like proceedings were found useful in order to make a decent and competent provision for the numerous branches of a family, and for other domestic views. None of which could be effected by a mere, simple, corporal transfer of the soil from one man to another, which was principally calculated for conveying an absolute unlimited dominion. Written deeds were therefore introduced, in order to specify and perpetuate the peculiar purposes of the party who conveyed: yet still, for a very long series of years, they were never made use of, but in company with the more antient and notorious method of transfer by delivery of corporal possession.

Livery of seisin, by the common law, is necessary to be made upon every grant of an estate of freehold in hereditaments corporeal, whether of inheritance or for life only. In hereditaments incorporeal it is impossible to be made; for they are not the object of the senses: and in leases for years, or other chattel interests, it is not necessary. In leases for years indeed an actual *entry* is necessary, to vest the estate in the lessee: for a bare lease gives him only a right to enter, which is called his interest in the term, or *interesse termini:* and when he enters in pursuance of that right, he is then, and not before, in possession of his term, and complete tenant for years. This entry by the tenant himself serves the purpose of notoriety, as well

as livery of ſeiſin from the granter could have done; which it would have been improper to have given in this caſe, becauſe that ſolemnity is appropriated to the conveyance of a freehold. And this is one reaſon why freeholds cannot be made to commence *in futuro*, becauſe they cannot (at the common law) be made but by livery of ſeiſin; which livery, being an actual manual tradition of the land, muſt take effect *in præſenti*, or not at all.

Livery of ſeiſin is either in *deed* or in *law*.

Livery in *deed* is thus performed. The feoffor, leſſor, or his attorney, together with the feoffee, leſſee, or his attorney, (for this may as effectually be done by deputy or attorney as by the principals themſelves in perſon), come to the land or to the houſe; and there, in the preſence of witneſſes, declare the contents of the feoffment or leaſe on which livery is to be made. And then the feoffor, if it be of land, doth deliver to the feoffee, all other perſons being out of the ground, a clod or turf, or a twig or bough there growing, with words to this effect: "I deliver theſe to you in the name of ſeiſin of all the lands and tenements contained in this deed." But, if it be of a houſe, the feoffor muſt take the ring or latch of the door, the houſe being quite empty, and deliver it to the feoffee in the ſame form; and then the feoffee muſt enter alone, and ſhut the door, and then open it, and let in the others. If the conveyance or feoffment be of divers lands, lying ſcattered in one and the ſame county, then in the feoffor's poſſeſſion, livery of ſeiſin of any parcel, in the name of the reſt, ſufficeth for all; but if they be in ſeveral counties, there muſt be as many liveries as there are counties. For, if the title to theſe lands comes to be diſputed, there muſt be as many trials as there are counties, and the jury of one county are no judges of the notoriety of a fact in another. Beſides, antiently, this ſeiſin was obliged to be delivered *coram paribus de vicineto*, before the peers or freeholders of the neighbourhood, who atteſted ſuch delivery in the body or on the back of the deed; according to the rule of the feodal law, *Pares debent intereſſe inveſtituræ feudi, et non alii*: for which this reaſon is expreſsly given; becauſe the peers or vaſſals of the lord, being bound by their oath of fealty, will take care that no fraud be committed to his prejudice, which ſtrangers might be apt to connive at. And though afterwards the ocular atteſtation of the *pares* was held unneceſſary, and livery might be made before any credible witneſſes, yet the trial, in caſe it was diſputed, (like that of all other atteſtations,) was ſtill reſerved to the *pares* or jury of the county. Alſo, if the lands be out on leaſe, though all lie in the ſame county, there muſt be as many liveries as there are tenants: becauſe no livery can be made in this caſe, but by the conſent of the particular tenant; and the conſent of one will not bind the reſt. And in all theſe caſes it is prudent, and uſual, to endorſe the livery of ſeiſin on the back of the deed, ſpecifying the manner, place, and time of making it; together with the names of the witneſſes. And thus much for livery in deed.

Livery in *law* is where the ſame is not made *on* the land, but *in ſight of it* only; the feoffor ſaying to the feoffee, "I give you yonder land, enter and take poſſeſſion." Here, if the feoffee enters during the life of the feoffor, it is a good livery, but not otherwiſe; unleſs he dares not enter through fear of his life or bodily harm; and then his continual claim, made yearly in due form of law, as near as poſſible to the lands, will ſuffice without an entry. This livery in law cannot, however, be given or received by attorney, but only by the parties themſelves.

SEIZE, in the ſea-language, is to make faſt or bind, particularly to faſten two ropes together with rope-yarn. The ſeizing of a boat is a rope tied to a ring or little chain in the foreſhip of the boat, by which means it is faſtened to the ſide of the ſhip.

SEIZURE, in commerce, an arreſt of ſome merchandiſe, moveable, or other matter, either in conſequence of ſome law or of ſome expreſs order of the ſovereign. Contraband goods, thoſe fraudulently entered, or landed without entering at all, or at wrong places, are ſubject to ſeizure. In ſeizures among us, one-half goes to the informer, and the other half to the king.

SELAGO, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 48th order, *Aggregatæ*. The calyx is quinquefid: the tube of the corolla capillary, with the limb nearly equal, and a ſingle ſeed. There are 22 ſpecies.

SELDEN (JOHN), called by Grotius *the glory of England*, was born at Salvington in Suſſex in 1584. He was educated at the free ſchool at Chicheſter; whence he was ſent to Hart-Hall in the univerſity of Oxford, where he ſtaid four years. In 1612, he entered himſelf in Clifford's Inn, in order to ſtudy the law; and about two years after removed to the Inner Temple, where he ſoon acquired great reputation by his learning. He had already publiſhed ſeveral of his works; and this year wrote verſes in Latin, Greek, and Engliſh, upon Mr. William Browne's Britannia's Paſtorals. In 1614, he publiſhed his Titles of Honour; and in 1616, his Notes on Sir John Forteſcue's book *De Laudibus Legum Angliæ*. In 1618, he publiſhed his Hiſtory of Tythes; which gave great offence to the clergy, and was animadverted upon by ſeveral writers; and for that book he was called before the high commiſſion court, and obliged to make a public acknowledgment of his ſorrow for having publiſhed it. In 1621, being ſent for by the parliament, though he was not then a member of that houſe, and giving his opinion very ſtrongly in favour of their privileges in oppoſition to the court, he was committed to the cuſtody of the ſheriff of London, but was ſet at liberty after five weeks confinement. In 1623, he was choſen burgeſs for Lancaſter; but, amidſt all the diviſions of the nation, kept himſelf neuter, proſecuting his ſtudies with ſuch application, that though he was the next year choſen reader of Lyon's Inn, he refuſed to perform that office. In 1625, he was choſen burgeſs for Great Bedwin in Wiltſhire, to ſerve in the firſt parliament of king Charles I. in which he declared himſelf warmly againſt the duke of Buckingham; and on his grace's being impeached by the houſe of commons, was appointed one of the managers of the articles againſt him. In 1627 and 1628, he oppoſed the court party with great vigour. The parliament being prorogued to January 20, 1629, Mr. Selden retired to the earl of Kent's houſe at Wreſt, in Bedfordſhire, where he finiſhed his *Marmora Arundeliana*. The parliament being met, he, among others, again diſtinguiſhed himſelf by his zeal againſt the court; when the king diſſolving the parliament, ordered ſeveral of the members to be brought before the King's Bench bar, and committed to the Tower. Among theſe was Mr. Selden, who inſiſting on the benefit of the laws, and refuſing to make his ſubmiſſion, was removed to the King's Bench priſon. Being here in danger of his life on account of the plague then raging in Southwark, he petitioned the lord high treaſurer, at the end of Trinity-term, to intercede with his majeſty that he might be removed to the Gate-houſe, Weſtminſter, which was granted: but in Michaelmas term following, the judges objecting to the lord treaſurer's warrant by which he had been removed to the Gate-houſe, an order was made for conveying him back to the King's Bench, whence he was releaſed in the latter end of the ſame year; but fifteen years after, the parliament ordered him 5000l. for the loſſes he had ſuſtained on this occaſion. He was afterwards committed, with ſeveral other gentlemen, for diſperſing a libel; but the author, who was abroad, being diſcovered, they were at length ſet at liberty. In 1634, a diſpute ariſing between the Engliſh and Dutch concerning the herring-fiſhery on the Britiſh coaſt, he was prevailed upon by archbiſhop Laud to draw up his *Mare Clauſum*, in anſwer to Grotius's *Mare Liberum*: which greatly recommended him to the favour of the court. In 1640, he was choſen member for the univerſity of Oxford; when he again op-

poſed the court, though he might, by complying, have raiſed himſelf to very conſiderable poſts. In 1643, he was appointed one of the lay-members to ſit in the aſſembly of divines at Weſtminſter, and was the ſame year appointed keeper of the records in the Tower. Whilſt he attended his duty in the aſſembly, a warm debate aroſe reſpecting the diſtance of Jericho from Jeruſalem. The party which contended for the ſhorteſt diſtance, urged, as a proof of their opinion being well founded, that fiſhes were carried from the one city to the other, and ſold in the market. Their adverſaries were ready to yield to the force of this concluſive argument, when Selden, who deſpiſed both parties, as well as the frivolouſneſs of their diſpute, exclaimed, "Perhaps the fiſhes were ſalted!" This unexpected remark left the victory doubtful, and renewed the debate; and our author, who was ſick of ſuch trifling, ſoon found employment more ſuited to his genius; for, in 1645, he was made one of the commiſſioners of the admiralty. The ſame year he was unanimouſly elected maſter of Trinity-college, Cambridge; but declined accepting. He died in 1654; and was interred in the Temple church, where a monument is erected to his memory. Dr. Wilkes obſerves, that he was a man of uncommon gravity and greatneſs of ſoul, averſe to flattery, liberal to ſcholars, charitable to the poor; and though he had great latitude in his principles with regard to eccleſiaſtical power, yet he had a ſincere regard for the church of England. He wrote many learned works beſides thoſe already mentioned; the principal of which are, 1. *De Jure Naturali & Gentium juxta Diſciplinam Hebræorum.* 2. *De Nuptiis & Divortiis.* 3. *De Anno Civili veterum Hebræorum.* 4. *De Nummis.* 5. *De Diis Syris.* 6. *Uxor Hebraica.* 7. *Jani Anglorum Facies altera*, &c. All his works were printed together in 1726, in 3 vols. folio.

SELENITES, in natural hiſtory, the name of a large claſs of foſſils, the characters of which are theſe: they are bodies compoſed of ſlender and ſcarce viſible filaments, arranged into fine, even, and thin flakes; and thoſe diſpoſed into regular figures in the ſeveral different genera, approaching to a rhomboid or hexangular column, or a rectangled parallelogram; fiſſile, like the talcs, but they not only lie in a horizontal, but alſo in a perpendicular direction; they are flexile in a ſmall degree, but not at all elaſtic; they do not ferment with acid menſtrua, but readily calcine in the fire. Of this claſs there are ſeven orders of bodies, and under thoſe ten genera. The ſelenitæ of the firſt order are thoſe compoſed of horizontal plates, and approaching to a rhomboidal form: of the ſecond are thoſe compoſed of horizontal plates, arranged into a columnar and angular form: of the third are thoſe whoſe filaments are ſcarce viſibly arranged into plates, but which, in the whole maſſes, appear rather of a ſtriated than of a tubulated ſtructure: of the fourth are thoſe which are flat, but of no determinately angular figure: of the fifth are thoſe formed of plates perpendicularly arranged: of the ſixth are thoſe formed of congeries of plates, arranged into the figure of a ſtar; and of the ſeventh are thoſe of a complex and indeterminate figure.

Of the firſt of theſe orders there are three genera. 1. The *leptodecarhombes.* 2. The *pachodecarhombes.* 3. The *tetradecarhombes.* Of the ſecond order there are alſo three genera. 1. The *iſchnamblucæ.* 2. The *iſamblucæ.* 3. The *oxucia.* Of the third order there is only one known genus, the *inamblucia.* Of the fourth order there is alſo only one known genus, the *ſanidia.* Of the fifth order there is alſo only one known genus, the *cathetoclipes.* Of the ſixth order, 1. The *lepaſtra*—2. The *tricheſtra.* Of the ſeventh order there is only one genus, the *ſymplexia.*

The ſtructure of the ſelenitæ of all the genera of the firſt order is exactly alike; they are all compoſed of a great number of broad flakes or plates, in a great meaſure externally reſembling the flakes of the foliaceous talcs: theſe are of the length and breadth of the whole maſs; the top and bottom being each only one ſuch plate, and thoſe between them, in like manner, each complete and ſingle; and the body may always be eaſily and evenly ſplit, according to the direction of theſe flakes. Theſe differ, however, extremely from the talcs, for they are each compoſed of a number of parallel threads or filaments, which are uſually diſpoſed parallelly to the ſides of the body, though ſometimes parallelly to its ends. In many of the ſpecies they are alſo divided by parallel lines, placed at a conſiderable diſtance from each other, and the plates in ſplitting often break at theſe lines; add to this, that they are not elaſtic, and that they readily calcine. The ſtructure of thoſe of the ſecond order is the ſame with that of the firſt: but that in many of the ſpecimens of them the filaments of which the plates are compoſed run in two directions, and meet in an obtuſe angle; and in the middle there is generally ſeen in this caſe a ſtraight line running the whole length of the column; and ſmall parcels of clay inſinuating themſelves into this crack, repreſent in it the figure of an ear of graſs ſo naturally, as to have deceived many into a belief that there was really an ear of graſs there. The other orders conſiſting only of ſingle genera, the ſtructure of each is explained under the generical name.

SELENITES, in chemiſtry, called alſo *gypſum ſpatoſum*, a ſpecies of gypſum or plaſter of Paris. See GYPSUM.

SELENOGRAPHY, a branch of coſmography, which deſcribes the moon and all the parts and appearances thereof, as geography does thoſe of the earth. See MOON.

SELEUCIA, (anc. geogr.), ſurnamed *Babylonia*, becauſe ſituated on its confines, at the confluence of the Euphrates and Tigris. Ptolemy places it in Meſopotamia. It is called alſo *Seleucia ad Tigrim*, (Polybius, Strabo, Iſidorus, Characenus); waſhed on the ſouth by the Euphrates, on the eaſt by the Tigris, (Theophylactus); generally agreed to have been built or enlarged by Seleucus Nicanor, maſter of the eaſt after Alexander; by means of which Babylon came to be deſerted. It is ſaid to have been originally called *Coche*, (Ammian, Eutropius); though others, as Arrian, diſtinguiſh it, as a village, from *Seleucia*: and, according to Zoſimus, the antient name of Selucia was *Zochaſia*. Now called *Bagdad*. E. lon. 44. 21. N. lat. 35. 10. There were many other cities of the ſame name, all built by Seleucus Nicanor.

SELEUCIDÆ, in chronology. Era of the Seleucidæ, or the Syro-Macedonian era, is a computation of time, commencing from the eſtabliſhment of the Seleucidæ, a race of Greek kings, who reigned as ſucceſſors of Alexander the Great in Syria, as the Ptolemies did in Egypt. This era we find expreſſed in the books of the Maccabees, and on a great number of Greek medals ſtruck by the cities of Syria, &c. The Rabbins call it the *era of contracts*, and the Arabs *therik dilkarnain*, that is, the "era of the two horns." According to the beſt accounts, the firſt year of this era falls in the year 311 B. C. being 12 years after Alexander's death.

SELEUCUS (NICANOR), one of the chief generals under Alexander the Great, and, after his death, founder of the race of princes called *Seleucidæ*. He is equally celebrated as a renowned warrior, and as the father of his people; yet his virtues could not protect him from the fatal ambition of Ceraunus, one of his courtiers, by whom he was aſſaſſinated 280 B. C.

SELF-HEAL, the PRUNELLA VULGARIS of Linnæus.—The ſtem is erect, and about eight or ten inches high. The leaves grow on foot-ſtalks, are ovato-oblong, ſlightly indented, and ſomewhat hairy. The bracteæ are heart-ſhaped, oppoſite, and fringed. The flowers are white or purpliſh, grow in denſe ſpikes, and are terminal. This plant is perennial, grows wild in meadows and paſture grounds, and flowers in June and July. This herb is recommended as a mild reſtringent and vulnerary in ſpittings of blood, and other hemorrhagies and fluxes; and in gargariſms againſt aphthæ and inflammations of the fauces. Its virtues do not appear to be very great; to the taſte it diſcovers a very ſlight auſterity or bitteriſhneſs, which is more ſenſible in

the flowery tops than in the leaves, though the latter are generally directed for medicinal uſe.

Self-*Murder*. See Suicide.

SELINUM, in botany: A genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The fruit is oval, oblong, compreſſed, plane, and ſtriated in the middle: the involucrum is reflexed; the petals cordate and equal. There are ſeven ſpecies, the ſylveſtre, paluſtre, auſtriacum, carvifolia, chabraci, ſeguieri, monnieri.

SELKIRK (Alexander), whoſe adventures gave riſe to a well known hiſtorical romance, was born at Largo, in the county of Fife, about the year 1676, and was bred a ſeaman. He went from England, in 1703, in the capacity of ſailing-maſter of a ſmall veſſel called the *Cinque Ports Galley*, Charles Pickering captain, burthen about 90 tons, with 16 guns and 63 men; and in September the ſame year failed from Corke, in company with another ſhip of 26 guns and 120 men, called the St. George, commanded by that famous navigator William Dampier, intending to cruize on the Spaniards in the South Sea. On the coaſt of Brazil, Pickering died, and was ſucceeded in his command by his lieutenant Thomas Stradling. They proceeded on their voyage round Cape Horn to the iſland of Juan Fernandes, whence they were driven by the appearance of two French ſhips of 36 guns each, and left five of Stradling's men there on ſhore, who were taken off by the French. Hence they failed to the coaſt of America, where Dampier and Stradling quarrelled, and ſeparated by agreement, on the 19th of May 1704. In September following, Stradling came again to the iſland of Juan Fernandes, where Selkirk and his captain had a difference, which, with the circumſtance of the ſhip's being very leaky, and in bad condition, induced him to determine on ſtaying there alone; but when his companions were about to depart, his reſolution was ſhaken, and he deſired to be taken on board again. The captain, however, refuſed to admit him, and he was obliged to remain, having nothing but his clothes, bedding, a gun, and a ſmall quantity of powder and ball; a hatchet, knife, and kettle; his books, and mathematical and nautical inſtruments. He kept up his ſpirits tolerably till he ſaw the veſſel put off, when (as he afterwards related) his heart yearned within him, and melted at parting with his comrades and all human ſociety at once.

Thus left ſole monarch of the iſland, with plenty of the neceſſaries of life, he found himſelf in a ſituation hardly ſupportable. He had fiſh, goat's fleſh, turnips and other vegetables; yet he grew dejected, languid, and melancholy, to ſuch a degree as to be ſcarce able to refrain from doing violence to himſelf.—Eighteen months paſſed before he could, by reaſoning, reading his bible, and ſtudy, be thoroughly reconciled to his condition. At length he grew happy, employing himſelf in decorating his huts, chaſing the goats, whom he equalled in ſpeed, and ſcarcely ever failed of catching. He alſo tamed young kids, laming them to prevent their becoming wild; and he kept a guard of tame cats about him, to defend him when aſleep from the rats, who were very troubleſome. When his clothes were worn out, he made others of goats ſkins, but could not ſucceed in making ſhoes, with the uſe of which, however, habit, in time, enabled him to diſpenſe. His only liquor was water. He computed that he had caught 1000 goats during his abode in the iſland; of which he had let go 500, after marking them by ſlitting their ears. Commodore Anſon's people, who were there about 30 years after, found the firſt goat which they ſhot upon landing was thus marked, and, as it appeared to be very old, concluded that it had been under the power of Selkirk. But it appears by capt. Carteret's account of his voyage in the Swallow ſloop, that other perſons practiſed this mode of marking, as he found a goat with his ears thus ſlit on the neighbouring iſland of Mas-a-fuera, where Selkirk never was. He made companions of his tame goats and cats, often dancing and ſinging with them. Though he conſtantly performed his devotions at ſtated hours, and read aloud; yet, when he was taken off the iſland, his language, from diſuſe of converſation, was become ſcarcely intelligible. In this ſolitude he continued four years and four months; during which time only two incidents happened which he thought worth relating, the occurrences of every day being in his circumſtances nearly ſimilar. The one was, that purſuing a goat eagerly, he caught it juſt on the edge of a precipice, which was covered with buſhes, ſo that he did not perceive it, and he fell over to the bottom, where he lay (according to captain Rogers's account) 24 hours ſenſeleſs; but, as he related to Sir R. Steele, he computed, by the alteration of the moon, that he had lain three days. When he came to himſelf, he found the goat lying under him dead. It was with great difficulty that he could crawl to his habitation, whence he was unable to ſtir for ten days, and did not recover of his bruiſes for a long time. The other event was the arrival of a ſhip, which he at firſt ſuppoſed to be French: and ſuch is the natural love of ſociety in the human mind, that he was eager to abandon his ſolitary felicity, and ſurrender himſelf to them, although enemies; but upon their landing, approaching them, he found them to be Spaniards, of whom he had too great a dread to truſt himſelf in their hands. They were by this time ſo near that it required all his agility to eſcape, which he effected by climbing into a thick tree, being ſhot at ſeveral times as he ran off. Fortunately the Spaniards did not diſcover him, though they ſtayed ſome time under the tree where he was hid, and killed ſome goats juſt by. In this ſolitude Selkirk remained until the 2d of February 1709, when he ſaw two ſhips come into the bay, and knew them to be Engliſh. He immediately lighted a fire as a ſignal; and, on their coming on ſhore, found they were the Duke, captain Rogers, and the Ducheſs, captain Courtney, two privateers from Briſtol. He gave them the beſt entertainment he could afford; and, as they had been a long time at ſea without freſh proviſions, the goats which he caught were highly acceptable. His habitation conſiſting of two huts, one to ſleep in, the other to dreſs his food in, was ſo obſcurely ſituated, and ſo difficult of acceſs, that only one of the ſhip's officers would accompany him to it. Dampier, who was pilot on board the Duke, and knew Selkirk very well, told captain Rogers, that, when on board the Cinque-Ports, he was the beſt ſeaman on board that veſſel; upon which captain Rogers appointed him maſter's mate of the Duke. After a fortnight's ſtay at Juan Fernandes, the ſhips proceeded on their cruize againſt the Spaniards; plundered a town on the coaſt of Peru; took a Manilla ſhip off California; and returned by way of the Eaſt Indies to England, where they arrived the 1ſt of October 1711; Selkirk having been abſent eight years, more than half of which time he had ſpent alone in the iſland. The public curioſity being excited reſpecting him, he was induced to put his papers into the hands of Defoe, to arrange and form them into a regular narrative. Theſe papers muſt have been drawn up after he left Juan Fernandes, as he had no means of recording his tranſactions there. Captain Cook remarks, as an extraordinary circumſtance, that he had contrived to keep an account of the days of the week and month: but this might be done, as Defoe makes Robinſon Cruſoe do, by cutting notches in a poſt, or many other methods. From this account of Selkirk, Defoe took the idea of writing a more extenſive work, the romance of Robinſon Cruſoe, and very diſhoneſtly defrauded the original proprietor of his ſhare of the profits. Of the time or place or manner of this extraordinary man's death we have received no account; but in 1792 the cheſt and muſket which Selkirk had with him on the iſland were in the poſſeſſion of his grand-nephew, John Selkirk weaver in Largo, where doubtleſs they are at preſent.

Selkirk, the capital of the county of the ſame name, is a ſmall town pleaſantly ſituated on a riſing ground, and enjoys an

extenſive proſpect in all directions, eſpecially up and down the river Etterick. It is remarkable for nothing but thoſe plaintive airs produced in its neighbourhood, the natural ſimplicity of which are the pride of Scotland and the admiration of ſtrangers. W. lon. 2. 46. N. lat. 55. 26.

SELKIRKSHIRE, a county of Scotland, bounded on the north by Edinburghſhire, on the eaſt by Roxburghſhire, on the ſouth by Dumfriesſhire, and on the weſt by Peebleſhire. It extends from north to ſouth 20 miles, and 10 from eaſt to weſt, where broadeſt. The principal rivers are the Tweed, Ettrick, Yarrow, and Gala.

SELLA TURCICA, is a deep depreſſion between the clinoid apophyſes of the ſphenoid bone. See ANATOMY.

SELTZER WATER, is a mineral water which ſprings up at Lower Seltzer, a village in the electorate of Triers, about 10 miles from Frankfort on the Mayne. It is a very uſeful medicinal water. It contains, according to ſome, a very ſmall portion of calcareous earth, of a native mineral alkali, and an acid; but of theſe the quantity is too ſmall to attribute any medicinal virtues to them; but it contains alſo near 1.7th of its bulk of fixed air, which is more than is found in any other mineral water, and to this it owes its principal virtues. Others have ſaid that it is of the very ſame nature with Pyrmont water, and contains a ſubtile aqueous fluid, a volatile iron, and a predominant alkali, all joined together into one briſk ſpirituous water. The conſequence of theſe different opinions reſpecting its conſtituent parts is, that different methods have been recommended for imitating it.

According to the former analyſis, artificial Seltzer water may be prepared by adding one ſcruple of magneſia alba, ſix ſcruples of foſſil alkali, and four ſcruples of common ſalt, to each gallon of water, and ſaturating the water with fixed air or carbonic acid. According to the latter it may be imitated by adding to a quart of the pureſt and lighteſt water thirty drops of a ſtrong ſolution of iron made in ſpirit of ſalt, a drachm of oil of tartar per deliquium, and thirty drops of ſpirit of vitriol, or a little more or leſs as is found neceſſary, not to let the alkali of the oil of tartar prevail too ſtrongly, though it muſt prevail a little. If the proportions be carefully obſerved, and the whole of theſe ingredients ſhaken briſkly together, the artificial Seltzer or Pyrmont water thus made will ſtrongly reſemble the natural, and have the ſame good effect in medicine.

But as fixed air is the only efficacious medicinal part of the compoſition of Seltzer water, the beſt method of imitating it is by impregnating common water with that acid by a proceſs for which we are indebted to Dr. Prieſtley. The firſt idea of this kind occurred to him in 1767, when, having placed ſhallow veſſels of water within the region of fixed air, on the ſurface of the fermenting veſſels of a brewery, and left them all night in that ſituation, he found that the water had acquired a very ſenſible and pleaſant impregnation. He proceeded to accelerate the impregnation by pouring the water from one veſſel into another, while they were both held within the ſphere of the fixed air. The method of effecting this by air diſlodged from chalk and other calcareous ſubſtances did not occur to him till the year 1772, when he publiſhed his directions for this purpoſe, together with a drawing of the neceſſary apparatus, which he had before communicated to the Board of Admiralty. That apparatus has now given way to another invented by Dr. Nooth, made of glaſs, and the manner of uſing which is well known. See 2d pl. 7.

SEM, or SHEM, the ſon of Noah, memorable for his filial piety in concealing the folly and diſgrace of his father; for which he received a remarkable benediction, about 2476 B. C. He lived to the age of 600 years.

Ras SEM. See RAS *Sem* and PETRIFIED *City*.

SEMECARPUS, in botany: A genus of the trigynia order, belonging to the pentandria claſs of plants. The corolla is quinquepetalous; the drupa is heart-ſhaped, cellulous, and monoſpermous. There is but one ſpecies.

SEMEN, SEED. See BOTANY. With reſpect to *number*, plants are either furniſhed with one ſeed, as ſea-pink and biſtort; two, as wood roof and the umbelliferous plants; three, as ſpurge; four, as the lip flowers of Tournefort and rough-leaved plants of Ray; or many, as ranunculus, anemone, and poppy. The *form* of ſeeds is likewiſe extremely various, being either large or ſmall, round, oval, heart ſhaped, kidney-ſhaped, angular, prickly, rough, hairy, wrinkled, ſleek or ſhining, black, white, or brown. Moſt ſeeds have only one cell or internal cavity; thoſe of leſſer burdock, valerian, lamb's lettuce, cornelian cherry, and ſebeſten, have two. With reſpect to *ſubſtance*, ſeeds are either ſoft, membranaceous, or of a hard bony ſubſtance; as in gromwell, tamarind, and all the nuciferous plants. In point of *magnitude*, ſeeds are either very large, as in the cocoa-nut; or very ſmall, as in campanula, *ammannia*, rampions, and throat-wort.

With reſpect to ſituation, they are either diſperſed promiſcuouſly through the pulp (*ſemina nidulantia*), as in water-lily; affixed to a ſuture or joining of the valves of the ſeed-veſſel, as in the croſs-ſhaped and pea-bloom flowers; or placed upon a *placenta* or receptacle within the ſeed veſſel, as in tobacco and thorn apple.

Seeds are ſaid to be naked (*ſemina nuda*) which are not contained in a cover or veſſel: ſuch are thoſe of the lip and compound flowers, the umbelliferous and rough-leaved plants; covered ſeeds (*ſemina tecta*) are contained in ſome veſſel, whether of the capſule, pod, berry, apple, or cherry kind.

A ſimple ſeed is ſuch as bears neither crown, wing, nor downy *pappus*; the varieties in ſeeds, ariſing from theſe circumſtances, are particularly enumerated under their reſpective heads.

In aſſimilating the animal and vegetable kingdoms, Linnæus denominates ſeeds the eggs of plants. The fecundity of plants is frequently marvellous; from a ſingle plant or ſtalk of Indian Turkey wheat, are produced, in one ſummer, 2000 ſeeds; of elecampane, 3000; of ſun-flower, 4000; of poppy, 32,000; of a ſpike of cat's tail, 10,000 and upwards: a ſingle fruit, or ſeed-veſſel, of tobacco, contains 1000 ſeeds; that of white poppy, 8000. Mr. Ray relates, from experiments made by himſelf, that 1012 tobacco ſeeds are equal in weight to one grain; and that the weight of the whole quantum of ſeeds in a ſingle tobacco-plant is ſuch as muſt, according to the above proportion, determine their number to be 360,000. The ſame author eſtimates the annual produce of a ſingle ſtalk of ſpleen-wort to be upwards of one million of ſeeds.

The diſſemination of plants reſpects the different methods or vehicles by which nature has contrived to diſperſe their ſeeds for the purpoſe of increaſe. Theſe by naturaliſts are generally reckoned four.

1. Rivers and running waters. 2. The wind. 3. Animals. 4. An elaſtic ſpring, peculiar to the ſeeds themſelves.

(1.) The ſeeds which are carried along by rivers and torrents are frequently conveyed many hundreds of leagues from their native ſoil, and caſt upon a very different climate, to which, however, by degrees they render themſelves familiar.

(2.) Thoſe which are carried by the wind, are either *winged*, as in fir-tree, trumpet-flower, tulip-tree, birch, arbor-vitæ, meadow-rue, and jeſſamine, and ſome umbelliferous plants; furniſhed with a *pappus*, or downy crown, as in valerian, poplar, reed, ſucculent ſwallowwort, cotton-tree, and many of the compound flowers; placed within a winged *calyx* or ſeed-veſſel, as in ſcabious, ſea-pink, dock, dioſcorea, aſh, maple, and elm-trees, logwood and woad; or, laſtly, contained within a ſwelled *calyx* or ſeed-veſſel, as in winter-cherry, cucubalus, melilot, bladder-nut, fumitory, bladder-ſena, heart-ſeed, and chick-peaſe.

(3.) Many birds ſwallow the ſeeds of vanelloe, juniper, miſletoe, oats, millet, and other graſſes, and void them entire. Squirrels, rats, parrots, and other animals, ſuffer many of the ſeeds which they devour to eſcape, and thus in effect diſſeminate them. Moles, ants, earthworms, and other inſects, by ploughing up the earth, admit a free paſſage to thoſe ſeeds which have been ſcattered upon its ſurface. Again, ſome ſeeds attach themſelves to animals, by means of hooks, crotchets, or hairs, which are either affixed to the feeds themſelves, as in hound's-tongue, mouſe-ear, vervain, carrot, baſtard-parſley, ſanicle, water hemp-agrimony, *arctopus* and *verleſina*; to their calyx, as in burdock, agrimony, *rhexia*, ſmall wild bugloſs, dock, nettle, pellitory, and lead-wort; or to their fruit or ſeed-veſſel, as in liquorice, enchanter's nightſhade, croſs-wort, clivers, French honeyſuckle, and arrow-headed graſs.

(4.) The ſeeds which diſperſe themſelves by an elaſtic force, have that force reſident either in their *calyx*, as in oats and the greater number of ferns; in their *pappus*, as in centaurea crupina; or in their *capſule*, as in geranium, herb-bennet, African ſpiræa, fraxinella, horſe-tail, balſam, Malabar nut, cucumber, elaterium, and male balſam apple.

Semen, in the animal economy. See Physiology, and Anatomy.

Semen *Sanctum*, or *Santonicum*. See Artemisia.

SEMENDRIAH, a town of Turkey in Europe, in the province of Servia, with a good citadel. It is the capital of a ſangiacate, was taken by the Turks in 1690, and is ſeated on the Danube, in E. lon. 21. 45. N. lat. 45. 0.

SEMENTINÆ feriæ, in antiquity, feaſts held annually among the Romans, to obtain of the gods a plentiful harveſt. They were celebrated in the temple of Tellus, where ſolemn ſacrifices were offered to Tellus and Ceres. Theſe feaſts were held about ſeed-time, uſually in the month of January; for, as Macrobius obſerves, they were moveable feaſts.

SEMI, a word borrowed from the Latin, ſignifying *half*; but only uſed in compoſition with other words, as in the following articles.

Semi-*Arians*, in eccleſiaſtical hiſtory, a branch of the antient Arians, conſiſting, according to Epiphanius, of ſuch as, in appearance, condemned the errors of that hereſiarch, but yet acquieſced in ſome of the principles thereof, only palliating and hiding them under ſofter and more moderate terms. Though they ſeparated from the Arian faction (ſee Arians), they could never be brought to acknowledge that the Son was homoouſios, that is, conſubſtantial, or of the ſame ſubſtance with the Father; they would only allow him to be homoiouſios, that is, of a like ſubſtance with the Father, or ſimilar to the Father in his eſſence, not by nature, but by a peculiar privilege. The ſemi-arianiſm of the moderns conſiſts in their maintaining that the Son was from all eternity begotten by the *will* of the Father, contrary to the doctrine of the orthodox, who ſeem to teach that the eternal generation is *neceſſary*. Such at leaſt are the reſpective opinions of Dr. Clarke and Biſhop Bull. See Theology.

Semicircle, in geometry, half a circle, or that figure comprehended between the diameter of the circle and half its circumference.

Semicolon, in grammar, one of the points or ſtops uſed to diſtinguiſh the ſeveral members of a ſentence from each other. The mark or character of the ſemicolon is (;), and has its name as being of ſomewhat leſs effect than a colon; or as demanding a ſhorter pauſe. The proper uſe of the ſemicolon is to diſtinguiſh the conjunct members of a ſentence. Now, by a conjunct member of a ſentence is meant ſuch a one as contains at leaſt two ſimple members.—Whenever, then, a ſentence can be divided into ſeveral members of the ſame degree, which are again diviſible into other ſimple members, the former are to be ſeparated by a ſemicolon. For inſtance: "If fortune bear a great ſway over him, who has nicely ſtated and concerted every circumſtance of an affair; we muſt not commit every thing, without reſerve, to fortune, leſt ſhe have too great a hold of us." Again: *Si quantum in agro locisque deſertis audacia poteſt, tantum in foro atque judiciis impudentia valeret; non minus in cauſa cederet Aulus Cæcinna Sexta Æbutii impudentiæ, quam tum in vi facienda ceſſit audaciæ.* An inſtance in a more complex ſentence we have in Cicero: *Res familiaris primum bene parta ſit, nulloque turpi quæſtu: tum quam plurimis, modo dignis, ſe utilem præbeat; deinde augeatur ratione, diligentia, parſimonia; nec libidini potius luxuriæque, quam liberalitati et beneficentiæ pareat.*

But though the proper uſe of the ſemicolon be to diſtinguiſh conjunct members, it is not neceſſary that all the members divided hereby be conjunct. For, upon dividing a ſentence into great and equal parts, if one of them be conjunct, all thoſe other parts of the ſame degree are to be diſtinguiſhed by a ſemicolon.—Sometimes alſo it happens, that members that are oppoſite to each other, but relate to the ſame verb, are ſeparated by a ſemicolon. Thus Cicero: *Ex hac parte pudor, illinc petulantia; hinc fides, illinc fraudatio; hinc pietas, illinc ſcelus*, &c. To this likewiſe may be referred ſuch ſentences, where, the whole going before, the parts follow: as "The parts of oratory are four; invention, diſpoſition, elocution, and pronunciation."

Semicupium, in medicine, a half-bath, wherein the patient is only placed up to the navel.

Semidiameter, half the diameter, or a right line drawn from the centre of a circle or ſphere to its circumference: being the ſame with what is otherwiſe called the *radius*.

Semiflosculus, in botany, a term uſed to expreſs the flowers of the ſyngeneſia claſs. Theſe ſemifloſculi are petals, hollow in their lower part, but in their upper flat, and continued in the ſhape of a tongue.

Semitone, in muſic. See Interval.

SEMINARY, in its primary ſenſe, the ground where any thing is ſown, to be afterwards tranſplanted.

Seminary, in a figurative ſenſe, is frequently applied to places of education, whence ſcholars are tranſplanted into life.—In Catholic countries it is particularly uſed for a kind of college or ſchool, where youth are inſtructed in the ceremonies, &c. of the ſacred miniſtry. Of theſe there are great numbers; it being ordained by the council of Trent, that there be a ſeminary belonging to each cathedral, under the direction of the biſhop.

SEMINATION, denotes the manner or act of ſhedding and diſperſing the ſeeds of plants. See Semen.

SEMIPELAGIANS, in eccleſiaſtical hiſtory, a name antiently, and even at this day, given to ſuch as retain ſome tincture of Pelagianiſm. See Pelagians. Caſſian, who had been a deacon of Conſtantinople, and was afterwards a prieſt at Marſeilles, was the chief of theſe Semipelagians; whoſe leading principles were, 1. That God did not diſpenſe his grace to one more than another in conſequence of predeſtination, *i. e.* an eternal and abſolute decree, but was willing to ſave all men, if they complied with the terms of his goſpel. 2. That Chriſt died for all men. 3. That the grace purchaſed by Chriſt, and neceſſary to ſalvation, was offered to all men. 4. That man, before he received grace, was capable of faith and holy deſires. 5. That man was born free, and was conſequently capable of reſiſting the influences of grace, or of complying with its ſuggeſtion. The Semipelagians were very numerous; and the doctrine of Caſſian, though variouſly explained, was received in the greateſt part of the monaſtic ſchools in Gaul, from whence it ſpread itſelf far and wide through the European provinces. As to the Greeks and other eaſtern Chriſtians, they had embraced the Semipelagian doctrines before Caſſian, and ſtill adhere to them. In the 6th century, the controverſy between the Semipelagians and the diſciples of Auguſtin prevailed much, and continued to divide the weſtern churches.

SEMIRAMIS (fab. hist.), a celebrated queen of Assyria, daughter of the goddess Derceto, by a young Assyrian. She was exposed in a desert; but her life was preserved by doves for one whole year, till Simmas, one of the shepherds of Ninus, found her and brought her up as his own child. Semiramis, when grown up, married Menones, the governor of Nineveh, and accompanied him to the siege of Bactria; where, by her advice and prudent directions, she hastened the king's operations, and took the city. These eminent services, together with her uncommon beauty, endeared her to Ninus. The monarch asked her of her husband, and offered him his daughter Sosana in her stead; but Menones, who tenderly loved Semiramis, refused; and when Ninus had added threats to entreaties, he hanged himself. No sooner was Menones dead, than Semiramis, who was of an aspiring soul, married Ninus, by whom she had a son called *Ninyas*. Ninus was so fond of Semiramis, that at her request he resigned the crown, and commanded her to be proclaimed queen and sole empress of Assyria. Of this, however, he had cause to repent: Semiramis put him to death, the better to establish herself on the throne; and when she had no enemies to fear at home, she began to repair the capital of her empire, and by her means Babylon became the must superb and magnificent city in the world. She visited every part of her dominions, and left every where immortal monuments of her greatness and benevolence. To render the roads passable and communication easy, she hollowed mountains and filled up valleys, and water was conveyed at a great expense by large and convenient aqueducts to barren deserts and unfruitful plains. She was not less distinguished as a warrior. Many of the neighbouring nations were conquered; and when Semiramis was once told as she was dressing her hair, that Babylon had revolted, she left her toilette with precipitation, and, though only half dressed, refused to have the rest of her head adorned before the sedition was quelled and tranquillity re-established. Semiramis has been accused of licentiousness; and some authors have observed that she regularly called the strongest and stoutest men in her army to her arms, and afterwards put them to death, that they might not be living witnesses of her incontinence. Her passion for her son was also unnatural; and it was this criminal propensity which induced Ninyas to destroy his mother with his own hand. Some say that Semiramis was changed into a dove after death, and received immortal honours in Assyria. It is supposed that she lived about 11 centuries before the Christian æra, and that she died in the 62d year of her age and the 25th of her reign. Many fabulous reports have been propagated about Semiramis, and some have declared that for some time she disguised herself and passed for her son Ninyas. *Lempriere's Bibliotheca Classica.*

SEMPERVIVUM, HOUSE LEEK, in botany: A genus of plants belonging to the order of dodecagynia, and to the class of dodecandria; and in the natural method ranking under the 13th order, *Succulentæ*. The calyx is divided into 12 parts; the petals are 12, and the capsules 12, containing many seeds. There are 12 species; the arboreum, canariense, glutinosum, glandulosum, tectorum, globiferum, villosum, tortuosum, arachnoideum, montanum, sedeforme, and menanthes. Linnæus has only eight of these. The tectorum alone is a native of Britain. The stalk is about a foot high; the radical leaves are thick, oval, pointed, fringed, and spreading in a rose; those on the stem are imbricated and membranous: the flowers are pale red and sessile, and grow in curved terminal bunches. It is frequent on the tops of houses, and flowers in July.

Lewis observes that the filtered juice of house leek, on the addition of an equal quantity of rectified spirit of wine, forms a light white coagulum, like cream of fine pomatum, of a weak but penetrating taste: this, freed from the fluid part, and exposed to the air, almost totally exhales. From this experiment it is concluded by some, that house leek contains a volatile alkaline salt: but the juice coagulates in the same manner with volatile alkalis themselves, as also with fixed alkalis: Acids produce no coagulation.

SENAAR, or SENNAAR. See SENNAAR.

SENATE, in general, is an assembly or council of senators; that is, of the principal inhabitants of a state, who have a share in the government. The senate of antient Rome is of all others the most celebrated. It exercised no contentious jurisdiction; but appointed judges, either from among the senators or knights, to determine processes: it also appointed governors of provinces, and disposed of the revenues of the commonwealth, &c. Yet did not the whole sovereign power reside in the senate, since it could not elect magistrates, make laws, or decide of war and peace; in all which cases the senate was obliged to consult the people.

The senate, when first instituted by Romulus, consisted of 100 members; to whom he afterwards added the same number when the Sabines had migrated to Rome. Tarquin the antient made the senate consist of 300, and this number remained fixed for a long time; but afterwards it fluctuated greatly, and was increased first to 700, and afterwards to 900 by J. Cæsar, who filled the senate with men of every rank and order. Under Augustus the senators amounted to 1000, but this number was reduced, and fixed to 600. The place of a senator was always bestowed upon merit: the monarchs had the privilege of choosing the members; and after the expulsion of the Tarquins, it was one of the rights of the consuls, till the election of the censors, who from their office seemed most capable of making choice of men whose character was irreproachable, whose morals were pure, and relations honourable. Only particular families were admitted into the senate; and when the plebeians were permitted to share the honours of the state, it was then required that they should be born of free citizens. It was also required that the candidates should be knights before their admission into the senate. They were to be above the age of 25, and to have previously passed through the inferior offices of quæstor, tribune of the people, edile, pretor, and consul.

The senate always met of course on the 1st of January, for the inauguration of the new consuls; and in all months, universally, there were three days, viz. the calends, nones, and ides, on which it regularly met: but it always met on extraordinary occasions, when called together by consul, tribune, or dictator.

To render their decrees valid and authentic, a certain number of members was requisite, and such as were absent without some proper cause were always fined. In the reign of Augustus, 400 senators were requisite to make a senate. Nothing was transacted before sun-rise or after sun-set. In their office the senators were the guardians of religion, they disposed of the provinces as they pleased, they prorogued the assemblies of the people, they appointed thanksgivings, nominated their ambassadors, distributed the public money, and in short had the management of every thing political or civil in the republic, except the creating of magistrates, the enacting of laws, and the declarations of war or peace, which were confined to the assemblies of the people.

SENATOR, in general, denotes a member of some senate. The dignity of a Roman senator could not be supported without the possession of 80,000 sesterces, or about 7000l. English money; and therefore such as squandered away their money, and whose fortune was reduced below this sum, were generally struck out of the list of senators. This regulation was not made in the first ages of the republic, when the Romans boasted of their poverty. The senators were not permitted to be of any trade or profession. They were distinguished from the rest of the people by their dress; they wore the laticlave, half-boots of a black colour, with a crescent or silver buckle in the form of a C; but this last honour was confined only to the descendants of those

hundred ſenators who had been elected by Romulus, as the letter C ſeems to imply. (See the preceding article.) Among us, ſenator is a member of parliament. In the laws of king Edward the Confeſſor, we are told that the Britons called thoſe *ſenators* whom the Saxons called afterwards *aldermen* and *boroughmaſters*; though not for their age, but their wiſdom; for ſome of them were young men, but very well ſkilled in the laws. Kenulph king of the Mercians granted a charter, which ran thus, viz. *Conſilio et conſenſu* epiſcoporum *et* ſenatorum *gentis ſuæ largitus fuit dicto monaſterio*, &c. In Scotland, the lords of ſeſſion are called *ſenators* of the college of juſtice.

SENATUS AUCTORITAS. See the next article.

SENATUS *Conſultum*, which made part of the Roman law.—When any public matter was introduced into the ſenate, which was always called *referre ad ſenatum*, any ſenator whoſe opinion was aſked, was permitted to ſpeak upon it as long as he pleaſed, and on that account it was often uſual for the ſenators to protract their ſpeeches till it was too late to determine. When the queſtion was put, they paſſed to the ſide of that ſpeaker whoſe opinion they approved, and a majority of votes was eaſily collected, without the trouble of counting the numbers. When the majority was known, the matter was determined, and a *ſenatus conſultum* was immediately written by the clerks of the houſe, at the feet of the chief magiſtrates, and it was ſigned by all the principal members of the houſe. When there was not a ſufficient number of members to make a ſenate, the deciſion was called *ſenatus auctoritas*, but it was of no force if it did not afterwards paſs into a *ſenatus conſultum*. The *ſenatus conſulta* were at firſt left in the cuſtody of the kings, and afterward of the conſuls, who could ſuppreſs or preſerve them; but about the year of Rome 304, they were always depoſited in the temple of Ceres, and afterwards in the treaſury, by the ediles of the people.

SENECA (LUCIUS ANNÆUS), a Stoic philoſopher, was born at Corduba in Spain, about the beginning of the Chriſtian æra, of an equeſtrian family, which had probably been tranſplanted thither in a colony from Rome. He was the ſecond ſon of Marcus Annæus Seneca, commonly called the rhetorician, whoſe remains are printed under the title of "Suaſoriæ & Controverſiæ, cum Declamationum Excerptis;" and his youngeſt brother Annæus Mela, for there were three of them, was memorable for being the father of the poet Lucan. He was removed to Rome, together with his father and the reſt of his family, while he was yet in his infancy. There he was educated in the moſt liberal manner, and under the beſt maſters. He learned his eloquence from his father; but his genius rather leading him to philoſophy, he put himſelf under the Stoics Attalus, Sotion, and Papirius Fabianus; men famous in their way, and of whom he has made honourable mention in his writings It is probable too, that he travelled when he was young, ſince we find him in ſeveral parts of his works, making very exact and curious obſervations upon Egypt and the Nile. But this, though entirely agreeable to his own humour, did not at all correſpond with that ſcheme or plan of life which his father had drawn out for him; who therefore forced him to the bar, and put him upon ſoliciting for public employments; ſo that he afterwards became queſtor, prætor, and, as Lipſius will have it, even conſul.

In the firſt year of Claudius, when Julia the daughter of Germanicus was accuſed of adultery by Meſſalina, and baniſhed, Seneca was baniſhed too, being charged as one of the adulterers. Corſica was the ſeat of his exile, where he lived eight years; and wrote his books "Of Conſolation," addreſſed to his mother Helvia, and to his friend Polybius, and perhaps ſome of thoſe tragedies which go under his name. When Agrippina was married to Claudius, as ſhe was upon the death of Meſſalina, ſhe prevailed with the emperor to recall Seneca from baniſhment; and afterwards procured him to be tutor to her ſon Nero, whom ſhe deſigned for the empire. [illegible]

pupil, he acquired that prodigious wealth which rendered him in a manner equal to kings. All this wealth, however, together with the luxury and effeminacy of a court, does not appear to have had any ill effect upon the temper and diſpoſition of Seneca. He continued abſtemious, exact in his manners, and, above all, free from the vices ſo commonly prevalent in ſuch places, flattery and ambition. How well he acquitted himſelf in quality of preceptor to his prince, may be known from the five firſt years of Nero's reign, which have always been conſidered as a perfect pattern of good government. But, when Poppæa and Tigellinus had got the command of this prince's humour, and hurried him into the moſt extravagant and abominable vices, he ſoon grew weary of his maſter, whoſe life muſt indeed have been a conſtant rebuke to him. Seneca, perceiving that his favour declined at court, and that he had many accuſers about the prince, who were perpetually whiſpering in his ears his great riches, magnificent houſes, fine gardens, &c. and what a favourite through their means he was grown with the people, made an offer of them all to Nero. Nero refuſed to accept them; but, having, as it is ſuppoſed, diſpatched Burrhus by poiſon, could not be eaſy till he had rid himſelf of Seneca alſo. Accordingly he attempted, by means of Cleonicus, a freedman of Seneca, to take him off by poiſon; but, this not ſucceeding, he ordered him to be put to death, upon an information that he was conſcious to Piſo's conſpiracy againſt his perſon; not that he had any real proofs of Seneca's being at all concerned in this plot, but only that he was glad to lay hold of any pretence for deſtroying him. He left Seneca, however, at liberty to chooſe his manner of dying, who cauſed his veins to be opened immediately; his friends ſtanding round him, whoſe tears he endeavoured to ſtop, ſometimes by gently admoniſhing, ſometimes by ſharply rebuking them. His wife Paulina, who was very young in compariſon of himſelf, had yet the reſolution and affection to bear him company, and thereupon ordered her veins to be opened at the ſame time; but, as Nero had no particular ſpite againſt her, and was not willing to make his cruelty more odious and inſupportable than there ſeemed occaſion for, he gave orders to have her death prevented, upon which her wounds were bound up, and the blood ſtopped; in juſt time to ſave her; but ſhe looked miſerably pale and wan all her life after. In the mean time Seneca, finding his death ſlow and lingering, deſired Statius Annæus, his phyſician, to give him a doſe of poiſon, which had been prepared ſome time before, in caſe it ſhould be wanted; but, this not having its uſual effect, he was carried to a hot bath, where he was at length ſtifled with the ſteams. He died, as Lipſius conjectures, in his 63d or 64th year, and in the 10th or 11th of Nero. His works are ſo well known by the ſeveral editions which have been publiſhed, that we need not be particular in an account of them. Some have imagined, that he was a Chriſtian, and that he held a correſpondence with St. Paul by letters. He muſt have heard of Chriſt and his doctrine, and his curioſity might lead him to make ſome inquiry about them; but, as for the letters publiſhed under the names of the Philoſopher and Apoſtle, they have long been declared ſpurious by the critics, and perfectly unworthy of either of them.

SENECIO, GROUNDSEL, in botany: A genus belonging to the claſs of ſyngeneſia, and to the order of polygamia ſuperflua; and in the natural claſſification ranked under the 49th order, *Compoſitæ*. The receptacle is naked; the pappus ſimple; the calyx cylindrical and calyculated. The ſcales are equal and contiguous, ſo as to ſeem entire; thoſe at the baſe are few, and have their apices or points decayed. There are 57 ſpecies. Of theſe, ſeven are Britiſh, the vulgaris, viſcoſus, ſylvaticus, erucifolius, jacobæa, paludoſus, and ſaracenicus.

SENEGAL, a part of Negroland in Africa, the boundaries of which are not known. See GUINEA.

[illegible] called *Saint Louis*, is a ſmall [illegible]

iſland in the mouth of the river Senegal, and according to Maſkelyne's tables is ſituated in N. lat. 15. 53. W. lon. 16. 31. The Dutch were the firſt Europeans who ſettled at Senegal; but their colony was expelled by the French in 1687. It was taken by the Engliſh in 1692; and retaken by the French the year following. It was a ſecond time taken poſſeſſion of by the Engliſh in 1758; but in 1779 the French recovered it, and it was ceded by the Britiſh crown by the treaty of 1783. The beſt account of this iſland which we have ſeen, is given in the intereſting voyage of M. Saugnier to the coaſt of Africa.

SENEKA, or SENEGA, *Rattleſnake-root, Milk-wort*, a medicinal plant. See POLYGALA.

SENESCHAL, (*Seneſchallus*), derived from the German *ſein* "a houſe or a place," and *ſcale* "an officer," is a ſteward, and ſignifies one who has the diſpenſing of juſtice in ſome particular caſes: As the high ſeneſchal or ſteward of England; *ſeneſchal de la hotel du roi*, "ſteward of the king's houſehold, ſeneſchal, or ſteward of courts, &c." *Co. Lit.* 61. *Croke's Juriſd.* 102. *Kitch.* 83. See STEWARD.

SENNA, the leaf of the caſſia ſenna of Linnæus. See CASSIA. Senna appears to have been cultivated in England in the time of Parkinſon (1640); and Miller tells us, that by keeping theſe plants in a hot-bed all the ſummer, he frequently had them in flower; but adds, it is very rarely that they perfect their ſeeds in England. There can be little doubt, however, but that ſome of the Britiſh poſſeſſions may be found well enough adapted to the growth of this vegetable, and that the patriotic views of the Society for encouraging Arts, &c. which has offered a reward to thoſe who ſucceed in the attempt, will be ultimately accompliſhed.

Senna, which is in common uſe as a purgative, was firſt known to the Arabian phyſicians Serapion and Meſue: the firſt among the Greeks who takes any notice of it is Auctarius, but he only ſpeaks of the fruit, and not of the leaves. To remove the diſagreeable taſte of this medicine, Dr. Cullen recommends coriander ſeeds; and, for preventing the gripings with which it is ſometimes attended, he thinks the warmer aromatics, as cardamoms or ginger, would be more effectual.

The *Senna Italica*, or blunt-leaved ſenna, is a variety of the Alexandrian ſpecies; which, by its cultivation in the ſouth of France (Provence), has been found to aſſume this change. It is leſs purgative than the pointed-leaved ſenna, and is therefore to be given in larger doſes. It was employed as a cathartic by Dr. Wright at Jamaica, where it grows on the ſand-banks near the ſea.

SENNAR, a town of Africa, capital of a kingdom of the ſame name. See NUBIA. It is five miles in circumference, and contains near 100,000 inhabitants. The houſes are all one ſtory high, with flat roofs; but the ſuburbs contain only cottages covered with reeds. The palace is ſurrounded by high walls, of bricks dried in the ſun, but is only a confuſed heap of buildings. The heats are almoſt inſupportable in the day-time, except in the rainy ſeaſon, which begins in April, and continues three months, at which time the air is unwholeſome. The commodities are elephants teeth, tamarinds, civet, tobacco, and gold duſt. There is a market near the palace, where ſlaves are ſold: the females ſit on one ſide, the males on another, and the Egyptian merchants buy great numbers of them every year. The women of quality have ſlight garments of ſilk, and wear rings of various metals on their hair, arms, legs, ears, and fingers. Women of a low rank, and girls, have clothes wrapped round them from the waiſt to the knees. The men go almoſt naked. The merchandiſe required at Sennar are ſpices, paper, braſs, hardware, glaſs beads, and a black drug with which they colour their eyelids and eyebrows. It is ſeated on an eminence near the river Nile. E. lon. 30. 0. N. lat. 15. 4.

SENNERTUS (DANIEL), an eminent phyſician, was born in 1572 at Breſlaw; and in 1593 he was ſent to Wittemberg, where he made great progreſs in philoſophy and phyſic. He viſited the univerſities of Leipſic, Jena, Francfort upon the Oder, and Berlin; but ſoon returned to Wittemberg, where he was promoted to the degree of doctor of phyſic, and ſoon after to a profeſſorſhip in the ſame faculty. He was the firſt who introduced the ſtudy of chemiſtry into that univerſity; he gained a great reputation by his works and practice, and was very generous to the poor. He died of the plague at Wittemberg in 1637. He raiſed himſelf enemies by contradicting the antients. He thought the ſeed of all living creatures animated, and that the ſoul of this ſeed produces organization. He was accuſed of impiety for aſſerting that the ſouls of beaſts are not material; for this was affirmed to be the ſame thing with aſſerting that they are immortal; but he rejected this conſequence, as he well might do.

SENONES, (anc. geog.), a people of Gallia Celtica, ſituated on the Sequana to the ſouth of the Pariſii, near the confluence of the Jeauna or Yonne with the above-mentioned river. Their moſt conſiderable exploit was their invaſion of Italy, and taking and burning ROME. This was done by a colony of them long before tranſported into Italy, and ſettled on the Adriatic. Their capital, Agendicum in Gaul, was in the lower age called *Senones*, now *Sens*. In Italy the Senones extended themſelves as far as the river Aeſis; but were afterwards driven beyond the Rubicon, which became the boundary of Gallia Ciſalpina, (Polybius, Strabo).

SENSATION, in philoſophy, the perception of external objects by means of the ſenſes. See METAPHYSICS.

SENSE, a faculty of the ſoul whereby it perceives external objects by means of the impreſſions they make on certain organs of the body. See METAPHYSICS, and ANATOMY.

Common SENSE, is a term that has been variouſly uſed both by antient and modern writers. With ſome it has been ſynonymous with public ſenſe; with others it has denoted prudence; in certain inſtances, it has been confounded with ſome of the powers of taſte; and, accordingly thoſe who commit egregious blunders with regard to decorum, ſaying and doing what is offenſive to their company, and inconſiſtent with their own character, have been charged with a defect in common ſenſe. Some men are diſtinguiſhed by an uncommon acuteneſs in diſcovering the characters of others; and this talent has been ſometimes called *common ſenſe*; ſimilar to which is that uſe of the term, which makes it to ſignify that experience and knowledge of life which is acquired by living in ſociety. To this meaning Quintilian refers, ſpeaking of the advantages of a public education: *Senſum ipſum qui communis dicitur, ubi diſcet, cum ſe a congreſſu, qui non hominibus ſolum, ſed mutis quoque animalibus naturalis eſt, ſegregarit?* Lib. i. cap. 2.

But the term *common ſenſe* hath in modern times been uſed to ſignify that power of the mind which perceives truth, or commands belief, not by progreſſive argumentation, but by an inſtantaneous, inſtructive and irreſiſtible impulſe; derived neither from education nor from habit, but from nature; acting independently of our will, whenever its object is preſented, according to an eſtabliſhed law, and therefore called *ſenſe*; and acting in a ſimilar manner upon all, or at leaſt upon a great majority of mankind, and therefore called *common ſenſe*. See METAPHYSICS.

Moral SENSE, is a determination of the mind to be pleaſed with the contemplation of thoſe affections, actions, or characters of rational agents, which we call *good* or *virtuous*. This moral ſenſe of beauty in actions and affections may appear ſtrange at firſt view: ſome of our moraliſts themſelves are offended at it in Lord Shafteſbury, as being accuſtomed to deduce every approbation or averſion from rational views of intereſt. It is certain that his Lordſhip has carried the influence of the moral ſenſe very far, and ſome of his followers have carried it further. The advocates for the

felfifh fyftem feem to drive their opinions to the oppofite extreme, and we have elfewhere endeavoured to fhow that the truth lies between the contending parties. See MORAL PHILOSOPHY.

SENSIBLE NOTE, in mufic, is that which conftitutes a third major above the dominant, and a femitone beneath the tonic. *Si*, or B, is the fenfible note in the tone of *ut* or C *fol* ✻; or G fharp, in the tone of *la* or A. They call it the *fenfible note* on this account, that it caufes to be perceived the tone or natural feries of the key and the tonic itfelf; upon which, after the chord of the dominant, the fenfible note taking the fhorteft road, is under a neceffity of rifing; which has made fome authors treat this fenfible note as a major diffonance, for want of obferving, that diffonance, being a relation, cannot be conftituted unlefs by two notes between which it fubfifts. It is not meant that the fenfible note is the feventh of the tone, becaufe, in the minor mode, this feventh cannot be a fenfible note but in afcending; for, in defcending, it is at the diftance of a full note from the tonic, and of a third minor from the dominant.

SENSIBILITY, is a nice and delicate perception of pleafure or pain, beauty or deformity. It is very nearly allied to tafte; and, as far as it is natural, feems to depend upon the organization of the nervous fyftem. It is capable, however, of cultivation, and is experienced in a much higher degree in civilized than in favage nations, and among perfons liberally educated than among boors and illiterate mechanics. The man who has cultivated any of the fine arts has a much quicker and more exquifite perception of beauty and deformity in the execution of that art, than another of equal or even greater natural powers, who has but cafually infpected its productions. He who has been long accuftomed to that decorum of manners which characterizes the polite part of the world, perceives almoft inftantaneoufly the fmalleft deviation from it, and feels himfelf almoft as much hurt by behaviour harmlefs in itfelf, as by the groffeft rudenefs; and the man who has long proceeded fteadily in the paths of virtue, and often painted to himfelf the deformity of vice, and the miferies of which it is productive, is more quickly alarmed at any deviation from rectitude, than another who, though his life has been ftained by no crime, has yet thought lefs upon the principles of virtue and confequences of vice.

That the man of true fenfibility has more pains and more pleafures than the callous wretch, is univerfally admitted, as well as that his enjoyments and fufferings are more exquifite in their kinds; and as no man lives for himfelf alone, no man will acknowledge his want of fenfibility, or exprefs a wifh that his heart were callous. It is, however, a matter of fome moment to diftinguifh real fenfibilities from ridiculous affections; thofe which tend to increafe the fum of human happinefs from fuch as have a contrary tendency, and to cultivate them all in fuch a manner as to make them anfwer the ends for which they were implanted in us by the benificent Author of nature. This can be done only by watching over them as over other affociations, for exceffive fenfibility, as it is not the gift of nature, is the bane of human happinefs. "Too much tendernefs (as Rouffeau well obferves) proves the bittereft curfe inftead of the moft fruitful bleffing; vexation and difappointment are its certain confequences. The temperature of the air, the change of the feafons, the brilliancy of the fun, or thicknefs of the fogs, are fo many moving fprings to the unhappy poffeffor, and he becomes the wanton fport of their arbitration."

SENSITIVE PLANT. See MIMOSA, DIONÆA, and HEDYSARUM. The fenfitive plants are well known to poffefs a kind of motion, by which the leaves and ftalks are contracted and fall down upon being flightly touched, or fhaken with fome degree of violence.

The contraction of the leaves and branches of the fenfitive plant when touched, is a very fingular phenomenon. Different hypothefes have been formed by botanifts in order to explain it; but we are difpofed to believe that thefe have generally been deduced rather from analogical reafoning than from a collection of facts and obfervations. We fhall therefore give an account of all the important facts which we have been able to collect upon this curious fubject; and then draw fuch conclufions as obvioufly refult from them, without, however, attempting to fupport any old, or to eftablifh a new, hypothefis.

1. It is difficult to touch the leaf of a healthy fenfitive plant fo delicately that it will not immediately collapfe, the foliola or little leaves moving at their bafe till they come into contract, and then applying themfelves clofe together. If the leaf be touched with a little more force, the oppofite leaf will exhibit the fame appearance. If a little more force be applied, the partial footftalks bend down towards the common footftalk from which they iffue, making with it a more acute angle than before. If the touch be more violent ftill, all the leaves fituated on the fame fide with the one that has been touched will inftantly collapfe, and the partial footftalk will approach the common footftalk to which it is attached, in the fame manner as the partial footftalk of the leaf approaches the ftem or branch from which it iffues; fo that the whole plant, from having its branches extended, will immediately appear like a weeping birch.

2. Thefe motions of the plant are performed by means of three diftinct and fenfible articulations. The firft, that of the foliola or lobes to the partial footftalk; the fecond, that of the partial footftalk to the common one; the third, that of the common footftalk to the trunk. The primary motion of all which is the clofing of the leaf upon the partial footftalk, which is performed in a fimilar manner, and by a fimilar articulation. This, however, is much lefs vifible than the others. Thefe motions are wholly independent on one another, as may be proved by experiment. It appears that if the partial footftalks are moved, and collapfe toward the petioli, or thefe toward the trunk, the little leaves, whofe motion is ufually primary to thefe, fhould be affected alfo; yet experiment proves that it is poffible to touch the footftalks in fuch a manner as to affect them only, and make them apply themfelves to the trunk, while the leaves feel nothing of the touch; but this cannot be, unlefs the footftalks are fo difpofed as that they can fall to the trunk, without fuffering their leaves to touch any part of the plant in their paffage, becaufe, if they do, they are immediately affected.

3. Winds and heavy rains make the leaves of the fenfitive plant contract and clofe; but no fuch effect is produced from flight fhowers.

4. At night, or when expofed to much cold in the day, the leaves meet and clofe in the fame manner as when touched, folding their upper furfaces together, and in part over each other, like fcales or tiles, fo as to expofe as little as poffible of the upper furface to the air. The oppofite fides of the leaves (foliola) do not come clofe together in the night, for when touched they apply themfelves clofer together. Dr. Darwin kept a fenfitive plant in a dark place for fome hours after day-break, the leaves and footftalks were collapfed as in its moft profound fleep; and, on expofing it to the light, above 20 minutes paffed before it was expanded.

5. In the month of Auguft, a fenfitive plant was carried in a pot out of its ufual place into a dark cave, the motion that it received in the carriage fhut up its leaves and they did not open till 24 hours afterwards; at this time they became moderately open, but were afterwards fubject to no changes at night or morning, but remained three days and nights with their leaves in the fame moderately open ftate. At the end of this time they were brought out again into the air, and there recovered their natural periodical motions, fhutting every night, and opening every morning, as naturally and as ftrongly as if the plant had not been in this forced ftate; and while in the cave, it was ob-

ſe vel to be very little leſs affected with the touch than when abroad in the open air.

6. The great heats of ſummer, when there is open ſunſhine at noon, a ect the plant in ſome degree like cold, cauſing it to ſhut up its leaves a little, but never in any very great degree. The plant, however, is leaſt of all affected about nine o'clock in the morning, and that is conſequently the propereſt time to make experiments on it. A branch of the ſenſitive plant cut off, and laid by, retains yet its property of ſhutting up and opening in the morning for ſome days; and it holds it longer if kept with one end in water, than if left to dry more ſuddenly.

7. The leaves only of the ſenſitive plant ſhut up in the night, not the branches; and if it be touched at this time, the branches are affected in the ſame manner as in the day, ſhutting up, or approaching to the ſtalk or trunk, in the ſame manner, and often with more force. It is of no conſequence what the ſubſtance is with which the plant is touched, it anſwers alike to all; but there may be obſerved a little ſpot, diſtinguiſhable by its paler colour in the articulations of its leaves, where the greateſt and niceſt ſenſibility is evidently placed.

8. Duhamel having obſerved, about the 15th of September, in moderate weather, the natural motion of a branch of ſenſitive plant, remarked, that at nine in the morning it formed with the ſtem an angle of 100 degrees; at noon, 112 degrees; at three afternoon, it returned to 100; and after touching the branch, the angle was reduced to 90. Three quarters of an hour after it had mounted to 112; and at eight at night, it deſcended again, without being touched, to 90. The day after, in finer weather, the ſame branch, at eight in the morning, made an angle of 135 degrees with the ſtem; after being touched, the angle was diminiſhed to 80; an hour after, it aroſe again to 135; being touched a ſecond time, it deſcended again to 80; an hour and a half after, it had riſen to 145; and upon being touched a third time, deſcended to 135; and remained in that poſition till five o'clock in the afternoon, when being touched a fourth time it fell to 110.

9. The parts of the plants which have collapſed afterwards unfold themſelves, and return to their former expanded ſtate. The time required for that purpoſe varies, according to the vigour of the plant, the ſeaſon of the year, the hour of the day, the ſtate of the atmoſphere. Sometimes half an hour is requiſite, ſometimes only ten minutes. The order in which the parts recover themſelves varies in like manner; ſometimes it is the common footſtalk; ſometimes the rib to which the leaves are attached; and ſometimes the leaves themſelves are expanded, before the other parts have made any attempt to be reinſtated in their former poſition.

10. If, without ſhaking the other ſmaller leaves, we cut off the half of a leaf or lobe belonging to the laſt pair, at the extremity or ſummit of a wing, the leaf cut and its antagoniſt, that is to ſay, the firſt pair, begin to approach each other; then the ſecond, and ſo on ſucceſſively, till all the leſſer leaves, or lobes of that wing, have collapſed in like manner. Frequently, after 12 or 15 ſeconds, the lobes of the other wings, which were not immediately affected by the ſtroke, ſhut; whilſt the ſtalk and its wing, beginning at the bottom, and proceeding in order to the top, gradually recover themſelves. If, inſtead of one of the leſſ r ex reme leaves, we cut off one belonging to the pair that is ext the footſtalk, its antagoniſt ſhuts, as do the other pairs ſucceſſively, from the bottom to the top. If all the leaves of one ſide of a wing be cut off, the oppoſite leaves are not aff cted, but remain expanded. With ſome addreſs, it is poſſible even to cut off a branch without hurting the leaves, or making them fall. The common footſtalk of the winged leaves being cut as far as three-fourths of its diameter, all the parts which hang down collapſe, but quickly recover without a earing to have ſuffered any conſiderable violence by the ſhock. An inciſion being made into one of the principal branches to the depth of one-half the diameter, the branches ſituated betwixt the ſection and the root will fall down; thoſe above the inciſion remain as before, and the leſſer leaves continue open; but this direction is ſoon deſtroyed, by cutting off one of the lobes at the extremity, as was obſerved above. Laſtly, a whole wing being cut off with precaution near its inſertion into the common footſtalk, the other wings are not affected by it, and its own lobes do not ſhut. No motion enſues from piercing the branch with a needle or other ſharp inſtrument.

11. If the end of one of the leaves be burned with the flame of a candle, or by a burning glaſs, or by touching it with hot iron, it cloſes up in a moment, and the oppoſite leaf does the ſame, and after that the whole ſeries of leaves on each ſide of the partial or little footſtalk; then the footſtalk itſelf; then the branch or common footſtalk; all do the ſame, if the burning has been in a ſufficient degree. This proves that there is a very nice communication between all the parts of the plant, by means of which the burning, which only is applied to the extremity of one leaf, diffuſes its influence through every part of the ſhrub. If a drop of aquafortis be carefully laid upon a leaf of the ſenſitive plant, ſo as not to ſhake it in the leaſt, the leaf does not begin to move till the acrid liquor corrodes the ſubſtance of it; but at that time, not only that particular leaf, but all the leaves placed on the ſame footſtalk, cloſe themſelves up. The vapour of burning ſulphur has alſo this effect on many leaves at once, according as they are more or leſs expoſed to it; but a bottle of very acrid and ſulphureous ſpirit of vitriol, placed under the branches unſtopped, produces no ſuch effect. Wetting the leaves with ſpirit of wine has been obſerved alſo to have no effect, nor the rubbing oil of almonds over them; though this laſt application deſtroys many plants.

From the preceding experiments the following concluſions may be fairly drawn: 1. The contraction of the parts of the ſenſitive plant is occaſioned by an external force, and the contraction is in proportion to the force. 2. All bodies which can exert any force affect the ſenſitive plant; ſome by the touch or by agitation, as the wind, rain, &c.; ſome by chemical influence, as heat and cold. 3. Touching or agitating the plant produces a greater effect than an inciſion or cutting off a part, or by applying heat or cold.

Attempts have been made to explain theſe curious phenomena. Dr. Darwin, in the notes to his admired poem, intitled, *The Botanic Garden*, lays it down as a principle, that "the ſleep of animals conſiſts in a ſuſpenſion of voluntary motion; and as vegetables are ſubject to ſleep as well as animals, there is reaſon to conclude (ſays he) that the various action of cloſing their petals and foliage may be juſtly aſcribed to a voluntary power; for without the faculty of volition ſleep would not have been neceſſary to them." Whether this definition of ſleep when applied to animals be juſt, we ſhall not inquire; but it is evident the ſuppoſed analogy between the ſleep of animals and the ſleep of plants has led Dr. Darwin to admit this aſtoniſhing concluſion, that plants have volition. As volition preſuppoſes a mind or ſoul, it were to be wiſhed that he had given us ſome information concerning the nature of a vegetable ſoul, which can think and will. We ſuſpect, however, that this vegetable ſoul will turn out to be a mere mechanical or chemical one; for it is affected by external forces uniformly in the ſame way, its volition is merely paſſive, and never makes any ſucceſsful reſiſtance againſt thoſe cauſes by which it is influenced. All this is a mere abuſe of words. We look upon all attempts to explain the motions of plants as abſurd, and all reaſoning from ſuppoſed analogy between animals and vegetables as the ſource of wild conjecture, and not of ſound philoſophy. We view the contraction and expanſion of the ſenſitive plant in the ſame

light as we do gravitation, chemical attraction, electricity, and magnetism, as a singular fact, the circumstances of which we may be fully acquainted with, but must despair of understanding its cause.

What has been said under this article chiefly refers to the *mimosa sensitiva* and *pudica*. For a full account of the motions of vegetables in general, see *Vegetable Motion*, under the article Motion.

SENTENCE, in law, a judgment passed in court by the judge in some procels, either civil or criminal. See Judgment.

Sentence, in grammar, denotes a period; or a set of words comprehending some perfect sense or sentiment of the mind. The business of pointing is to distinguish the several parts and members of sentences, so as to render the sense thereof as clear, distinct, and full as possible. See Punctuation. In every sentence there are two parts necessarily required; a noun for the subject, and a definite verb: whatever is found more than these two, affects one of them, either immediately, or by the intervention of some other, whereby the first is affected. Again, every sentence is either simple or compound: a simple sentence is that consisting of one single subject, and one finite verb.—A compound sentence contains several subjects and finite verbs, either expresly or implicitly. A *simple* sentence needs no point or distinction; only a period to close it: as, "A good man loves virtue for itself."—In such a sentence, the several adjuncts affect either the subject or the verb in a different manner. Thus the word *good* expresses the quality of the subject, *virtue* the object of the action, and *for itself* the end thereof.—Now none of these adjuncts can be separated from the rest of the sentence: for if one be, why should not all the rest? and if all be, the sentence will be minced into almost as many parts as there are words. But if several adjuncts be attributed in the same manner either to the subject or the verb, the sentence becomes compound, and is to be divided into parts. In every *compound* sentence, as many subjects, or as many finite verbs as there are, either expresly or implied, so many distinctions may there be. Thus, "My hopes, fears, joys, pains, all centre in you." And thus "*Catilina abiit, excessit, evasit, erupit.*"——The reason of which pointing is obvious; for as many subjects or finite verbs as there are in a sentence, so many members does it really contain. Whenever, therefore, there occur more nouns than verbs, or contrariwise, they are to be conceived as equal. Since, as every subject requires its verbs, so every verb requires its subject, wherewith it may agree: excepting, perhaps, in some figurative expressions.

SENTICOSÆ (from *sentis*, a "briar or bramble)," the name of the 35th order in Linnæus's fragments of a natural method, consisting of rose, bramble, and other plants, which resemble them in port and external structure. See Botany.

SENTIMENT, according to Lord Kames, is a term appropriated to such thoughts as are prompted by passion. It differs from a perception; for a perception signifies the act by which we become conscious of external objects. It differs from consciousness of an internal action, such as thinking, suspending thought, inclining, resolving, willing, &c. And it differs from the conception of a relation among objects; a conception of that kind being termed *opinion*.

SENTINEL, or Sentry, in military affairs, a private soldier placed in some post to watch the approach of the enemy, to prevent surprises, to stop such as would pass without orders or discovering who they are. They are placed before the arms of all guards, at the tents and doors of general officers, colonels of regiments, &c.

Sentinel *Perdu*, a soldier posted near an enemy, or in some very dangerous post where he is in hazard of being lost. All sentinels are to be vigilant on their posts; neither are they to sing, smoke tobacco, nor suffer any noise to be made near them. They are to have a watchful eye over the things committed to their charge. They are not to suffer any light to remain, or any fire to be made, near their posts in the night-time; neither is any sentry to be relieved or removed from his post but by the corporal of the guard. They are not to suffer any one to touch or handle their arms, or in the night-time to come within ten yards of their post. No person is to strike or abuse a sentry on his post; but when he has committed a crime, he is to be relieved, and then punished according to the rules and articles of war. A sentinel, on his post in the night, is to know nobody but by the counter-sign: when he challenges, and is answered, *Relief*, he calls out, *Stand, relief! advance, corporal!* upon which the corporal halts his men, and advances alone within a yard of the sentry's firelock (first ordering his party to rest, on which the sentry does the same), and gives him the counter-sign, taking care that no one hear it.

SEPIA, the Cuttle-fish, a genus belonging to the order of vermes mollusca. (2nd plate 7). There are eight brachia interspersed on the interior side, with little round serrated cups, by the contraction of which the animal lays fast hold of any thing. Besides these eight arms, it has two tentacula longer than the arms, and frequently pedunculated. The mouth is situated in the centre of the arms, and is horny and hooked, like the bill of a hawk. The eyes are below the tentacula, towards the body of the animal. The body is fleshy, and received into a sheath as far as the breast. Their food are tunnies, sprats, lobsters, and other shell fish. With their arms and trunks they fasten themselves, to resist the motion of the waves. Their beak is like that of a parrot. The females are distinguished by two paps. They copulate as the polypi do, by a mutual embrace, and lay their eggs upon sea-weed and plants, in parcels like bunches of grapes. Immediately after they are laid they are white, and the males pass over and impregnate them with a black liquor, after which they grow larger. On opening the egg, the embryo-cuttle is found alive. The males are very constant, accompany their females everywhere, face every danger in their defence, and rescue them intrepidly at the hazard of their own lives. The timorous females fly as soon as they see the males wounded. The noise of a cuttle-fish, on being dragged out of the water, resembles the grunting of a hog. When the male is pursued by the sea-wolf or other ravenous fish, he shuns the danger by stratagem. He squirts his black liquor, sometimes to the quantity of a dram, by which the water becomes black as ink, under shelter of which he baffles the pursuit of his enemy. This ink or black liquor has been denominated by Mr. le Cat *æthiops animal*, and is reserved in a particular gland. In its liquid state it resembles that of the choroïd in man; and would then communicate an indelible dye; when dry, it might be taken for the product of the black liquor in negroes dried, and made a precipitate by spirit of wine. This æthiops animal in negroes as well as in the cuttle-fish, is more abundant after death than even during life. It may serve either for writing or printing; in the former of which ways the Romans used it. It is said to be an ingredient in the composition of Indian ink mixed with rice. There are five species.

1. The *loligo*, or great cuttle, with short arms and long tentacula; the lower part of the body rhomboid and pinnated, the upper thick and cylindric. They inhabit all our seas, where having blackened the water by the effusion of their ink, they abscond, and with their tail leap out of the water. They are gregarious and swift in their motions: they take their prey by means of their arms; and embracing it, bring it to their central mouth. They adhere to the rocks, when they wish to be quiescent, by means of the concave discs that are placed along their arms.

2. The *octopodia*, with eight arms, connected at their bottom

by a membrane. This is the polypus of Pliny, which he diftinguifhes from the loligo and fepia by the want of the tail and tentacula. They inhabit our feas, but are moft at home in the Mediterranean. In hot climates thefe are found of an enormous fize. The Indians affirm that fome have been feen two fathoms broad over their centre, and each arm nine fathoms long. When the Indians navigate their little boats, they go in dread of them; and left thefe animals fhould fling their arms over and fink them, they never fail without an ax to cut them off. When ufed for food they are ferved up red from their own liquor, which from boiling with the addition of nitre becomes red. Barthol. fays, upon cutting one of them open, fo great a light broke forth, that at night, upon taking away the candle, the whole houfe feemed to be in a blaze.

3. The *media*, or middle cuttle, with a long, flender, cylindric body; tail finned, pointed, and carinated on each fide; two long tentacula; the body almoft tranfparent, green, but convertible into a dirty brown; confirming the remark of Pliny, that they change their colour through fear, adapting it, chameleon-like, to that of the place they are in. The eyes are large and fmaragdine.

4. The *fepiola*, or fmall cuttle, with a fhort body, rounded at the bottom, has a round fin on each fide and two tentacula. They are taken off Flintfhire, but chiefly inhabit the Mediterranean.

5. The *officinalis*, or officinal cuttle, with an ovated body, has fins along the whole of the fides, almoft meeting at the bottom; and two long tentacula. The body contains the bone, the cuttle-bone of the fhops, which was formerly ufed as an abforbent. The bones are frequently flung on all our fhores; the animal very rarely. The conger eels bite off their arms, or feet; but they grow again, as does the lizard's tail (Plin. ix. 29). They are preyed upon by the plaife. This fifh emits (in common with the other fpecies), when frightened or purfued, the black liquor which the antients fuppofed, by darkening the circumambient wave, concealed it from the enemy; and which they fometimes made ufe of inftead of ink.

This animal was efteemed a delicacy among them; and is eaten even at prefent by the Italians. Rondeletius gives us two receipts for the dreffing, which may be continued to this day. Athenæus alfo leaves us the method of making an antique cuttle fifh faufage; and we learn from Ariftotle, that thofe animals are in higheft feafon when pregnant.

SEPIARIÆ, (from *fepes*, "a hedge"), the name of the 44th order of Linnæus's Fragments of a Natural Method, confifting of a beautiful collection of woody plants, fome of which, from their fize and elegance, are very proper furniture for hedges. See Botany.

SEPS, in zoology, a fpecies of Lacerta. See Basiliscus.

SEPTARIÆ, in natural hiftory, a large clafs of foffils, commonly known by the names of *ludus Helmontii* and *waxen veins*. They are defined to be foffils not inflammable, nor foluble in water; of a moderately firm texture and dufky hue, divided by feveral fepta or thin partitions, and compofed of a fparry matter greatly debafed by earth; not giving fire with fteel; fermenting with acids, and in great part diffolved by them; and calcining in a moderate fire. Of this clafs there are two diftinct orders of bodies, and under thofe fix genera. The feptariæ of the firft order are thofe which are ufually found in large maffes, of a fimple uniform conftruction, but divided by large fepta either into larger and more irregular portions, or into fmaller and more equal ones, called *talc*. The genera of this order are four. 1. Thofe divided by fepta of fpar, called *fecomiæ*: 2. Thofe divided by fepta of earthy matter, called *gaiophragmia*: 3. Thofe divided by fepta of the matter of the pyrites, called *pyritercia*: And, 4. Thofe divided by fepta of fpar, with an admixture of cryftal, called *diaugophragmia*. Thofe of the fecond order are fuch as are ufually found in fmaller maffes, of a cruftated ftructure, formed by various incruftations round a central nucleus, and divided by very thin fepta. Of this order are only two genera. 1. Thofe with a fhort roundifh nucleus, inclofed within the body of the mafs; and, 2. Thofe with a long nucleus, ftanding out beyond the ends of the mafs.

SEPTAS, in botany: A genus of plants belonging to the order of *Heptagynia*, and the clafs of *Heptandria*; and in the natural fyftem ranged under the 13th order, *Succulentæ*. The calyx is divided into feven parts; the petals are feven; the germens feven: the capfules are alfo feven, and contain many feeds. There is only one fpecies, the *Capenfis*, which is a native of the Cape of Good Hope, is round-leaved, and flowers in Auguft or September.

SEPTEMBER, the ninth month of the year, confifting of only thirty days; it took its name as being the feventh month, reckoning from March, with which the Romans began their year.

SEPTENNIAL, any thing lafting feven years.

Septennial *Elections*. Blackftone, in his Commentaries, Vol. I. p. 189. fays, (after obferving that the utmoft extent of time allowed the fame parliament to fit by the ftat. 6. W. and M. c. 2. was three years), "But, by the ftatute 1 Geo. I. ft. 2. c. 38. (in order *profeffedly* to prevent the great and continued expenfes of frequent elections, and the violent heats and animofities confequent thereupon, and for the peace and fecurity of the government, juft then recovering from the late rebellion), this term was prolonged to feven years; and what alone is an inftance of the vaft authority of parliament, the very fame houfe that was chofen for three years enacted its own continuance for feven."

SEPTENTRIO, in aftronomy, a conftellation, more ufually called *urfa minor*. In cofmography, the term *feptentrio* denotes the fame with *north*: and hence feptentrional is applied to any thing belonging to the north; as *feptentrional figns, parallels*. &c.

SEPTICS, are thofe fubftances which promote putrefaction, chiefly the calcareous earths, magnefia, and teftaceous powders. From the many curious experiments made by Sir John Pringle to afcertain the *feptic* and *antifeptic* virtues of natural bodies, it appears that there are very few fubftances of a truly *feptic* nature. Thofe commonly reputed fuch by authors, as the alcaline and volatile falts, he found to be nowife *feptic*. However, he difcovered fome, where it feemed leaft likely to find any fuch quality; thefe were chalk, common falt, and teftaceous powders. Nothing could be more unexpected, than to find fea falt a haftener of putrefaction; but the fact is thus; one dram of falt preferves two drams of frefh beef in two ounces of water, above thirty hours uncorrupted, in a heat equal to that of the human body; or, which is the fame thing, this quantity of falt keeps flefh fweet twenty hours longer than pure water; but then half a dram of falt does not preferve it above two hours longer. Twenty-five grains have little or no antifeptic virtue, and ten, fifteen, or even twenty grains, manifeftly both haften and heighten the corruption. The quantity which had the moft putrefying quality, was found to be about ten grains to the above proportion of flefh and water. Many inferences might be drawn from this experiment: one is, that fince falt is never taken in aliment beyond the proportion of the corrupting quantities, it would appear that it is fubfervient to digeftion chiefly by its *feptic* virtue, that is, by foftening and refolving meats; an action very different from what is commonly believed. It is to be obferved, that the above experiments were made with the falt kept for domeftic ufes. See Pringle's Obferv. on the Difeafes of the army, p. 348, et feq.

SEPTIZON, or Septizonium, in Roman antiquity, a celebrated maufoleum, built by Septimus Severus, in the tenth region of the city of Rome: it was fo called from *feptem* and

zona, becaufe it confifted of feven ftories, each of which was furrounded by a row of columns.

SEPTUAGESIMA, in the kalendar, denotes the third Sunday before Lent, or before Quadragefima Sunday: fuppofed by fome to take its name from its being about feventy days before Eafter.

SEPTUAGINT, the name given to a Greek verfion of the books of the Old Teftament, from its being fuppofed to be the work of feventy-two Jews, who are ufually called the *feventy interpreters*, becaufe feventy is a round number. The hiftory of this verfion is expreffly written by Ariftæas, an officer of the guards to Ptolemy Philadelphus, the fubftance of whofe account is as follows: Ptolemy having erected a fine library at Alexandria, which he took care to fill with the moft curious and valuable books from all parts of the world, was informed that the Jews had one containing the laws of Mofes, and the hiftory of that people; and being defirous of enriching his library with a Greek tranflation of it, applied to the high-prieft of the Jews; and to engage him to comply with his requeft, fet at liberty all the Jews whom his father Ptolemy Soter had reduced to flavery. After fuch a ftep, he eafily obtained what he defired; Eleazar the Jewifh high-prieft fent back his ambaffadors with an exact copy of the Mofaical law, written in letters of gold, and fix elders of each tribe, in all feventy-two; who were received with marks of refpect by the king, and then conducted into the ifle of Pharos, where they were lodged in a houfe prepared for their reception, and fupplied with every thing neceffary. They fet about the tranflation without lofs of time, and finifhed it in feventy-two days: and the whole being read in the prefence of the king, he admired the profound wifdom of the laws of Mofes; and fent back the deputies laden with prefents, for themfelves, the high-prieft, and the temple.

Ariftobulus, who was tutor to Ptolemy Phyfcon, Philo who lived in our Saviour's time, and was contemporary with the apoftles, and Jofephus, fpeak of this tranflation as made by 72 interpreters, by the care of Demetrius Phalereus in the reign of Ptolemy Philadelphus. All the Chriftian writers, during the firft 15 centuries of the Chriftian era, have admitted this account of the Septuagint as an undoubted fact. But fince the Reformation, critics have boldly called it in queftion, becaufe it was attended with circumftances which they think inconfiftent, or, at leaft, improbable. Du Pin has afked, why were 72 interpreters employed, fince 12 would have been fufficient? Such an objection is trifling. We may as well afk, why did king James I. employ 54 tranflators in rendering the Bible into Englifh, fince Du Pin thinks 12 would have been fufficient?

1. Prideaux objects that the Septuagint is not written in the Jewifh, but in the Alexandrian, dialect; and could not therefore be the work of natives of Paleftine. But thefe dialects were probably at that time the fame, for both Jews and Alexandrians had received the Greek language from the Macedonians about 50 years before.

2. Prideaux further contends that all the books of the Old Teftament could not be tranflated at the fame time; for they exhibit great difference of ftyle. To this it is fufficient to reply that they were the work of 72 men, each of whom had feparate portions affigned them.

3. The Dean alfo urges that Ariftæas, Ariftobulus, Philo, and Jofephus, all directly tell us that the law was tranflated without mentioning any of the other facred books. But nothing was more common among writers of the Jewifh nation than to give this name to the Scriptures as a whole. In the New Teftament law is ufed as fynonymous with what we call the Old Teftament. Befides, it is exprefsly faid by Ariftobulus, in a fragment quoted by Eufebius (*Præp. Evan.* l. 1.), that the whole Sacred Scripture was rightly tranflated through the means of Demetrius Phalereus, and by the command of Philadelphus. Jofephus indeed, fays the learned Dean, afferts, in the preface to his Antiquities, that the Jewifh interpreters did not tranflate for Ptolemy the whole Scriptures, but the law only. Here the evidence is contradictory, and we have to determine, whether Ariftobulus or Jofephus be moft worthy of credit. We do not mean, however, to accufe either of forgery, but only to inquire which had the beft opportunities of knowing the truth. Ariftobulus was an Alexandrian Jew, tutor to an Egyptian king, and lived within 100 years after the tranflation was made, and certainly had accefs to fee it in the royal library. Jofephus was a native of Paleftine, and lived not until 300 years or more after the tranflation was made, and many years after it was burnt along with the whole library of Alexandria in the wars of Julius Cæfar. Suppofing the veracity of thefe two writers equal, as we have no proof of the contrary, which of them ought we to confider as the beft evidence? Ariftobulus furely. Prideaux, indeed, feems doubtful whether there was ever fuch a man; and Dr. Hody fuppofes that the commentaries on the five books of Mofes, which bear the name of Ariftobulus, were a forgery of the fecond century. To prove the exiftence of any human being, who lived 2000 years before us, and did not perform fuch works as no mere man ever performed, is a tafk which we are not difpofed to undertake; and we believe it would not be lefs difficult to prove that Philo and Jofephus exifted, than that fuch a perfon as Ariftobulus did not exift. If the writings which have paffed under his name were a forgery of the fecond century, it is furprifing that they fhould have impofed upon Clemens Alexandrinus, who lived in the fame century, and was a man of abilities, learning, and well acquainted with the writings of the antients. Eufebius, too, in his *Præp. Evan.* quotes the commentaries of Ariftobulus. But, continues the learned Dean, "Clemens Alexandrinus is the firft author that mentions them. Now, had any fuch commentaries exifted in the time of Philo and Jofephus, they would furely have mentioned them. But is the circumftance of its not being quoted by every fucceeding author a fufficient reafon to difprove the authenticity of any book? Neither Philo nor Jofephus undertook to give a lift of preceding authors, and it was by no means the uniform practice of thefe times always to name the authors from whom they derived their information."

4. Prideaux further contends that the fum which Ptolemy is faid to have given to the interpreters is too great to be credible. If his computation were juft, it certainly would be fo. He makes it 2,000,000 l. fterling, but other writers reduce it to 85,421 l. and fome to 56,947 l.; neither of which is a fum fo very extraordinary in fo great and magnificent a prince as Philadelphus, who fpent, according to a paffage in Athenæus (lib. v.), no lefs than 10,000 talents on the furniture of one tent; which is fix times more than what was fpent in the whole of the embaffy and tranflation, which amounted only to 1552 talents.

5. Prideaux fays, "that what convicts the whole ftory of Ariftæas of falfity is, that he makes Demetrius Phalereus to be the chief actor in it, and a great favourite of the king; whereas Philadelphus, as foon as his father was dead, caft him into prifon, where he foon after died." But it may be replied, that Philadelphus reigned two years jointly with his father Lagus, and it is not faid by Hermippus that Demetrius was out of favour with Philadelphus during his father's life. Now, if the Septuagint was tranflated in the beginning of the reign of Philadelphus, as Eufebius and Jerome think, the difficulty will be removed. Demetrius might have been librarian during the reign of Philadelphus, and yet imprifoned on the death of Lagus. Indeed, as the caufe of Philadelphus's difpleafure was the advice which Demetrius gave to his father, to prefer the fons of Arfinoë before the fon of Berenice, he could fcarcely fhow it till his father's death. The Septuagint tranflation might there-

fore be begun while Philadelphus reigned jointly with his father, but not be finifhed till after his father's death.

6. Befides the objections which have been confidered, there is only one that deferves notice. The antient Chriftians not only differ from one another concerning the time in which Ariftobulus lived, but even contradict themfelves in different parts of their works. Sometimes they tell us, he dedicated his book to Ptolemy Philometer, at other times they fay, it was addreffed to Philadelphus and his father. Sometimes they make him the fame perfon who is mentioned in 2 Maccabees, chap. 1. and fometimes one of the 72 interpreters 152 years before. It is difficult to explain how authors fall into fuch inconfiftencies, but it is probably occafioned by their quoting from memory. This was certainly the practice of almoft all the early Chriftian writers, and fometimes of the apoftles themfelves. Miftakes were therefore inevitable. Jofephus has varied in the circumftances of the fame event, in his antiquities and wars of the Jews, probably from the fame caufe; but we do not hence conclude, that every circumftance of fuch a relation is entirely falfe. In the account of the Marquis of Argyle's death in the reign of Charles II. we have a very remarkable contradiction. Lord Clarendon relates, that he was condemned to be hanged, which was performed the fame day: on the contrary, Burnet, Woodrow, Heath, Echard, concur in ftating, that he was beheaded; and that he was condemned upon the Saturday and executed upon the Monday. Was any reader of Englifh hiftory ever fceptic enough to raife from hence a queftion, whether the Marquis of Argyle was executed or not? Yet this ought to be left in uncertainty according to the way of reafoning in which the facts refpecting the tranflation of the Septuagint are attempted to be difproved.

Such are the objections which the learned and ingenious Prideaux has raifed againft the common account of the Septuagint tranflation, and fuch are the anfwers which may be given to them. We have chofen to fupport that opinion which is fanctioned by hiftorical evidence, in preference to the conjectures of modern critics however ingenious; being perfuaded, that there are many things recorded in hiftory, which, though perfectly true, yet, from our imperfect knowledge of the concomitant circumftances, may, at a diftant period, feem liable to objections. To thofe who require pofitive evidence, it may be ftated thus. Ariftæas, Ariftobulus, Philo. and Jofephus, affure us that the law was tranflated. Taking the law in the moft reftricted fenfe, we have at leaft fufficient authority to affert that the Pentateuch was rendered into Greek under Ptolemy Philadelphus. Ariftobulus affirms that the whole Scriptures were tranflated by the 72. Jofephus confines their labours to the books of Mofes. He therefore who cannot determine to which of the two the greateft refpect is due, may fufpend his opinion. It is certain, however, that many of the other books were tranflated before the age of our Saviour; for they are quoted both by him and his apoftles: and, perhaps, by a minute examination of antient authors, in the fame way that Dr. Lardner has examined the Chriftian fathers to prove the antiquity of the New Teftament, the precife period in which the whole books of the Septuagint were compofed might, with confiderable accuracy, be afcertained.

For 400 years this tranflation was in high eftimation with the Jews. It was read in their fynagogues in preference to the Hebrew; not only in thofe places where Greek was the common language, but in many fynagogues of Jerufalem and Judæa. But when they faw that it was equally valued by the Chriftians, they became jealous of it, and at length, in the fecond century, Aquila, an apoftate Chriftian, attempted to fubftitute another Greek tranflation in its place. In this work he was careful to give the antient prophecies concerning the Meffiah a different turn from the Septuagint, that they might not be applicable to Chrift. In the fame defign he was followed by Symmachus and Theodotion, who alfo, as St. Jerome informs us, wrote out of hatred to Chriftianity.

In the mean time, the Septuagint, from the ignorance, boldnefs, and careleffnefs of tranfcribers, became full of errors. To correct thefe, Origen publifhed a new edition in the beginning of the third century, in which he placed the tranflations of Aquila, Symmachus, and Theodotion. This edition was called *Tetrapla*, the tranflations being arranged oppofite to one another in four columns. He alfo added one column, containing the Hebrew text in Hebrew letters, and another exhibiting it in Greek. In a fecond edition he publifhed two additional Greek verfions; one of which was found at Nicopolis, and the other at Jericho: this was called the *Hexapla*. By comparing fo many tranflations, Origen endeavoured to form a correct copy of the Scriptures. Where they all agreed, he confidered them right. The paffages which he found in the LXX, but not in the Hebrew text, he marked with an obelifk: what he found in the Hebrew, but not in the LXX, he marked with an afterifk. St. Jerome fays that the additions which Origen made to the LXX, and marked with an afterifk, were taken from Theodotion. From this valuable work of Origen the verfion of the LXX was tranfcribed in a feparate volume, with the afterifks and obelifks for the ufe of the churches; and from this circumftance the great work itfelf was neglected and loft.

About the year 300 two new editions of the LXX were publifhed; the one by Hefychius an Egyptian bifhop, and the other by Lucian a prefbyter of Antioch. But as thefe authors did not mark with any note of diftinction the alterations which they had made, their edition does not poffefs the advantages of Origen's.

The beft edition of the LXX is that of Dr. Grabe, which was publifhed in the beginning of the prefent century. He had accefs to two MSS, nearly of equal antiquity, the one found in the Vatican library at Rome, the other in the Royal library at St. James's, which was prefented to Charles I. by Cyril, patriarch of Alexandria, and hence is commonly called the *Alexandrine MS*. Anxious to difcover which of thefe was according to the edition of Origen Dr. Grabe collected the fragments of the Hexapla, and found they agreed with the Alexandrine MS. but not with the Vatican where it differed with the other. Hence he concluded that the Alexandrine MS. was taken from the edition of Origen. By comparing the quotations from fcripture in the works of Athanafius and St. Cyril (who were patriarchs of Alexandria at the time St. Jerome fays Hefychius's edition of the LXX was there ufed) with the Vatican MS. he found they agreed fo well that he juftly inferred that that MS. was taken from the edition of Hefychius. This verfion was in ufe to the time of our bleffed Saviour, and is that out of which moft of the citations in the New Teftament, from the Old, are taken. It was alfo the ordinary and canonical tranflation made ufe of by the Chriftian church in the earlieft ages; and it ftill fubfifts in the churches both of the eaft and weft.

Thofe who defire a more particular account of the Septuagint tranflations may confult Hody *de Bibliorum Textibus*, Prideaux's Connections, Owen's Inquiry into the Septuagint Verfion, Blair's Lectures on the Canon, and Michaelis's Introduction to the New Teftament, laft edition.

Septuagint *Chronology*, the chronology which is formed from the dates and periods of time mentioned in the Septuagint tranflation of the Old Teftament. It reckons 1500 years more from the creation to Abraham than the Hebrew bible. Dr. Kennicot, in the differtation prefixed to his Hebrew bible, has fhown it to be very probable that the chronology of the Hebrew fcriptures, fince the period juft mentioned, was corrupted by the Jews, between the years 175 and 200, and that the chro-

hology of the Septuagint is more agreeable to truth. It is a fact, that during the second and third centuries the Hebrew scriptures were almost entirely in the hands of the Jews, while the Septuagint was confined to the Christians. The Jews had therefore a very favourable opportunity for this corruption. The following is the reason which is given by oriental writers: it being a very antient tradition, that the Messiah was to come in the sixth chiliad, because he was to come in the last days (founded on a mystical application of the six days creation), the contrivance was *to shorten the age of the world from about 5500 to 3760; and thence to prove that Jesus could not be the Messiah.* Dr. Kennicott adds, that some Hebrew copies having the larger chronology were extant till the time of Eusebius, and some till the year 700.

SEPTUM, in anatomy, an inclosure or partition; a term applied to several parts of the body, which serve to separate one part from another; as, *septum narium*, or partition between the nostrils, &c.

SEPULCHRAL, something belonging to sepulchres or tombs: thus a sepulchral column is a column erected over a tomb, with an inscription on its shaft; and sepulchral lamps, those said to have been found burning in the tombs of several martyrs and others. See LAMP.

SEPULCHRE, a tomb or place destined for the interment of the dead. This term is chiefly used in speaking of the burying-places of the antients, those of the moderns being usually called *tombs*. Sepulchres were held sacred and inviolable; and the care taken of them has always been held a religious duty, grounded on the fear of God, and the belief of the soul's immortality. Those who have searched or violated them have been thought odious by all nations, and were always severely punished. The Egyptians called sepulchres *eternal houses*, in contradistinction to their ordinary houses or palaces, which they called *inns*, on account of their short stay in the one in comparison of their long abode in the other. See TOMB.

Regular Canons of St. SEPULCHRE, a religious order, formerly instituted at Jerusalem, in honour of the holy sepulchre, or the tomb of Jesus Christ. Many of these canons were brought from the Holy Land into Europe, particularly into France, by Louis the Younger; into Poland, by Jaxa, a Polish gentleman; and into Flanders, by the counts thereof; many also came into England. This order was, however, suppressed by pope Innocent VIII. who gave its revenues and effects to that of our Lady of Bethlehem: which also becoming extinct, they were bestowed on the knights of St. John of Jerusalem. But the suppression did not take effect in Poland, where they still subsist, as also in several provinces of Germany. These canons follow the rule of St. Augustine.

Knights of the Holy SEPULCHRE, a military order, established in Palestine about the year 1114. The knights of this order in Flanders chose Philip II. king of Spain, for their master, in 1558, and afterwards his son; but the grand-master of the order of Malta prevailed on the last to resign; and when afterwards the duke of Nevers assumed the same quality in France, the same grand-master, by his interest and credit, procured a like renunciation of him, and a confirmation of the union of this order to that of Malta.

SEQUANI, a people antiently forming a part of Gallia Celtica, but annexed to Belgica by Augustus, separated from the Helvetii by mount Jura, with the Rhine on the east (Strabo), bordering on the Ædui, and Segustiano to the south, and Lingones to the west (Tacitus). Late Franche Comté.

SEQUESTRATION, in common law, is setting aside the thing in controversy from the possession of both the parties that contend for it. In which sense it is either voluntary, as when done by the consent of the parties; or necessary, as where it is done by the judge, of his own authority, whether the parties will or not.

SEQUESTRATION, in the civil law, is the act of the ordinary, disposing of the goods and chattels of one deceased, whose estate no man will meddle with. A widow is also said to sequester, when she disclaims having any thing to do with the estate of her deceased husband. Among the Romanists, in questions of marriage, where the wife complains of impotency in the husband, she is to be sequestered into a convent, or into the hands of matrons, till the process be determined.

SEQUESTRATION is also used for the act of gathering the fruits of a benefice void, to the use of the next incumbent. Sometimes a benefice is kept under sequestration for many years, when it is of so small value, that no clergyman fit to serve the cure will be at the charge of taking it by institution; in which case the sequestration is committed either to the curate alone, or to the curate and church-wardens jointly. Sometimes the profits of a living in controversy, either by the consent of the parties, or the judge's authority, are sequestered and placed for safety in a third hand, till the suit is determined, a minister being appointed by the judge to serve the cure, and allowed a certain salary out of the profits. Sometimes the profits of a living are sequestered for neglect of duty, for dilapidations, or for satisfying the debts of the incumbent.

SEQUESTRATION in chancery, is a commission usually directed to seven persons therein named, empowering them to seize the defendant's personal estate, and the profits of his real, and to detain them, subject to the order of the court. It issues on the return of the serjeant at arms, wherein it is certified, that the defendant had secreted himself. Sequestrations were first introduced by Sir Nicholas Bacon, lord keeper in the reign of Queen Elizabeth; before which the court found some difficulty in enforcing its process and decrees; and they do not seem to be in the nature of process to bring in the defendant, but only intended to enforce the performance of the court's decree.

A sequestration is also made, in London, upon an action of debt; the course of proceeding in which case is this: The action being entered, the officer goes to the defendant's shop or warehouse, when no person is there, and takes a padlock, and hangs it on the door, uttering these words: "I do sequester this warehouse, and the goods and merchandize therein, of the defendant in this action, to the use of the plaintiff," &c. after which he sets on his seal, and makes a return of the sequestration in the compter; and four days being passed after the return made, the plaintiff may, at the next court, have judgment to open the shop or warehouse, and to have the goods appraised by two freemen, who are to be sworn at the next court held for that compter; and then the serjeant puts his hand to the bill of appraisement, and the court grants judgment thereon; but yet the defendant may put in bail before satisfaction, and by that means dissolve the sequestration; and after satisfaction, may put in bail to disprove the debt, &c.

In the time of the civil wars, sequestration was used for a seizing of the estates of delinquents for the use of the commonwealth.

SEQUIN, a gold coin, struck at Venice, and in several parts of the Grand Signior's dominions. In Turkey it is called *dahab*, or piece of gold; and according to Volney is in value about 6s. 3d. sterling. It varies, however, considerably in its value in different countries. At Venice it is equal to about 9s. 2d. sterling. The Venetian sequins are in great request in Syria, from the fineness of their standard, and the practice they have of employing them for women's trinkets. The fashion of these trinkets does not require much art; the piece of gold is simply pierced, in order to suspend it by a chain, likewise of gold, which flows upon the breast. The more sequins that are

attached to this chain, and the greater the number of these chains, the more is a woman thought to be ornamented. This is the favourite luxury, and the emulation of all ranks. Even the female peasants, for want of gold, wear piastres or smaller pieces; but the women of a certain rank disdain silver; they will accept of nothing but sequins of Venice, or large Spanish pieces, and crusadoes. Some of them wear 200 or 300, as well lying flat, as strung one on another, and hung near the forehead at the edge of the head-dress. It is a real load: but they do not think they can pay too dearly for the satisfaction of exhibiting this treasure at the public bath, before a crowd of rivals, to awaken whose jealousy constitutes their chief pleasure. The effect of this luxury on commerce, is the withdrawing considerable sums from circulation, which remain dead; besides, that when any of these pieces return into common use, having lost their weight by being pierced, it becomes necessary to weigh them. The practice of weighing money is general in Syria, Egypt, and all Turkey. No piece, however effaced, is refused there; the merchant draws out his scales and weighs it, as in the days of Abraham, when he purchased his sepulchre. In considerable payments, an agent of exchange is sent for, who counts paras by thousands, rejects a great many pieces of false money, and weighs all the sequins, either separately or together.

SERAGLIO, formed from the Persian word *seraw*, or Turkish word *sarai*, which signifies a house, and is commonly used to express the house or palace of a prince. In this sense it is frequently used at Constantinople: the houses of foreign ambassadors are called *seraglios*. But it is commonly used by way of eminence for the palace of the grand signior at Constantinople, where he keeps his court, and where his concubines are lodged, and where the youth are trained up for the chief posts of the empire.

It is a triangle about three Italian miles round, wholly within the city, at the end of the promontory Chrysoceras, now called the *Seraglio Point*. The buildings run back to the top of the hill, and from thence are gardens that reach to the edge of the sea. It is inclosed with a very high and strong wall, upon which there are several watch towers: and it has many gates, some of which open toward the sea-side, and the rest into the city; but the chief gate is one of the latter, which is constantly guarded by a company of capoochees, or porters; and in the night it is well guarded towards the sea. The outward appearance is not very beautiful, the architecture being irregular, consisting of separate edifices in the form of pavilions and domes.

The ladies of the seraglio are a collection of beautiful young women, chiefly sent as presents from the provinces and the Greek islands, most of them the children of Christian parents. The brave prince Heraclius hath for some years past abolished the infamous tribute of children of both sexes, which Georgia formerly paid every year to the Porte. The number of women in the harem depends on the taste of the reigning monarch or sultan. Selim had 2000, Achmet had but 300, and the late sultan had nearly 1600. On their admission they are committed to the care of old ladies, taught sewing and embroidery, music, dancing, and other accomplishments, and furnished with the richest clothes and ornaments. They all sleep in separate beds, and between every fifth there is a preceptress. Their chief governess is called *Katon Kinga*, or governess of the noble young ladies. There is not one servant among them, for they are obliged to wait on one another by rotation; the last that is entered serves her who preceded her and herself. These ladies are scarcely ever suffered to go abroad, except when the grand signior removes from one place to another, when a troop of black eunuchs conveys them to the boats, which are inclosed with lattices and linen curtains; and when they go by land they are put into close chariots, and signals are made at certain distances, to give notice that none approach the roads through which they march. The boats of the harem, which carry the grand signior's wives, are manned with 24 rowers, and have white covered tilts, shut alternately by Venetian blinds. Among the emperor's attendants are a number of mutes, who act and converse by signs with great quickness, and some dwarfs, who are exhibited for the diversion of his majesty.

When he permits the women to walk in the gardens of the seraglio, all people are ordered to retire, and on every side there is a guard of black eunuchs, with sabres in their hands, while others go their rounds in order to hinder any person from seeing them. If, unfortunately, any one is found in the garden, even through ignorance or inadvertence, he is undoubtedly killed, and his head brought to the feet of the grand signior, who gives a great reward to the guard for their vigilance. Sometimes the grand signior passes into the gardens to amuse himself when the women are there; and it is then that they make use of their utmost efforts, by dancing, singing, seducing gestures, and amorous blandishments, to ensnare the affections of the monarch. It is not permitted that the monarch should take a virgin to his bed, except during the solemn festivals, and on occasion of some extraordinary rejoicings, or the arrival of some good news. Upon such occasions, if the sultan chooses a new companion to his bed, he enters into the apartment of the women, who are ranged in files by the governesses, to whom he speaks, and intimates the person he likes best: the ceremony of the handkerchief, which the grand signior is said to throw to the girl he elects, is an idle tale, without any foundation. As soon as the grand signior has chosen the girl that he has destined to be the partner of his bed, all the others follow her to the bath, washing and perfuming her, and dressing her superbly, conducting her, singing, dancing, and rejoicing, to the bed chamber of the grand signior, who is generally, on such an occasion, already in bed. Scarcely has the new elected favourite entered the chamber, introduced by the grand eunuch who is upon guard, than she kneels down, and when the sultan calls her, she creeps into bed to him at the foot of the bed, if the sultan does not order her, by especial grace, to approach by the side: after a certain time, upon a signal given by the sultan, the governess of the girls and all her suite enter the apartment, and take her back again, conducting her with the same ceremony to the women's apartments; and if by good fortune she becomes pregnant, and is delivered of a boy, she is called *asaki sultaness*, that is to say, sultaness-mother; for the first son she has the honour to be crowned, and she has the liberty of forming her court. Eunuchs are also assigned for her guard, and for her particular service. No other ladies, though delivered of boys, are either crowned or maintained with such costly distinction as the first; however, they have their service apart, and handsome appointments. After the death of the sultan, the mothers of the male children are shut up in the old seraglio, from whence they can never come out any more, unless any of their sons ascend the throne. Baron de Tott informs us, that the female slave who becomes the mother of a sultan, and lives long enough to see her son mount the throne, is the only woman who at that period alone acquires the distinction of *sultana-mother*; she is till then in the interior of her prison with her son. The title of *bache kadun*, principal woman, is the first dignity of the grand signior's harem; and she hath a larger allowance than those who have the title of second, third, and fourth woman, which are the four free women the Koran allows.

A description of the seraglio or *harem*, as it is often called, of the emperor of Morocco, may be found in the very interesting tour of Mr. Lempriere, who, being a surgeon by profession, was admitted into the harem to prescribe for some of the ladies who

were indiſpoſed, and was therefore enabled to give a particular account of this female priſon, and, what is ſtill more curious, of the manners and behaviour of its inhabitants.

It is melancholy to reflect on the ſituation of the unfortunate women confined in theſe places. Being conſidered as the mere inſtruments of pleaſure, no attention is paid to the improvement of their minds. They have no employment to occupy their time. Their needle-work is performed by Jeweſſes; their food is dreſſed, and their chambers taken care of, by ſlaves and domeſtics. They have no amuſement but a rude and barbarous kind of melancholy muſic, without melody, variety, or taſte; and converſation with one another, which muſt indeed be very confined, uniform, and inanimate, as they never ſee a new object. Excluded from the enjoyment of freſh air and exerciſe, ſo neceſſary for the ſupport of health and life; deprived of all ſociety but that of their fellow-ſufferers, a ſociety to which moſt of them would prefer ſolitude itſelf; they are only to be conſidered as the moſt abject of ſlaves—ſlaves to the vices and caprice of a licentious tyrant, who exacts even from his wives themſelves a degree of ſubmiſſion and reſpect which borders upon idolatry, and which God and nature never meant ſhould be paid to a mortal.

SERAI, a building on the high-road, or in large cities in India, erected for the accommodation of travellers.

SERAPH, or Seraphim, a ſpirit of the higheſt rank in the hierarchy of angels; who are thus called from their being ſuppoſed to be moſt inflamed with divine love, by their nearer and more immediate attendance at the throne of God, and to communicate their fervour to the remoter and inferior orders. See Angel.

SERAPHIC, burning or inflamed with love or zeal, like a ſeraphim: thus St. Bonaventure is called the *ſeraphic doctor*, from his abundant zeal and fervour.

SERAPIAS, in botany: A genus of plants belonging to the order of diandria, and to the claſs of gynandria; and in the natural ſyſtem arranged under the 7th order, *Orchideæ*. The nectarium is egg-ſhaped and gibbous, with an egg ſhaped lip. The ſpecies, according to Linnæus, are ten. 1. Latifolia; 2. Longifolia; 3. Grandiflora, or enſifolia; 4. Lancifolia; 5. Rubra; 6. Lingua; 7. Cordigera; 8. Capenſis; 9. Erecta; 10. Falcata. The three firſt are natives of Britain. 1. The *Latifolia*, or broad-leaved helleborine, is diſtinguiſhed by fibrous bulbs, by ovate ſtem-claſping leaves, and pendulous flowers. The ſtalk is erect, about a cubit high, and furniſhed with ſix or eight nervous oval leaves; the ſpike is about ſix inches long; the upper petals are of a green colour, and of an oval acute form; the lateral ones are a little ſhorter, and of a white colour, with a little tinge of green. 2. The *Paluſtris*, or marſh helleborine, grows in rough boggy paſtures and marſhes, and flowers in July. It is diſtinguiſhed by fibrous bulbs, ſword-ſhaped ſeſſile leaves, pendulous flowers; and the lip of the nectarium is obtuſe, ſomewhat ſerrated, and longer than the petals. The flowers grow to the number of 15 or 20 in a looſe ſpike. The three exterior petals are green mixed with red; the lateral ones are white with a red bluſh; and the nectarium is marked with red lines and yellow tuberculous ſpots. 3. The *Grandiflora*, or white-flowered helleborine, grows in woods, and flowers in June. Its characteriſtics are, fibrous bulbs, ſword ſhaped leaves, erect flowers; and the lip of the nectarium is obtuſe and ſhorter than the petals. The flowers are large and erect, and conſiſting of ſix or eight in a thin ſpike; the petals are all white, and connive together; the lip of the nectarium is incloſed within the petals, is white and ſtreaked with three yellow prominent lines.

SERAPHON, a phyſician of Alexandria. He and Philinus of the iſle of Cos were both ſcholars of Herophilus, and were founders of the empiric ſect: which happened about 287 B. C.

SERAPIS, in mythology, an Egyptian deity, who was worſhipped under various names and attributes, as the tutelary god of Egypt in general, and as the patron of ſeveral of their principal cities. Tacitus informs us, that he was worſhipped as a kind of univerſal deity that repreſented Eſculapius, Oſiris, Jupiter, and Pluto; and he was ſometimes taken for Jupiter Ammon, the Sun, and Neptune: and the honours that were rendered to him at Alexandria were more ſolemn and extraordinary than thoſe of any other place.

Plutarch and Clemens of Alexandria, as well as Tacitus, inform us, that while the firſt Ptolemy was employed in fortifying Alexandria with walls, adorning it with temples and ſtately buildings, there appeared to him in his ſleep a young man of extraordinary beauty, of a ſtature more than human, admoniſhing him to diſpatch into Pontus ſome of his moſt truſty friends to bring from thence his ſtatue: he aſſured him, that the city and kingdom which poſſeſſed it ſhould prove happy, glorious, and powerful. The young man having thus ſpoke, diſappeared, mounting up into heaven in a blaze of fire.

Ptolemy diſcovered his viſion to the prieſts; but finding them ignorant of Pontus, he had recourſe to an Athenian, who informed him that near Sinope, a city of Pontus, there was a temple much reſorted to by the natives, which was conſecrated to Pluto, where he had a ſtatue, near which ſtood that of a woman. Ptolemy neglecting the injunctions of the apparition, it again appeared to him in a menacing attitude; and the king immediately diſpatched ambaſſadors to the Serapian monarch, loaded with preſents. The king of Sinope conſented; but his ſubjects oppoſed the removal of the ſtatue. The god, however, of his own accord, as we are informed, conveyed himſelf to the ambaſſador's ſhip, and in three days landed in Alexandria. The ſtatue of Serapis was erected in one of the ſuburbs of the city, where a magnificent temple was afterwards reared.

The ſtatue of Serapis, according to Macrobius, was of a human form, with a baſket or buſhel on his head, ſignifying plenty; his right hand leaned on the head of a ſerpent, whoſe body was wound round a figure with three heads, of a dog, a lion, and a wolf; in his left hand he held a meaſure of a cubit length, as it were to take the height of the waters of the Nile. The figure of Serapis is found on many antient medals.

The famous temple of Serapis at Alexandria was deſtroyed by order of Theodoſius; and the celebrated ſtatue of this deity was broken in pieces, and its limbs carried firſt in triumph by the Chriſtians through the city, and then thrown into a fierce fire, kindled for that purpoſe in the amphitheatre. As the Egyptians aſcribed the overflowing of the Nile, to which was owing the fertility of their country, to the benign influence of their god Serapis, they concluded, that now he was deſtroyed, the river would no longer overflow, and that a general famine would enſue; but when they obſerved, on the contrary, that the Nile ſwelled to a greater height than had been known in the memory of man, and thereby produced an immenſe plenty of all kinds of proviſions, many of the pagans, renouncing the worſhip of idols, adored the God of the Chriſtians.

SERENADE, a kind of concert given in the night by a lover to his miſtreſs, under her window. Theſe ſometimes only conſiſt of inſtrumental muſic, but at other times voices are added: the muſic and ſongs compoſed for theſe occaſions are alſo called *ſerenades*.

SERENE, a title of honour given to ſeveral princes and to the principal magiſtrates of republics. The king of Britain, the republic and doge of Venice, and the children of the king of Spain, are called *moſt ſerene*; and when the pope or the ſacred college write to the emperor, to kings, or to the doge, they give them no other title. In like manner the emperor gives no other title to any king, except to the king of France.

SERENUS (Sammonicus), a celebrated phyſician in the

reigns of the emperor Severus and Caracalla, in and about the year 200. He wrote feveral treatifes on hiftory and the works of nature; but there is only one of them extant, which is a very indifferent poem on the Remedies of Difeafes. He was murdered at a feftival by the order of Caracalla. He had a library that contained 62,000 volumes, which Quintus Serenus Sammonicus his fon gave to Gordian the Younger, to whom he was preceptor.

SERES (Ptolemy); a people of the Farther Afia; bounded on the weft by Scythia extra Imaum; on the north and eaft, by Terra Incognita; and on the fouth, by India extra Gangem. According to thefe limits, their country anfwers nearly to Cathoy or North China. Other authors vary greatly in placing them, though the generality agree in placing them far to the eaft. Mela places them between the Indi and Scythæ; and perhaps beyond the Indi, if we diftinguifh the Sinæ from them. The antients commend them for their cotton manufactures, different from the produce of the bombyces or filk-worms, called *feres* by the Greeks; whence *ferica* "filk."

SERGE, a woollen quilted ftuff, manufactured on a loom with four treddles, after the manner of rateens, and other ftuffs that have the whale. The goodnefs of ferges is known by the quilting, as that of cloths by the fpinning. Of ferges there are various kinds, denominated either from the different qualities thereof, or from the places where they are wrought. The moft confiderable is the London ferge, now highly valued abroad, particularly in France, where a manufacture is carried on with confiderable fuccefs, under the title of *ferge façon de Londres*.

The method of making the London ferge we fhall now defcribe: For wool, the longeft is chofen for the warp, and the fhorteft for the woof. Before either kind is ufed, it is firft fcoured, by putting it in a copper of liquor, fomewhat more than lukewarm, compofed of three parts of fair water and one of urine. After having ftaid long enough therein for the liquor to diffolve, and take off the greafe, &c. it is ftirred brifkly about with a wooden peel; taken out of the liquor, drained, and wafhed in a running water, dried in the fhade, beaten with fticks on a wooden rack to drive out the coarfer duft and filth, and then picked clean with the hands. Thus far prepared, it is greafed with oil of olives, and the longeft part, deftined for the warp, is combed with large combs, heated in a little furnace for the purpofe. To clear off the oil again, the wool is put in a liquor compofed of hot water, with foap melted therein; whence being taken out, wrung, and dried, it is fpun on the wheel.

As to the fhorter wool, intended for the woof, it is only carded on the knee with fmall cards, and then fpun on the wheel, without being fcoured of its oil. It muft be remarked, that the thread for the warp is always to be fpun much finer, and better twifted than that of the woof. The wool both for the warp and the woof being fpun, and the thread divided into fkains, that of the woof is put on fpools (unlefs it have been fpun upon them) fit for the cavity or eye of the fhuttle; and that for the warp is wound on a kind of wooden bobbins to fit it for warping. When warped, it is ftiffened with a kind of fize, whereof that made of the fhreds of parchment is held the beft; and when dry is put on the loom.

When mounted on the loom, the workman raifing and lowering the threads (which are paffed through a reed), by means of four treddels placed underneath the loom, which he makes to act tranfverfely, equally, and alternately one after another, with his feet, in proportion as the threads are raifed and lowered, throws the fhuttle acrofs from one fide to the other; and each time that the fhuttle is thrown, and the thread of the woof is croffed between thofe of the warp, ftrikes it with the frame to which the reed is faftened, through thofe teeth the threads of the warp pafs; and this ftroke he repeats twice or thrice, or even more, till he judges the croffing of the ferge fufficiently clofe: thus he proceeds till the warp is all filled with woof.

The ferge now taken off the loom is carried to the fuller, who fcours it in the trough of his mill with a kind of fat earth, called *fuller's earth*, firft purged of all ftones and filth. After three or four hours fcouring, the fuller's earth is wafhed out in fair water, brought by little and little into the trough, out of which it is taken when all the earth is cleared; then, with a kind of iron pincers or pliers, they pull off all the knots, ends, ftraws, &c. fticking out on the furface on either fide; and then returning it into the fulling trough, where it is worked with water fomewhat more than lukewarm, with foap diffolved therein for near two hours: it is then wafhed out till fuch time as the water becomes quite clear, and there be no figns of foap left; then it is taken out of the trough, the knots, &c. again pulled off, and then put on the tenter to dry, taking care as faft as it dries to ftretch it out both in length and breadth till it be brought to its juft dimenfions. When well dried, it is taken off the tenter, and dyed, fhorn, and preffed.

SERGEANT, or SERJEANT *at Law*, or *of the Coif*, is the higheft degree taken at the common law, as that of Doctor is of the civil law; and as thefe are fuppofed to be the moft learned and experienced in the practice of the courts, there is one court appointed for them to plead in by themfelves, which is the common pleas, where the common law of England is moft ftrictly obferved: but they are not reftricted from pleading in any other court, where the judges, who cannot have that honour till they have taken the degree of ferjeant at law, call them *brothers*.

SERGEANT *at Arms*, or *Mace*, an officer appointed to attend the perfon of the king; to arreft traitors, and fuch perfons of quality as offend; and to attend the lord high fteward, when fitting in judgment on a traitor. Of thefe, by ftatute 13 Rich. II. cap. 6. there are not to be above 30 in the realm. There are now nine at court at 100l. *per annum* falary each; they are called the *king's fergeants at arms*, to diftinguifh them from others: they are created with great ceremony, the perfon kneeling before the king, his majefty lays the mace on his right fhoulder, and fays, *Rife up fergeant at arms and efquire for ever*. They have, befides, a patent for the office, which they hold for life. They have their attendance in the prefence-chamber, where the band of gentlemen-penfioners wait; and, receiving the king at the door, they carry the maces before him to the chapel door, whilft the band of penfioners ftand foremoft, and make a lane for the king, as they alfo do when the king goes to the houfe of lords.

There are four other fergeants at arms, created in the fame manner; one, who attends the lord chancellor; a fecond, the lord treafurer; a third, the fpeaker of the houfe of commons; and a fourth, the lord mayor of London on folemn occafions. They have a confiderable fhare of the fees of honour, and travelling charges allowed them when in waiting, *viz*. five fhillings per day when the court is within ten miles of London, and ten fhillings when twenty miles from London. The places are in the lord chamberlain's gift.

There are alfo fergeants of the mace of an inferior kind, who attend the mayor or other head officer of a corporation.

Common SERGEANT, on officer in the city of London, who attends the lord mayor and court of aldermen on court days, and is in council with them on all occafions, within and without the precincts or liberties of the city. He is to take care of orphans eftates, either by taking account of them, or to fign their indentures, before their paffing the lord mayor and court of aldermen: and he was likewife to let and manage the orphans eftates, according to his judgment, to their beft advantage. See RECORDER.

SERGEANT, in war, is an uncommiffioned officer in a company of foot or troop of dragoons, armed with an halbert, and appointed to fee difcipline obferved, to teach the foldiers the exercife of their arms, to order, ftraiten, and form their ranks, files, &c. He receives the orders from the adjutant, which he com-

municates to his officers. Each company generally has two ſergeants.

SERGEANTY *(Serjeantia)*, ſignifies, in law, a ſervice that cannot be due by a tenant to any lord but the king; and this is either *grand ſergeanty*, or *petit*. The firſt is a tenure by which the one holds his lands of the king by ſuch ſervices as he ought to do in perſon to the king at his coronation; and may alſo concern matters military, or ſervices of honour in peace; as to be the king's butler, carver, &c. *Petit ſergeanty* is where a man holds lands of the king to furniſh him yearly with ſome ſmall thing towards his wars; and in effect payable as rent. Though all tenures are turned into *ſoc.age* by the 12 Car. II. cap. 24. yet the honorary ſervices of grand ſergeanty ſtill remain, being therein excepted. See KNIGHT-*Service*.

SERIES, in general, denotes a continual ſucceſſion of things in the ſame order, and having the ſame relation or connection with each other: in this ſenſe we ſay, a ſeries of emperors, kings, biſhops, &c. In natural hiſtory, a ſeries is uſed for an order or ſubdiviſion of ſome claſs of natural bodies; comprehending all ſuch as are diſtinguiſhed from the other bodies of that claſs, by certain characters which they poſſeſs in common, and which the reſt of the bodies of that caſt have not.

SERIES, in arithmetic and algebra, a rank or number of terms in ſucceſſion, increaſing or diminiſhing in ſome certain ratio or proportion. There are ſeveral kinds of ſeries; as *arithmetical*, *geometrical*, *infinite*, &c. See theſe ſubjects in our article ALGEBRA.

We refer thoſe who require more information to the following authors.—Bertrand's *Developpement*, &c. vol. 1; Dodſon's Mathematical Repoſitory, vol. 1; Emerſon's Algebra; Appendix to Graveſend's Algebra; Hutton's Paper on Cubic Equations and Infinite Series, in the Philoſophical Tranſactions for 1780; Maclaurin's Fluxions; Malcolm's Arithmetic; Maſeres's Annuities; and *Scriptores Logarithmici*, &c.; De Moivre's Doctrine of Chances, and a Paper by the ſame author in the Philoſophical Tranſactions, No. 240; Simpſon's Algebra, Eſſays, Fluxions, and Miſcellanies; Sterling's *Summatio et Interpolatio Serierum*; *Syntagma Matheſios*, &c.

SERINGAPATAM, a city of Hindoſtan, capital of Myſore, ſituate in an iſland of the river Cauvery. The mauſoleum of Hyder Ali is one of the moſt magnificent objects in the place: it is on the ſouth angle of the iſland, ſurrounded by a grove of beautiful cypreſs trees. Seringapatam is ſtrongly fortified; notwithſtanding which, lord Cornwallis, in 1792, here compelled Tippoo Sultan to ſign a treaty, by which he ſacrificed half of his dominions, and a vaſt ſum of money, to the Eaſt India Company and their allies. It is 290 miles W. by S. of Madras. E. lon. 76. 46. N. lat. 12. 31.

SERIOLA, in botany: A genus of plants belonging to the order of polygamia æqualis, and to the claſs of ſyngeneſia; and in the natural ſyſtem ranged under the 49th order, *Compoſitæ*. The receptacle is paleaceous; the calyx ſimple; and the pappus is ſomewhat plumoſe. There are four ſpecies; 1. The Levigata. 2. Æthnenſis. 3. Cretenſis. 4. Urens. The firſt is a native of the iſland of Candia, and flowers in July and Auguſt; the ſecond is a native of Italy; and the fourth is a native of the ſouth of Europe.

SERIPHIUM, in botany; a genus of plants belonging to the order of monogamia, and to the claſs of ſyngeneſia. The calyx is imbricated; the corolla is monopetalous and regular, with one oblong ſeed under it. There is only one ſpecies, the *cinereum*, which is a native of the Cape of Good Hope.

SERIPHUS (anc. geog.), one of the Cyclades or iſlands in the Ægean ſea, called *Saxum Seriphium* by Tacitus, as if all a rock; one of the uſual places of baniſhment among the Romans. The people, *Seriphii*, who, together with the Siphnii, joined Greece againſt Xerxes, were almoſt the only iſlanders who refuſed to give him earth and water in token of ſubmiſſion, (Herodotus). *Seriphia Rana*, a proverbial ſaying concerning a perſon who can neither ſing nor ſay; frogs in this iſland being ſaid to be dumb, (Pliny).

SERMON, a diſcourſe delivered in public, for the purpoſe of religious inſtruction and improvement.

Funeral SERMON. See FUNERAL *Orations*.

SERON OF ALMONDS, is the quantity of two hundred weight; of aniſe ſeed, it is from three to four hundred; of Caſtile ſoap, from two hundred and a half to three hundred and three quarters.

SEROSITY, in medicine, the watery part of the blood.

SERPENS, in aſtronomy, a conſtellation in the nothern hemiſphere, called more particularly *Serpens Ophiuchi*. The ſtars in the conſtellation Serpens, in Ptolemy's catalogue, are 18; in Tycho's, 13; in Hevelius's, 22; and in the Britannic catalogue, 64.

SERPENS *Biceps*, or *Double-headed Snake*; a monſter of the ſerpent kind, there being no permanent ſpecies of this conformation. That repreſented in 2d pl. 7, and copied from Edwards, came from the iſland of Barbadoes; and was ſaid to have been taken out of an egg of the ſize of a ſmall pullet's egg by a man who found it under ground as he was digging. The heads were not in a horizontal poſition when the ſnake lay on its belly, but inclined to each other on their under-ſides, leaving an opening for the throat to come in between the two heads underneath, as is expreſſed at A. The upper ſide, for the whole length, was covered with ſmall ſcales falling one over another; the belly was covered with ſingle ſcales running acroſs it, in the form of half rings. It was all over of a yellowiſh colour, without any ſpots or variation. Mr. Edwards alſo informs us that a perſon brought to him a common Engliſh ſnake, which had two heads quite ſeparate from each other, the necks parting about an inch from the head.

SERPENT, SERPENS, in zoology, a general term for all amphibious animals without legs. See COLUBER, BOA, ANGUIS, CÆCILIA, AMPHISBÆNA, CROTALUS, &c. The ſerpent has from the beginning been the enemy of man; and it has hitherto continued to terrify and annoy him, notwithſtanding all the arts which have been practiſed to deſtroy it. Formidable in itſelf, it deters the invader from the purſuit; and from its figure, capable of finding ſhelter in a little ſpace, it is not eaſily diſcovered by thoſe who would venture to try the encounter. Thus poſſeſſed at once of potent arms and inacceſſible or ſecure retreats, it baffles all the arts of man, though ever ſo earneſtly bent upon its deſtruction. For this reaſon, there is ſcarce a country in the world that does not ſtill give birth to this poiſonous brood, that ſeem formed to quell human pride, and repreſs the boaſts of ſecurity. Mankind have driven the lion, the tiger, and the wolf, from their vicinity; but the ſnake and the viper ſtill defy their power.

Their numbers, however, are thinned by human aſſiduity; and it is poſſible ſome of the kinds are wholly deſtroyed. In none of the countries of Europe are they ſufficiently numerous to be truly terrible. The various malignity that has been aſcribed to European ſerpents of old, is now utterly unknown; there are not above three or four kinds that are dangerous, and their poiſon operates in all in the ſame manner. The drowſy death, the ſtarting of the blood from every pore, the inſatiable and burning thirſt, the melting down the ſolid maſs of the whole form into one heap of putrefaction, ſaid to be occaſioned by the bites of African ſerpents, are horrors with which we are entirely unacquainted.

But though we have thus reduced theſe dangers, having been incapable of wholly removing them, in other parts of the world they ſtill rage with all their antient malignity. In the warm countries that lie within the tropic, as well as in the cold regions of the north, where the inhabitants are few, the ſerpents propagate in equal proportion. But of all countries, thoſe regions have them in the greateſt abundance where the fields are unpeopled and fertile, and where the climate ſupplies warmth and

humidity. All along the swampy banks of the river Niger or Oroonoko, where the sun is hot, the forests thick, and the men but few, the serpents cling among the branches of the trees in infinite numbers, and carry on an unceasing war against all other animals in their vicinity. Travellers have assured us, that they have often seen large snakes twining round the trunk of a tall tree, encompassing it like a wreath, and thus rising and descending at pleasure. We are not, therefore, to reject as wholly fabulous the accounts left us by the antients of the terrible devastations committed by a single serpent. It is probable, in early times, when the arts were little known, and mankind were but thinly scattered over the earth, that serpents, continuing undisturbed possessors of the forest, grew to an amazing magnitude; and every other tribe of animals fell before them. It then might have happened, that serpents reigned the tyrants of a district for centuries together. To animals of this kind, grown by time and rapacity to 100 or 150 feet in length, the lion, the tiger, and even the elephant itself, were but feeble opponents. That horrible fœtor, which even the commonest and the most harmless snakes are still found to diffuse, might in these larger ones become too powerful for any living being to withstand; and while they preyed without distinction, they might thus also have poisoned the atmosphere around them. In this manner, having for ages lived in the hidden and unpeopled forest, and finding, as their appetites were more powerful, the quantity of their prey decreasing, it is possible they might venture boldly from their retreats into the more cultivated parts of the country, and carry consternation among mankind, as they had before desolation among the lower ranks of nature. We have many histories of antiquity, presenting us such a picture; and exhibiting a whole nation sinking under the ravages of a single serpent. At that time man had not learned the art of uniting the efforts of many to effect one great purpose. Opposing multitudes only added new victims to the general calamity, and increased mutual embarrassment and terror. The animal was therefore to be singly opposed by him who had the greatest strength, the best armour, and the most undaunted courage. In such an encounter, hundreds must have fallen; till one, more lucky than the rest, by a fortunate blow or by taking the monster in its torpid interval, and surcharged with spoil, might kill, and thus rid his country of the destroyer. Such was the original occupation of heroes; and those who first obtained that name, from their destroying the ravagers of the earth, gained it much more deservedly than their successors, who acquired their reputation only for their skill in destroying each other. But as we descend into more enlightened antiquity, we find these animals less formidable, as being attacked in a more successful manner. We are told, that while Regulus led his army along the banks of the river Bagrada in Africa, an enormous serpent disputed his passage over. We are assured by Pliny, who says that he himself saw the skin, that it was 120 feet long, and that it had destroyed many of the army. At last, however, the battering engines were brought out against it; and these assailing it at a distance, it was soon destroyed. Its spoils were carried to Rome, and the general was decreed an ovation for his success. There are, perhaps, few facts better ascertained in history than this: an ovation was a remarkable honour; and was given only for some signal exploit that did not deserve a triumph: no historian would offer to invent that part of the story at least, without being subject to the most shameful detection. The skin was kept for several years after in the Capitol; and Pliny says he saw it there. At present, indeed, such ravages from serpents are scarce seen in any part of the world; not but that, in Africa and America, some of them are powerful enough to brave the assaults of men to this day.

Nequeunt expleri corda tuendo
Terribiles oculos villosaque setis pectore.

If we take a survey of serpents in general, they have marks by which they are distinguished from all the rest of animated nature. They have the length and the suppleness of the eel, but want fins to swim with; they have the scaly covering and pointed tail of the lizard, but they want legs to walk with; they have the crawling motion of the worm, but unlike that animal they have lungs to breathe with: like all the reptile kind, they are resentful when offended; and nature has supplied them with terrible arms to revenge every injury.

Though they are possessed of very different degrees of malignity, yet they are formidable to man, and have a strong similitude of form to each other. With respect to their conformation, all serpents have a very wide mouth in proportion to the size of the head: and, what is very extraordinary, they can gape and swallow the head of another animal which is three times as big as their own. However, it is no way surprising that the skin of the snake should stretch to receive so large a morsel; the wonder seems how the jaws could take it in. To explain this, it must be observed, that the jaws of this animal do not open as ours, in the manner of a pair of hinges, where bones are applied to bones and play upon one another: on the contrary, the serpent's jaws are held together at the roots by a stretching muscular skin; by which means they open as widely as the animal chooses to stretch them, and admit of a prey much thicker than the snake's own body. The throat, like stretching leather, dilates to admit the morsel; the stomach receives it in part, and the rest remains in the gullet, till putrefaction and the juices of the serpent's body unite to dissolve it.

Some serpents have fangs or canine teeth, and others are without them. The teeth in all are crooked and hollow, and, by a peculiar contrivance, are capable of being erected or depressed at pleasure.

The eyes of all serpents are small, if compared to the length of the body; and though differently coloured in different kinds, yet the appearance of all is malign and heavy; and, from their known qualities, they strike the imagination with the idea of a creature meditating mischief. In some, the upper eye-lid is wanting, and the serpent winks only with that below; in others, the animal has a nictitating membrane or skin, resembling that which is found in birds, which keeps the eye clean and preserves the sight. The substance of the eye in all is hard and horny; the crystalline humour occupying a great part of the globe.

The holes for hearing are very visible in all: but there are no conduits for smelling; though it is probable that some of them enjoy that sense in tolerable perfection.

In all these animals the tongue is long and forky. It is composed of two long fleshy substances, which terminate in sharp points, and are very pliable. At the root it is connected very strongly to the neck by two tendons, that give it a variety of play. Some of the viper kind have tongues a fifth part of the length of their bodies; they are continually darting them out; but they are entirely harmless, and only terrify those who are ignorant of the real situation of their poison.

If from the jaws we go on to the gullet, we shall find it very wide for the animal's size, and capable of being distended to a great degree; at the bottom of this lies the stomach, which is not so capacious, and receives only a part of the prey, while the rest continues in the gullet for digestion. When the substance in the stomach is dissolved into chyle, it passes into the intestines, and from thence goes to nourishment, or to be excluded by the vent.

Like most other animals, serpents are furnished with lungs, which we suppose are serviceable in breathing, though we cannot perceive the manner in which this operation is performed; for though serpents are often seen apparently to draw in their breath, yet we cannot find the smallest signs of their ever respiring it again. Their lungs, however, are long and large, and doubtless are necessary to promote their languid circulation. The heart

is formed as in the tortoife, the frog, and the lizard kinds, fo as to work without the affiftance of the lungs. It is fingle; the greateft part of the blood flowing from the great vein to the great artery by the fhorteft courfe. By this contrivance of nature we eafily gather two confequences; that fnakes are amphibious, being equally capable of living on land and in the water; and that alfo they are torpid in winter, like the bat, the lizard, and other animals formed in the fame manner.

The vent in thefe animals ferves for the emiffion of the urine and the fæces, and for the purpofes of generation. The inftrument of generation in the male is double; being forked like the tongue: the ovaries in the female are double alfo; and the aperture is very large, in order to receive the double inftrument of the male. They copulate in their retreats; and it is faid by the antients, that in this fituation they appear like one ferpent with two heads.

As the body of this animal is long, flender, and capable of bending in every direction, the joints in the back-bone are numerous beyond what one would imagine. In the generality of quadrupeds, they amount to not above 30 or 40; in the ferpent kind they amount to 145 from the head to the vent, and 25 more from that to the tail. The number of thefe joints muft give the back-bone a furprifing degree of pliancy; but this is ftill increafed by the manner in which each of thefe joints is locked into the other. In man and quadrupeds, the flat furfaces of the bones are laid one againft the other, and bound tight by finews; but in ferpents, the bones play one within the other like ball and focket, fo that they have full motion upon each other in every direction.

Though the number of joints in the back-bone is great, yet that of the ribs is ftill greater; for, from the head to the vent, there are two ribs to every joint, which makes their number 290 in all. Thefe ribs are furnifhed with mufcles, four in number; which being inferted into the head, run along to the end of the tail, and give the animal great ftrength and agility in all its motions.

The fkin alfo contributes to its motions, being compofed of a number of fcales, united to each other by a tranfparent membrane, which grows harder as it grows older, until the animal changes, which is generally twice a-year. This cover then burfts near the head, and the ferpent creeps from it by an undulatory motion, in a new fkin, much more vivid than the former. If the old flough be then viewed, every fcale will be diftinctly feen like a piece of net-work, and will be found greateft where the part of the body they covered was largeft.

There is much geometrical neatnefs in the difpofal of the ferpent's fcales, for affifting the animal's finuous motion. As the edges of the foremoft fcales lie over the ends of their following fcales, fo thofe edges, when the fcales are erected, which the animal has a power of doing in a fmall degree, catch in the ground like the nails in the wheel of a chariot, and promote and facilitate the animal's progreffive motion. The erecting thefe fcales is by means of a multitude of diftinct mufcles with which each is fupplied, and one end of which is tacked each to the middle of the foregoing.

In fome of the ferpent kind there is the exacteft fymmetry in thefe fcales: in others they are difpofed more irregularly. In fome there are larger fcales on the belly, and often anfwering to the number of ribs; in others, however, the animal is without them. Upon this flight difference, Linnæus has founded his diftinctions of the various claffes of the ferpent tribe.

When we come to compare ferpents with each other, the firft great diftinction appears in their fize; no other tribe of animals differing fo widely in this particular. This tribe of animals, like that of fifhes, feems to have no bounds put to their growth: their bones are in a great meafure cartilaginous, and they are confequently capable of great extenfion: the older, therefore, a ferpent becomes, the larger it grows; and as they feem to live to a great age, they arrive at an enormous fize.

Leguat affures us, that he faw one in Java that was 50 feet long. Carli mentions their growing to above 40 feet; and we have now the fkin of one in the Britifh Mufæum that meafures 32. Mr. Wentworth, who had large concerns in the Berbices in America, affures us, that in that country they grow to an enormous length. He one day fent out a foldier, with an Indian, to kill wild-fowl for the table: and they accordingly went fome miles from the fort: in purfuing their game, the Indian, who generally marched before, beginning to tire, went to reft himfelf on the fallen trunk of a tree, as he fuppofed; but juft as he was going to fit down, the enormous monfter began to move; and the poor favage perceiving that he had approached a boa, the greateft of all the ferpent kind, dropped down in an agony. The foldier, who perceived at fome diftance what had happened, levelled at the ferpent's head, and by a lucky aim fhot it dead: however, he continued his fire until he was affured that the animal was killed; and then going up to refcue his companion, who was fallen motionlefs by its fide, he, to his aftonifhment, found him dead likewife, being killed by the fright. Upon his return to the fort, and telling what had happened, Mr. Wentworth ordered the animal to be brought up, when it was meafured, and found to be 36 feet long. He had the fkin ftuffed, and then fent to Europe as a prefent to the prince of Orange, in whofe cabinet it is now to be feen at the Hague; but the fkin is fhrunk, by drying, two or three feet. In the Eaft Indies they grow alfo to an enormous fize, particularly in the ifland of Java, where we are affured that one of them will deftroy and devour a buffalo. See Boa.

But it is happy for mankind that the rapacity of thefe frightful creatures is often their punifhment; for whenever any of the ferpent kind have gorged themfelves in this manner, whenever their body is feen particularly diftended with food, they then become torpid, and may be approached and deftroyed with fafety. Patient of hunger to a furprifing degree, whenever they feize and fwallow their prey, they feem, like furfeited gluttons, unwieldy, ftupid, helplefs, and fleepy: they at that time feek fome retreat, where they may lurk for feveral days together, and digeft their meal in fafety; the fmalleft effort at that time is capable of deftroying them; they can fcarce make any refiftance; and they are equally unqualified for flight or oppofition: that is the happy opportunity of attacking them with fuccefs; at that time the naked Indian himfelf does not fear to affail them. But it is otherwife when this fleepy interval of digeftion is over: they then iffue, with famifhed appetites, from their retreats, and with accumulated terrors, every animal of the foreft flying before them.

Carli defcribes the long ferpent of Congo, making its track through the tall grafs, like mowers in a fummer's day. He could not without terror behold whole lines of grafs lying levelled under the fweep of its tail. In this manner it moved forward with great rapidity, until it found a proper fituation frequented by its prey; there it continued to lurk, in patient expectation; and would have remained for weeks together, had it not been difturbed by the natives.

Other creatures have a choice in their provifion: but the ferpent indifcriminately preys upon all; the buffalo, the tiger, and the gazelle. One would think that the porcupine's quills might be fufficient to protect it: but whatever has life, ferves to appeafe the hunger of thefe devouring creatures: porcupines, with all their quills, have frequently been found in their ftomachs when killed and opened; nay, they moft frequently are feen to devour each other.

A life of favage hoftility in the foreft, offers the imagination one of the moft tremendous pictures in nature. In thofe burning countries where the fun dries up every brook for hundreds of miles round; when what had the appearance of a great river in

the rainy ſeaſon, becomes, in ſummer, one dreary bed of ſand; in thoſe countries, a lake that is never dry, or a brook that is perennial, is conſidered by every animal as the greateſt convenience in nature. When they have diſcovered this, no dangers can deter them from attempting to ſlake their thirſt. Thus the neighbourhood of a rivulet, in the heart of the tropical continents, is generally the place where all the hoſtile tribes of nature draw up for the engagement. On the banks of this little envied ſpot, thouſands of animals of various kinds are ſeen venturing to quench their thirſt, or preparing to ſeize their prey. The elephants are perceived in a long line, marching from the darker parts of the foreſt; the buffalos are there, depending upon numbers for ſecurity; the gazelles relying ſolely upon their ſwiftneſs; the lion and tiger waiting a proper opportunity to ſeize; but chiefly the larger ſerpents are upon guard there, and defend the acceſſes of the lake. Not an hour paſſes without ſome dreadful combat; but the ſerpent, defended by its ſcales, and naturally capable of ſuſtaining a multitude of wounds, is, of all others, the moſt formidable. It is the moſt wakeful alſo; for the whole tribe ſleep with their eyes open, and are conſequently for ever upon the watch; ſo that, till their rapacity is ſatisfied, few other animals will venture to approach their ſtation.

But though theſe animals are of all others the moſt voracious; and though the morſel which they ſwallow without chewing, is greater than what any other creature, either by land or water, can devour; yet no animals upon earth bear abſtinence ſo long as they. A ſingle meal, with many of the ſnake kind, ſeems to be the adventure of a ſeaſon; it is an occurrence, of which they have been for weeks, nay ſometimes for months, in patient expectation. When they have ſeized their prey, their induſtry for ſeveral weeks is entirely diſcontinued; the fortunate capture of an hour often ſatisfies them for the remaining period of their annual activity. As their blood is colder than that of moſt other terreſtrial animals, and as it circulates but ſlowly through their bodies, ſo their powers of digeſtion are but feeble. Their prey continues, for a long time, partly in the ſtomach, partly in the gullet, and is often ſeen in part hanging out of the mouth. In this manner it digeſts by degrees; and in proportion as the part below is diſſolved, the part above is taken in. It is not therefore till this tedious operation is entirely performed, that the ſerpent renews its appetite and its activity. But ſhould any accident prevent it from iſſuing once more from its cell, it ſtill can continue to bear famine, for weeks, months, nay for years together. Vipers are often kept in boxes for ſix or eight months, without any food whatever; and there are little ſerpents ſometimes ſent over to Europe from Grand Cairo, that live for ſeveral years in glaſſes, and never eat at all, nor even ſtain the glaſs with their excrements.

If, leaving the conſideration of their appetites, we come to compare ſerpents as to their voices, ſome are found ſilent, ſome have a peculiar cry; but hiſſing is the ſound which they moſt commonly ſend forth, either as a call to their kind, or as a threat to their enemies. In the countries where they abound, they are generally ſilent in the middle of the day, when they are obliged to retire from the heat of the climate; but as the cool of the evening approaches, they are then heard iſſuing from their cells, with continued hiſſings; and ſuch is the variety of their notes, that ſome have aſſured us they very much reſemble the muſic of an Engliſh grove. This ſome will hardly credit: at any rate, ſuch notes, however pleaſing, can give but very little delight, when we call to mind the malignity of the minſtrel. If conſidered, indeed, as they anſwer the animal's own occaſions, they will be found well adapted to its nature, and fully anſwering the purpoſes of terrifying ſuch as would venture to offend it.

With reſpect to motion, ſome ſerpents, particularly thoſe of the viper kind, move ſlowly; while others dart with amazing ſwiftneſs. The motion in all is ſimilar; but the ſtrength of body in ſome gives a very different appearance. The viper, that is but a ſlow feeble-bodied animal, makes way in a heavy undulating manner; advancing its head, then drawing up its tail behind, and bending the body into a bow; then from the ſpot where the head and tail were united, advancing the head forward as before. This, which is the motion of all ſerpents, is very different from that of the earth-worm or the naked ſnail. The ſerpent, as was ſaid above, has a back-bone with numerous joints; and this bone the animal has the power of bending in every direction, but without being able to ſhorten or lengthen it at pleaſure. The earth-worm, on the other hand, has no back-bone; but its body is compoſed of rings, which, like a barber's puff, it can lengthen or ſhorten as it finds neceſſary. The earth-worm, therefore, in order to move forward, lengthens the body; then by the fore part clings to the ground where it has reached, and then contracts and brings up its rear: then, when the body is thus ſhortened, the fore-part is lengthened again for another progreſſion, and ſo on. The ſerpent, inſtead of ſhortening the body, bends it into an arch; and this is the principal difference between ſerpentine and vermicular progreſſion.

We have inſtanced this motion in the viper, as moſt eaſily diſcerned; but there are many ſerpents that dart with ſuch amazing ſwiftneſs, that they appear rather to leap than crawl. It is moſt probable, however, that no ſerpent can dart upon even ground further than its own length at one effort. Our fears indeed may increaſe the force of their ſpeed, which is ſometimes found ſo fatal. We are told by ſome, that they will dart to a very great diſtance; but this we have never been able to aſcertain. The manner of progreſſion in the ſwifteſt ſerpent we know, which is the jaculus, is by inſtantly coiling itſelf upon its tail, and darting from thence to its full extent; then carrying the tail, as quick as lightning, to the head; coiling and darting again: and by this means proceeding with extreme rapidity, without ever quitting the ground. Indeed, if we conſider the length and the weakneſs of the back-bone in all theſe animals; if we regard the make of the vertebræ, in which we ſhall find the junctures all formed to give play, and none to give power; we cannot be of opinion that they have a faculty of ſpringing from the ground, as they entirely want a *fulcrum*, if we may ſo expreſs it, from whence to take their ſpring; the whole body being compoſed of unſupported muſcles and joints that are yielding.

Though all ſerpents are amphibious, ſome are much fonder of the water than others; and, though deſtitute of fins or gills, remain at the bottom, or ſwim along the ſurface with great eaſe. From their internal ſtructure, we ſee how well adapted they are for either element; and how capable their blood is of circulating at the bottom, as freely as in the frog or the tortoiſe. They can, however, endure to live in freſh water only; for ſalt is an effectual bane to the whole tribe. The greateſt ſerpents are moſt uſually found in freſh water, either chooſing it as their favourite element, or finding their prey in ſuch places in the greateſt abundance. But that all will live and ſwim in liquids, appears from an experiment of Redi; who put a ſerpent into a large glaſs veſſel of wine, where it lived ſwimming about ſix hours; though, when it was by force immerſed and put under that liquid, it lived only one hour and a half. He put another in common water, where it lived three days; but when it was kept under water, it lived only about 12 hours. Their motion there, however, is perfectly the reverſe of what it is upon land; for, in order to ſupport themſelves upon an element lighter than their bodies, they are obliged to increaſe their ſurface in a very artificial manner. On earth their windings are perpendicular to the ſurface; in water they are parallel to it: in other words, if a perſon ſhould wave his hand up and down, it will give an idea of the animal's progreſs on land; if to the right and left, it will give ſome idea of its progreſs on the water.

Some ſerpents have a moſt horrible fœtor attending them, which is alone capable of intimidating the brave. This proceeds from two glands near the vent, like thoſe in the weaſel or polecat; and, like thoſe animals in proportion as they are excited by rage or by fear, the ſcent grows ſtronger. It would ſeem, however, that ſuch ſerpents as are moſt venemous are leaſt offenſive in this particular; ſince the rattleſnake and the viper have no ſmell whatever; nay, we are told, that at Calecut and Cranganon, in the Eaſt Indies, there are ſome very noxious ſerpents, who are ſo far from being diſagreeable, that their excrements are ſought after, and kept as the moſt pleaſing perfume. The Eſculapian ſerpent is alſo of this number.

Some ſerpents bring forth their young alive, as the viper; ſome bring forth eggs, which are hatched by the heat of their ſituation, as the common black ſnake, and the majority of the ſerpent tribe. When a reader ignorant of anatomy is told thot ſome of thoſe animals produce their young alive, and that ſome produce eggs only, he is apt to ſuppoſe a very great difference in the internal conformation, which makes ſuch a variety in the manner of bringing forth. But this is not the caſe: theſe animals are internally alike, in whatever manner they produce their young; and the variety in their bringing forth is rather a ſlight than a real diſcrimination. The only difference is, that the viper hatches her eggs, and brings them to maturity, within her body; the ſnake is more premature in her productions, aad ſends her eggs into the light ſome time before the young ones are capable of leaving the ſhell. Thus, if either are opened, the eggs will be found in the womb, covered with their membranous ſhell, and adhering to each other like large beads on a ſtring. In the eggs of both the young oncs will be found, though at different ſtages of maturity: thoſe of the viper will crawl and bite in the moment the ſhell that incloſes them is broke open; thoſe of the ſnake are not yet arrived at their perfect form.

Father Labat took a ſerpent of the viper kind that was nine feet long, and ordered it to be opened in his preſence. He then ſaw the manner in which the eggs of theſe animals lie in the womb. In this creature there were ſix eggs, each of the ſize of a gooſe egg, but longer, more pointed, and covered with a membranous ſkin, by which alſo they were united to each other. Each of theſe eggs contained from 13 to 15 young ones, about ſix inches long, and as thick as a gooſe quill. Though the female from whence they were taken was ſpotted, the young ſeemed to have a variety of colours very different from the parent; and this led the traveller to ſuppoſe that the colour was no characteriſtic mark among ſerpents. Theſe little miſchievous animals were no ſooner let looſe from the ſhell, than they crept about, and put themſelves into a threatening poſture, coiling themſelves up and biting the ſtick with which he was deſtroying them. In this manner he killed 74 young ones; thoſe that were contained in one of the eggs eſcaped at the place where the female was killed by the burſting of the egg and their getting among the buſhes.

The laſt diſtinction that we ſhall mention, but the moſt material among ſerpents, is, that ſome are venemous, and ſome inoffenſive. The various calamities that the poiſon of ſerpents is capable of producing, are not only inflicted by the animal itſelf, but by men more miſchievous even than ſerpents, who prepare their venom to deſtroy each other. With this the ſavages poiſon their arms, and alſo prepare their revengeful potions. The antients were known to preſerve it for the purpoſes of ſuicide; and even among ſemi-barbarous countries at this day, the venom of ſnakes is uſed as a philtre.

But though the poiſon be juſtly terrible to us, it has been given to very good purpoſes for the animal's own proper ſupport and defence. Without this, ſerpents, of all other animals, would be the moſt expoſed and defenceleſs; without feet for eſcaping a purſuit, without teeth capable of inflicting a dangerous wound, or without ſtrength for reſiſtance; incapable, from their ſize, of finding ſecurity in very ſmall retreats like the earth-worm, and diſguſting all from their deformity, nothing was left for them but a ſpeedy extirpation. But furniſhed as they are with powerful poiſon, every rank of animals approach them with dread, and never ſeize them but at an advantage. Nor is this all the benefit they derive from it. The malignity of a few ſerves for the protection of all. Though not above a tenth of their number are actually venemous, yet the ſimilitude they all bear to each other excites a general terror of the whole tribe; and the uncertainty of their enemies in which the poiſon chiefly reſides, makes even the moſt harmleſs formidable. Thus Providence ſeems to have acted with double precaution: it has given ſome of them poiſon for the general defence of a tribe naturally feeble; but it has thinned the numbers of thoſe which are venemous, leſt they ſhould become too powerful for the reſt of animated nature.

From theſe noxious qualities in the ſerpent kind, it is no wonder that not only man, but beaſts and birds, carry on an unceaſing war againſt them. The ichneumon of the Indians, and the peccary of America, deſtroy them in great numbers. Theſe animals have the art of ſeizing them near the head; and it is ſaid that they can ſkin them with great dexterity. The vulture and the eagle alſo prey upon them in great abundance; and often, ſouſing down from the clouds, drop upon a long ſerpent, which they ſnatch up ſtruggling and writhing in the air. Dogs alſo are bred up to oppoſe them. Father Feuillée tells us, that being in the woods of Martinico, he was attacked by a large ſerpent, which he could not eaſily avoid, when his dog immediately came to his relief, and ſeized the aſſailant with great courage. The ſerpent entwined him, and preſſed him ſo violently, that the blood came out of his mouth, and yet the dog never ceaſed till he had torn it to pieces. The dog was not ſenſible of his wounds during the fight; but ſoon after his head ſwelled prodigiouſly, and he lay on the ground as dead. But his maſter having found hard by a banana tree, he applied its juice, mixed with treacle, to the wounds; which recovered the dog, and quickly healed his ſores.

The Pſylli of old were famous for charming and deſtroying ſerpents. Some moderns pretend to the ſame art. Caſaubon ſays that he knew a man who could at any time ſummon 100 ſerpents together, and draw them into the fire. Upon a certain occaſion, when one of them, bigger than the reſt, would not be brought in, he only repeated his charm, and it came forward, like the reſt, to ſubmit to the flames. Philoſtratus deſcribes particularly how the Indians charm ſerpents. "They take a ſcarlet robe, embroidered with golden letters, and ſpread it before a ſerpent's hole. The golden letters have a faſcinating power; and by looking ſteadfaſtly, the ſerpent's eyes are overcome and laid aſleep." Theſe and many other feats have often been practiſed upon theſe animals by artful men, who had firſt prepared the ſerpents for their exerciſe, and then exhibited them as adventitiouſly aſſembled at their call. In India there is nothing ſo common as dancing ſerpents, which are carried about in a broad flat veſſel, ſomewhat reſembling a ſieve. Theſe erect and put themſelves in motion at the word of command. When their keeper ſings a ſlow tune, they ſeem by their heads to keep time; when he ſings a quicker meaſure, they appear to move more briſk and lively. All animals have a certain degree of docility; and we find that ſerpents themſelves can be brought to move and approach at the voice of their maſter. From this trick, ſucceſsfully practiſed before the ignorant, it is moſt probable have ariſen moſt of the boaſted pretenſions which ſome have made to charming of ſerpents: an art to which the native Americans pretend at this very day, but the

existence of which we are assured of by Mr. Hasselquist amongst the native Egyptians.

Though the generality of mankind regard this formidable race with horror, yet there have been some nations, and there are some at this day, that consider them with veneration and regard. The adoration paid by the antient Egyptians to a serpent, is well known: many of the nations at present along the western coast of Africa retain the same unaccountable veneration. Upon the gold and slave coasts, a stranger, upon entering the cottages of the natives, is often surprised to see the roof swarming with serpents, that cling there without molesting and unmolested by the natives. But his surprise will increase upon going further southward to the kingdom of Widah, when he finds that a serpent is the god of the country. This animal, which travellers describe as a huge overgrown creature, has its habitation, its temple, and its priests. These impress the vulgar with an opinion of its virtues; and numbers are daily seen to offer not only their goods, their provisions, and their prayers, at the shrine of their hideous deity, but also their wives and daughters. These the priests readily accept of, and, after some days of penance, return them to their suppliants, much benefited by the serpent's supposed embraces.

Serpent, a musical instrument, serving as a bass to the cornet, or *small shawn*, to sustain a chorus of singers in a large edifice. It has its name *serpent* from its figure, as consisting of several folds or wreaths, which serve to reduce its length, which would otherwise be six or seven feet. It is usually covered with leather, and consists of three parts, a mouth piece, a neck, and a tail. It has six holes, by means whereof it takes in the compass of two octaves. Mersennus, who has particularly described this instrument, mentions some peculiar properties of it, *e. gr.* that the sound of it is strong enough to drown 20 robust voices, being animated merely by the breath of a boy, and yet the sound of it may be attempered to the softness of the sweetest voice. Another peculiarity to this instrument is, that great as the distance between the third and fourth hole appears, yet, whether the third hole be open or shut, the difference is but a tone.

Serpent, in mythology, was a very common symbol of the sun, and he is represented biting his tail, and with his body formed into a circle, in order to indicate the ordinary course of this luminary, and under this form it was an emblem of time and eternity. The serpent was also the symbol of medicine, and of the gods which presided over it, as of Apollo and Æsculapius: and this animal was the object of very antient and general worship, under various appellations and characters. In most of the antient rites we find some allusion to the serpent, under the several titles of Ob, Ops, Python, &c. This idolatry is alluded to by Moses, (Lev. xx. 27.) The woman at Endor who had a familiar spirit is called Oub, or Ob, and it is interpreted Pythonissa. The place where she resided, says the learned Mr. Bryant, seems to have been named from the worship then instituted; for Endor is compounded of *En ador*, and signifies *fons Pythonis*, "the fountain of light," the oracle of the god Ador, which oracle was probably founded by the Canaanites, and had never been totally suppressed. His pillar was also called *Abbadir*, or *Ab-adir*, compounded of *ab* and *adir*, and meaning the serpent deity Addir, the same as Adorus.

In the orgies of Bacchus, the persons who partook of the ceremony used to carry serpents in their hands, and with horrid screams call upon Eva! Eva! Eva being, according to the writer just mentioned, the same as epha, or opha, which the Greeks rendered *ophis*, and by it denoted a serpent. These ceremonies and this symbolic worship began among the Magi, who were the sons of Chus; and by them they were propagated in various parts. Wherever the Ammonians founded any places of worship, and introduced their rites, there was generally some story of a serpent. There was a legend about a serpent at Colchis, at Thebes, and at Delphi; and likewise in other places. The Greeks called Apollo himself Python, which is the same as Opis, Oupis, and Oub.

In Egypt there was a serpent named Thermuthis, which was looked upon as very sacred; and the natives are said to have made use of it as a royal tiara, with which they ornamented the statues of Isis. The kings of Egypt wore high bonnets, terminating in a round ball, and surrounded with figures of asps; and the priests likewise had the representation of serpents upon their bonnets.

Abadon, or Abaddon, mentioned in the Revelations xx. 2. is supposed by Mr. Bryant to have been the name of the Ophite god, with whose worship the world had been so long infected. This worship began among the people of Chaldea, who built the city of Ophis upon the Tigris, and were greatly addicted to divination, and to the worship of the serpent. From Chaldea the worship passed into Egypt, where the serpent deity was called Canoph, Can-eph, and C'neph. It had also the name of Ob or Oub, and was the same as the Basiliscus or royal serpent, the same as the Thermuthis, and made use of by way of ornament to the statues of their gods. The chief deity of Egypt is said to have been Vulcan, who was styled Opas. He was the same as Osiris, the Sun, and hence was often called Ob-el, or Pytho-sol; and there were pillars sacred to him, with curious hieroglyphical inscriptions bearing the same name; whence among the Greeks, who copied from the Egyptians, every thing gradually tapering to a point was styled obelos, or obeliscus.

As the worship of the serpent began among the sons of Chus, Mr. Bryant conjectures, that from thence they were denominated Ethiopians and Aithiopians, from Ath-ope or Ath-opes, the god whom they worshipped, and not from their complexion: the Ethiopes brought these rites into Greece, and called the island where they first established them *Ellopia, Solis Serpentis insula*, the same with *Eubœa*, or *Oubaia*, i. e. "the serpent island." The same learned writer discovers traces of the serpent worship among the Hyperboreans, at Rhodes, named Ophiusa, in Phrygia, and upon the Hellespont, in the island Cyprus, in Crete, among the Athenians, in the name of Cecrops, among the natives of Thebes in Bœotia, among the Lacedemonians, in Italy, in Syria, &c. and in the names of many places, as well as of the people where the Ophites settled. One of the most early heresies introduced into the Christian church was that of the Ophitæ. Bryant's Analysis of Antient Mythology, vol. i. p. 43, &c. p. 473, &c.

Serpent *Stones*. See Cornu *Ammonis*.

Sea-Serpent. See Sea-*Serpent*.

SERPENTARIA, Snake-root; a species of Aristolochia.

SERPENTARIUS, in astronomy, a constellation of the northern hemisphere, called also Ophiuchus, and antiently Æsculapius. The stars in the constellation Serpentarius, in Ptolemy's catalogue, are 29; in Tycho's 15; in Hevelius's 40; in the Britannic catalogue they are 74.

SERPENTINE, in general, denotes any thing that resembles a serpent; hence the worm or pipe of a still, twisted in a spiral manner, is termed a *serpentine worm*.

Serpentine *Stone*, a genus of magnesian earths, of which there are different species: 1. The *fibrosus*, composed of fibrous and coherent particles. This resembles the asbestos so much that it might be confounded with it, were not the fibres of the serpentine so closely coherent that they cannot be distinguished when the stone is cut or polished. The fibres themselves are large, and seem to be twisted. There are two varieties, a dark green and a light one; the former from Germany, the latter from Sweden. 2. The *zoeblitz* serpentine, found near that place, of many different colours, as black, deep green, light green, red, blueish-gray, and white; but the green colour is

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most predominant. 3. *Porcelain earth mixed with iron.* It is met with either diffusible in water or indurated. The former is found of a red colour from China and Montmartre. The water-clinkers, imported from some places in Germany, seem to be made of this kind of earth. There are two varieties of the indurated kind, viz. the martial soap-earth, of a red colour, from Jalsberg and other places in Norway, or black from some parts of Sweden. 4. The *telgsto* of the Swedes, the same with the lapis ollaris. It is found in various places of Norway, as light gray, dark gray, whitish yellow, and dark green. It is employed with great advantage for building fire places, furnaces, &c. the extremities of the strata being turned towards the fire when it is slaty.

M. Magellan observes, that there is a great variety of colour as well as composition in this kind of stones; it being found either white, green, brown, yellow, light-blue, black, spotted, or streaked with veins of different colours. Its texture is either indistinct, obscurely laminar, or fibrous. The specific gravity is from 2400 to 2650; and it is harder than soap-rock or steatites; though not hard enough to strike fire with steel; being less smooth to the touch than steatites, but susceptible of a good polish, looking like marble; and is often met with in thin semitransparent plates. It melts in a strong heat without addition, and corrodes the crucibles, but hardens in a lower degree of heat. It is slowly and partially soluble in acids, but does not effervesce with them. According to Bayon's analysis, 100 parts of it contain about 41 of silex, or rather mica; 33 of magnesia; 10 of argillaceous earth; 12 of water, and about 3 of iron. That brought from Corsica contains a greater proportion of argil, and a smaller one of silex. The serpentine commonly so called, according to Fabroni, is a true lapis ollaris; but has its name from being variegated with green, yellowish, and brown spots, like the skin of some serpents: great quantities of it are found in Italy and Switzerland, where it is frequently worked into dishes and other vessels.

Serpentine *verses*, are such as begin and end with the same word. As, "*Ambo florentes ætatibus, Arcades ambo.*"

Serpentine, in the *Manege*. A horse is said to have a serpentine tongue, if it is always frisking and moving, and sometimes passing over the bit, instead of keeping in the void space, called the liberty of the tongue.

SERPICULA, in botany; a genus of plants belonging to the class of monœcia, and to the order of tetrandria. The male calyx is quadridentate, and the corolla consists of four petals: The female calyx is divided into four parts, and the pericarpium is a tomentose nut. There are two species, the verticillata and repens.

SERPIGO, in surgery, a kind of herpes, popularly called a *tetter* or ringworm. See Surgery.

SERPULA, in natural history; a genus belonging to the class of vermes, and to the order of testacea. The shell is single, tubular, and adhering to other bodies. The animal which inhabits it is the terebella.

SERRANUS (Joannes), or John de Serres, a learned French Protestant, was born about the middle of the sixteenth century. He acquired the Greek and Latin languages at Lausanne, and grew very fond of the philosophy of Aristotle and Plato. On his return to France he studied divinity. He began to distinguish himself in 1572 by his writings, but was obliged to forsake his country after the dreadful massacre of St. Bartholomew. He became minister of Nismes in 1582, but was never regarded as a very zealous Calvinist: he has even been suspected, though without reason, of having actually abjured the Protestant religion. He was one of the four clergymen whom Henry IV. consulted about the Romish religion, and who returned for answer, *that Catholics might be saved.* He wrote afterwards a treatise in order to reconcile the two communions, intitled *De fide Catholica, sive de principiis religionis Christianæ, communi omnium Christianorum consensu, semper et ubique ratis.* This work was disliked by the Catholics, and received with such indignation by the Calvinists of Geneva, that many writers have affirmed that they poisoned the author. It is certain at least that he died at Geneva in 1598, at the age of 50. His principal works are, 1. A Latin translation of Plato, published by Henry Stephens, which owes much of its reputation to the elegance of the Greek copy which accompanies it. 2. A Treatise on the Immortality of the Soul. 3. *De statu religionis et reipublicæ in Francia.* 4. *Memoire de la 3me guerre civile et derniers troubles de France sous Charles IX. &c.* 5. *Inventaire general de l'Histoire de France, illustre par la conference de l'Eglise et de l'Empire, &c.* 6. *Recueil de chose memorable avenue en France sous Henri II. François II. Charles IX. Henri III.* These three historical treatises have been justly accused of partiality and passion; faults which it is next to impossible for a contemporary writer to avoid, especially if he bore any part in the transactions which he describes. His style is exceedingly incorrect and inelegant; his mistakes too and misstatements of facts are very numerous.

SERRATED, in general, something indented or notched in the manner of a saw; a term much used in the description of the leaves of plants. See Botany.

SERRATULA, saw-wort, in botany: A genus of plants belonging to the class of syngenesia, and to the order of polygamia æqualis. In the natural system it is ranged under the 49th order, *Compositæ*. The calyx is subcylindrical, imbricated; the scales of it pointed, but not spinous. There are 15 species: The tinctoria, alpina, arvensis, coronata, japonica, salicifolia, multiflora, noveboracensis, præalta, glauca, squarrosa, scariosa, spicata, amara, and centauroides. The three first species are British. 1. The *tinctoria* is distinguished by a stem erect and slender, branched at the top, and three feet high. The leaves are smooth, pinnatifid, and serrated: The flowers are purple, in umbels, and terminal. The down of the seed is glossy, with a brown or gold tinge. It grows in woods and wet pastures. It dyes cloth of an exceeding fine yellow colour, which stands well when fixed with alum. Goats eat this plant; horses are not fond of it; cattle, swine, and sheep, leave it untouched. 2. The *alpina*, or mountain saw-wort. The root and stem are woody; the latter being from one to two feet high. The leaves are numerous, triangular, long, pointed, substantial, dark green above, white beneath, and serrated, with round intervals between the teeth, on footstalks. The flowers are purple. The scales of the calyx are very short and downy. It grows on high mountains, and flowers commonly in July or August. 3. The *arvensis*, corn saw-wort, or way-thistle. The stem is generally erect, branched, and two or three feet high. The leaves are sinuated, serrated, and spinous; those above being almost entire. The flowers are of a pale purple; the down is very long. This plant grows in cultivated grounds and by way-sides, and flowers in July or August. When burned it yields good ashes for making glass or fixed alkali.

SERRATUS, in anatomy, a name given to several muscles, from their resemblance to a saw. See Anatomy, *Table of the Muscles.*

SERTULARIA, in natural history, a genus belonging to the class of vermes, and to the order of zoophyta. The stem is radicated, fibrous, naked, and jointed; the florets are hydræ, and there is one at each joint. This genus comprehends 42 species of corallines.

SERVAL, mountain cat. See Felis.

SERVANDONI (John Nicolas), was born at Florence in 1695. He rendered himself famous by his exquisite taste in architecture, and by his genius for decorations, fetes, and buildings. He was employed and rewarded by most of the princes

in Europe. He was honoured in Portugal with the order of Chriſt: In France he was architect and painter to the king, and member of the different academies eſtabliſhed for the advancement of theſe arts. He received the ſame titles from the kings of Britain, Spain, Poland, and from the duke of Wirtemberg. Notwithſtanding theſe advantages, his want of œconomy was ſo great, that he left nothing behind him. He died at Paris in 1766. Paris is indebted to him for many of its ornaments. He made decorations for the theatres of London and Dreſden. The French king's theatre, called *la ſalle des Machines*, was under his management for ſome time. He was permitted to exhibit ſhows conſiſting of ſimple decorations: Some of theſe were aſtoniſhingly ſublime; his "Deſcent of Æneas into Hell" in particular, and his "Enchanted Foreſt," are well known. He built and embelliſhed a theatre at Chambor for Mareſchal Saxe; and furniſhed the plan and the model of the theatre royal at Dreſden. His genius for fêtes was remarkable; he had the management of a great number in Paris, and even in London. He conducted one at Liſbon given on account of a victory gained by the duke of Cumberland. He was employed frequently by the king of Portugal, to whom he preſented ſeveral elegant plans and models. The prince of Wales, too, father to the preſent king, engaged him in his ſervice; but the death of that prince prevented the execution of the deſigns which had been projected. He preſided at the magnificent *fête* given at Vienna on account of the marriage of the archduke Joſeph and the infanta of Parma. But it would be endleſs to attempt an enumeration of all his performances and exhibitions.

SERVANT, a term of relation, ſignifying a perſon who owes and pays obedience for a certain time and on certain conditions to another in quality of a maſter. As to the ſeveral ſorts of ſervants: It was obſerved, under the article LIBERTY, that pure and proper ſlavery does not, nay cannot, ſubſiſt in Britain: ſuch we mean whereby an abſolute and unlimited power is given to the maſter over the life and fortune of the ſlave. And indeed it is repugnant to reaſon, and the principles of natural law, that ſuch a ſtate ſhould ſubſiſt any where. See SLAVERY.

The law of England therefore abhors, and will not endure the exiſtence of ſlavery within this nation: ſo that when an attempt was made to introduce it, by ſtatute 1 Edw. VI. c. 3. which ordained, that all idle vagabonds ſhould be made ſlaves and fed upon bread, water, or ſmall drink, and refuſe-meat; ſhould wear a ring of iron round their necks, arms, or legs; and ſhould be compelled, by beating, chaining, or otherwiſe, to perform the work aſſigned them, were it ever ſo vile; the ſpirit of the nation could not brook this condition, even in the moſt abandoned rogues; and therefore this ſtatute was repealed in two years afterwards. And now it is laid down, that a ſlave or negro, the inſtant he lands in Britain, becomes a freeman; that is, the law will protect him in the enjoyment of his perſon and his property. Yet, with regard to any right which the maſter may have lawfully acquired to the perpetual ſervice of John or Thomas, this will remain exactly in the ſame ſtate as before: for this is no more than the ſame ſtate of ſubjection for life which every apprentice ſubmits to for the ſpace of ſeven years, or ſometimes for a longer term. Hence, too, it follows, that the infamous and unchriſtian practice of withholding baptiſm from negro-ſervants, leſt they ſhould thereby gain their liberty, is totally without foundation, as well as without excuſe. The law of England acts upon general and extenſive principles: it gives liberty, rightly underſtood, that is, protection, to a Jew, a Turk, or a Heathen, as well as to thoſe who profeſs the true religion of Chriſt; and it will not diſſolve a civil obligation between maſter and ſervant, on account of the alteration of faith in either of the parties; but the ſlave is entitled to the ſame protection in England before as after baptiſm; and, whatever ſervice the Heathen negro owed of right to his American maſter, by general, not by local law, the ſame (whatever it be) is he bound to render when brought to England and made a Chriſtian.

1. The firſt ſort of ſervants, therefore, acknowledged by the laws of England, are *menial ſervants*; ſo called from being *intra mœnia*, or domeſtics. The contract between them and their maſters ariſes upon the hiring. If the hiring be general, without any particular time limited, the law conſtrues it to be a hiring for a year; upon a principle of natural equity, that the ſervant ſhall ſerve and the maſter maintain him, throughout all the revolutions of the reſpective ſeaſons; as well when there is work to be done, as when there is not: but the contract may be made for any larger or ſmaller term. All ſingle men between 12 years old and 60, and married ones under 30 years of age, and all ſingle women between 12 and 40, not having any viſible livelihood, are compellable by two juſtices to go out to ſervice in huſbandry or certain ſpecific trades, for the promotion of honeſt induſtry; and no maſter can put away his ſervant, or ſervant leave his maſter, after being ſo retained, either before or at the end of his term, without a quarter's warning; unleſs upon reaſonable cauſe, to be allowed by a juſtice of the peace: but they may part by conſent, or make a ſpecial bargain.

2. Another ſpecies of ſervants are called *apprentices*, (from *apprendre*, to learn); and are uſually bound for a term of years, by deed indented or indentures, to ſerve their maſters, and be maintained and inſtructed by them. This is uſually done to perſons of trade, in order to learn their art and myſtery; and ſometimes very large ſums are given with them as a premium for ſuch their inſtruction: but it may be done to huſbandmen, nay, to gentlemen and others. And children of poor perſons may be apprenticed out by the overſeers, with conſent of two juſtices, till 24 years of age, to ſuch perſons as are thought fitting; who are alſo compellable to take them: and it is held, that gentlemen of fortune, and clergymen, are equally liable with others to ſuch compulſion: for which purpoſes our ſtatutes have made the indentures obligatory, even though ſuch pariſh-apprentice be a minor. Apprentices to trades may be diſcharged on reaſonable cauſe, either at the requeſt of themſelves or maſters, at the quarter-ſeſſions, or by one juſtice, with appeal to the ſeſſions; who may, by the equity of the ſtatute, if they think it reaſonable, direct reſtitution of a rateable ſhare of the money given with the apprentice: and pariſh-apprentices may be diſcharged in the ſame manner by two juſtices. But if an apprentice, with whom leſs than 10 pounds hath been given, runs away from his maſter, he is compellable to ſerve out his time of abſence, or make ſatisfaction for the ſame, at any time within ſeven years after the expiration of his original contract. See APPRENTICE and APPRENTICESHIP.

3. A third ſpecies of ſervants are *labourers*, who are only hired by the day or the week, and do not live *intra mœnia*, as part of the family; concerning whom the ſtatutes before-cited have made many very good regulations; 1. Directing that all perſons who have no viſible effects may be compelled to work: 2. Defining how long they muſt continue at work in ſummer and in winter: 3. Puniſhing ſuch as leave or deſert their work: 4. Empowering the juſtices at ſeſſions, or the ſheriff of the county, to ſettle their wages: and, 5. Inflicting penalties on ſuch as either give or exact more wages than are ſo ſettled.

4. There is yet a fourth ſpecies of ſervants, if they may be ſo called, being rather in a ſuperior, a miniſterial, capacity; ſuch as *ſtewards*, *factors*, and *bailiffs*; whom, however, the law conſiders as ſervants *pro tempore*, with regard to ſuch of their acts as affect their maſter's or employer's property.

As to the manner in which this relation affects the maſter, the ſervant himſelf, or third parties, ſee the article MASTER *and Servant*.

SERVETISTS, a name given to the modern Anti-trinitarians, from their being supposed to be the followers of Michael Servetus; who, in the year 1553, was burnt at Geneva, together with his books.

SERVETUS (Michael), a most ingenious and learned Spaniard, famous for his opposition to the received doctrine of the Trinity, and for the martyrdom he underwent on that account, was born in 1509, at Villa Nueva in Arragon. His father, who was a notary, sent him to the university of Toulouse, to study the civil law; and there he began to read the scriptures for the first time, probably because the Reformation made then a great noise in France. He was presently convinced, that the church wanted reforming; and it may be he went so far as to fancy, that the Trinity was one of the doctrines to be rejected. Be that as it will, he grew very fond of Anti-trinitarian notions; and, after he had been two or three years at Toulouse, resolved to retire into Germany, and set up for a reformer. He went to Basil, by way of Lyons and Geneva; and, having had some conferences at Basil with Oecolampadius, set out for Strasburg, being extremely desirous to discourse with Bucer and Capito, two celebrated reformers of that city. At his departure from Basil, he left a manuscript, entitled, "De Trinitatis Erroribus," in the hands of a bookseller, who sent it afterwards to Haguenau, whither Servetus went, and got it printed in 1531. The next year, he printed likewise at Haguenau another book, with this title, "Dialogorum de Trinitate Libri duo:" in an advertisement to which, he retracts what he had written in his former book against the Trinity, not as if it was false, but because it was written imperfectly, confusedly, unpolitely, and as it were by a child for the use of children.

Having published these two books, he resolved to return to France, because he was poor, and did not understand the German language. He went to Basil, and thence to Lyons, where he lived two or three years: then he went to Paris, and studied physic under Sylvius, Fernelius, and other professors: he took his degree of master of arts, and was admitted doctor of physic in the university there. Having finished his medical studies at Paris, he left that city, to go and practise in some other place: he settled two or three years in a town near Lyons, and then at Vienne in Dauphiny, for the space of ten or twelve. His books against the Trinity had raised a great tumult among the German divines, and spread his name throughout all Europe. While Servetus was at Paris, his books were dispersed in Italy, and very much approved by many who had thoughts of forsaking the church of Rome: upon which, in 1539, Melancthon wrote a letter to the senate of Venice, importing, that "a book of Servetus, who had revived the error of Paulus Samosatenus, was handed about in their country, and beseeching them to take care, that the impious error of that man may be avoided, rejected and abhorred." Servetus was at Lyons in 1542, before he settled in Vienne; and corrected the proofs of a Latin Bible that was printing there, to which he added a preface and some marginal notes, under the name of Villanovanus; for he was called in France Villeneuve, from Villanueva, the town where he was born.

Servetus continued to be so fond of his Anti-trinitarian notions, that he resolved to publish a third work in favour of them. This came out in 1553 at Vienne, with this title, "Christianismi Restitutio, &c." Servetus did not put his name to this work; but Calvin informed the Roman-Catholics in France, that he was the real author of it. Upon this information, Servetus was imprisoned at Vienne, and would certainly have been burnt alive, if he had not made his escape: however, sentence was passed on him, and his effigy was carried to the place of execution, fastened to a gibbet, and afterwards burned, with five bales of his books. Servetus in the mean time was retiring to Naples, where he hoped to practise physic with the same high repute as he had practised at Vienne; yet was so imprudent as to take his way through Geneva, though he knew that Calvin was his mortal enemy. Calvin, being informed of his arrival, acquainted the magistrates with it; upon which he was seized and cast into prison, and a prosecution was presently commenced against him for heresy and blasphemy. Calvin pursued him with a malevolence and fury, which was manifestly personal; though no doubt that reformer easily persuaded himself, that it was all pure zeal for the cause of God, and the good of his church. The articles of his accusation were numerous, and not confined to his book, called "Christianismi Restitutio;" but were sought out of all his other writings, which were ransacked for every thing that could be strained to a bad sense.

The magistrates of Geneva being sensible, in the mean time, that the trial of Servetus was a thing of the highest consequence, did not think fit to give sentence, without consulting the magistrates of the Protestant cantons of Switzerland; to whom therefore they sent Servetus's book, printed at Vienne, and also the writings of Calvin, with Servetus's answers; and at the same time desired to have the opinion of their divines about that affair. They all gave vote against him; in consequence of which he was condemned, and burnt alive Oct. 27, 1553.

SERVIA, a province of Turkey in Europe, bounded on the north by the rivers Danube and Save, which separate it from Hungary; on the east, by Bulgaria; on the west, by Bosnia; and on the south, by Albania and Macedonia. It is about 190 miles in length from east to west; 95 in breadth from north to south; and is divided into four sangiacates. Two of these were ceded to the Christians in 1718, who united them into one. This continued till 1739, when the Turks were victorious; and then they were abandoned to the Turks by the treaty of Belgrade. Belgrade is the capital town.

SERVICE, in law, is a duty which a tenant, on account of his fee, owes to his lord. There are many divisions of services; as, 1. Into personal, where something is to be done by the tenant in person, as homage and fealty. 2. Real, such as wards, marriages, &c. 3. Accidental, including heriots, reliefs, and the like. 4. Entire, where, on the alienation of any part of the lands by a tenant, the services become multiplied. 5. Frank-service, which was performed by freemen, who were not obliged to perform any base service, but only to find a man and horse to attend the lord into the army or to court. 6. Knight's service, by which lands were antiently held of the king, on paying homage, service in war, &c.

As in every free and well regulated society there must be a diversity of ranks, there must be a great number of persons employed in service, both in agriculture and domestic affairs. In this country, service is a contract into which the servant voluntarily enters; and the master's authority extends no further than to the performance of that species of labour for which the agreement was made.

"The treatment of servants (says that respectable moralist Mr. Paley), as to diet, discipline, and accommodation, the kind and quantity of work to be required of them, the intermission, liberty, and indulgence to be allowed them, must be determined in a great measure by custom; for where the contract involves so many particulars, the contracting parties express a few perhaps of the principal, and by mutual understanding refer the rest to the known custom of the country in like cases.

"A servant is not bound to obey the unlawful commands of his master; to minister, for instance, to his unlawful pleasures; or to assist him in unlawful practices in his profession; as in smuggling or adulterating the articles which he deals in. For the servant is bound by nothing but his own promise; and the obligation of a promise extends not to things unlawful.

"For the same reason, the master's authority does not justify the servant in doing wrong; for the servant's own promise, upon which that authority is founded, would be none.

"Clerks and apprentices ought to be employed entirely in the profeſſion or trade which they are intended to learn. Inſtruction is their wages; and to deprive them of the opportunities of inſtruction, by taking up their time with occupations foreign to their buſineſs, is to defraud them of their wages.

"The maſter is reſponſible for what a ſervant does in the ordinary courſe of his employment; for it is done under a general authority committed to him, which is in juſtice equivalent to a ſpecific direction. Thus, if I pay money to a banker's clerk, the banker is accountable: but not if I had paid it to his butler or his footman, whoſe buſineſs it is not to receive money. Upon the ſame principle, if I once ſend a ſervant to take up goods upon credit, whatever goods he afterwards takes up at the ſame ſhop, ſo long as he continues in my ſervice, are juſtly chargeable to my account.

"The law of this country goes great lengths in intending a kind of concurrence in the maſter, ſo as to charge him with the conſequences of his ſervant's conduct. If an innkeeper's ſervant rob his gueſts, the innkeeper muſt make reſtitution; if a farrier's ſervant lame your horſe, the farrier muſt anſwer for the damage; and ſtill further, if your coachman or carter drive over a paſſenger in the road, the paſſenger may recover from you a ſatisfaction for the hurt he ſuffers. But theſe determinations ſtand, I think, rather upon the authority of the law, than any principle of natural juſtice."

Choral SERVICE, in church-hiſtory, denotes that part of religious worſhip which conſiſts in chanting and ſinging. The advocates for the high antiquity of ſinging, as a part of church-muſic, urge the authority of St. Paul in its favour (Epheſ. ch. v. ver. 19. and Coloſ. chap. iii. ver. 16). On the authority of which paſſages it is aſſerted, that ſongs and hymns were, from the eſtabliſhment of the church, ſung in the aſſemblies of the faithful; and it appears from undoubted teſtimony, that ſinging, which was practiſed as a ſacred rite among the Egyptians and Hebrews, at a very early period, and which likewiſe conſtituted a conſiderable part of the religious ceremonies of the Greeks and Romans, made a part of the religious worſhip of Chriſtians, not only before churches were built, and their religion eſtabliſhed by law, but from the firſt profeſſion of Chriſtianity. However, the era from whence others have dated the introduction of muſic into the ſervice of the church, is that period during which Leontius governed the church of Antioch, *i. e.* between the year of Chriſt 347 and 356. See ANTIPHONY.

From Antioch the practice ſoon ſpread through the other churches of the Eaſt; and in a few ages after its firſt introduction into the divine ſervice, it not only received the ſanction of public authority, but thoſe were forbid to join in it who were ignorant of muſic. A canon to this purpoſe was made by the council of Laodicea, which was held about the year 372; and Zonaras informs us, that theſe canonical ſingers were reckoned a part of the clergy. Singing was introduced into the weſtern churches by St. Ambroſe about the year 374, who was the inſtitutor of the Ambroſian chant eſtabliſhed at Milan about the year 386; and Euſebius (lib. ii. cap. 17.) tells us, that a regular choir, and method of ſinging the ſervice, were firſt eſtabliſhed, and hymns uſed, in the church at Antioch during the reign of Conſtantine, and that St. Ambroſe, who had long reſided there, had his melodies thence. This was about 230 years afterwards amended by pope Gregory the Great, who eſtabliſhed the Gregorian chant; a plain, uniſonous kind of melody, which he thought conſiſtent with the gravity and dignity of the ſervice to which it was to be applied. This prevails in the Roman church even at this day: it is known in Italy by the name of *canto fermo*; in France by that of *plain chant*; and in Germany and moſt other countries by that of the *cantus Gregorianus*. Although no ſatisfactory account has been given of the ſpecific difference between the Ambroſian and Gregorian chants, yet all writers on this ſubject agree in ſaying, that St. Ambroſe only uſed the four authentic modes, and that the four plagal were afterwards added by St. Gregory. Each of theſe had the ſame final, or key-note, as its relative authentic; from which there is no other difference, than that the melodies in the four authentic or principal modes are generally confined within the compaſs of the eight notes above the key-note, and thoſe in the four plagal or relative modes, within the compaſs of the eight notes below the fifth of the key. See MODE.

Eccleſiaſtical writers ſeem unanimous in allowing that Pope Gregory, who began his pontificate in 590, collected the muſical fragments of ſuch antient pſalms and hymns as the firſt fathers of the church had approved and recommended to the firſt Chriſtians; and that he ſelected, methodized, and arranged them in the order which was long continued at Rome, and ſoon adopted by the chief part of the weſtern church. Gregory is alſo ſaid to have baniſhed from the church the *canto figurato*, as too light and diſſolute; and it is added, that his own chant was called *canto fermo*, from its gravity and ſimplicity.

It has been long a received opinion, that the eccleſiaſtical tones were taken from the reformed modes of Ptolemy; but Dr. Burney obſerves, that it is difficult to diſcover any connection between them, except in their names; for their number, upon examination, is not the ſame; thoſe of Ptolemy being ſeven, the eccleſiaſtical eight; and indeed the Greek names given to the eccleſiaſtical modes do not agree with thoſe of Ptolemy in the ſingle inſtance of key, but with thoſe of higher antiquity. From the time of Gregory to that of Guido, there was no other diſtinction of keys than that of authentic and plagal; nor were any ſemitones uſed but thoſe from E to F, B to C, and occaſionally A to B *b*.

With reſpect to the muſic of the primitive church, it may be obſerved, that though it conſiſted in the ſinging of pſalms and hymns, yet it was performed in many different ways; ſometimes the pſalms were ſung by one perſon alone, whilſt the reſt attended in ſilence; ſometimes they were ſung by the whole aſſembly; ſometimes alternately, the congregation being divided into ſeparate choirs; and ſometimes by one perſon, who repeated the firſt part of the verſe, the reſt joining in the cloſe of it. Of the four different methods of ſinging now recited, the ſecond and third were properly diſtinguiſhed by the names of *ſymphony* and *antiphony*; and the latter was ſometimes called *reſponſaria*, in which women were allowed to join. St. Ignatius, who, according to Socrates (lib. vi. cap. 8.), converſed with the apoſtles, is generally ſuppoſed to have been the firſt who ſuggeſted to the primitive Chriſtians in the Eaſt the method of ſinging hymns and pſalms alternately, or in dialogue; and the cuſtom ſoon prevailed in every place where Chriſtianity was eſtabliſhed; though Theodoret in his hiſtory (lib. ii. cap. 24.) tells us, that this manner of ſinging was firſt practiſed at Antioch. It likewiſe appears, that almoſt from the time when muſic was firſt introduced into the ſervice of the church, it was of two kinds, and conſiſted in a gentle inflection of the voice, which they termed plain ſong, and a more elaborate and artificial kind of muſic, adapted to the hymns and ſolemn offices contained in its ritual; and this diſtinction has been maintained even to the preſent day.

Although we find a very early diſtinction made between the manner of ſinging the hymns and chanting the pſalms, it is, however, the opinion of the learned Martini, that the muſic of the firſt five or ſix ages of the church conſiſted chiefly in a plain and ſimple chant of uniſons and octaves, of which many fragments are ſtill remaining in the *canto fermo* of the Romiſh miſſals. For with reſpect to muſic in parts, as it does not appear, in theſe early ages, that either the Greeks or Romans were in poſſeſſion of harmony or counterpoint, which has been generally aſcribed to Guido, a monk of Arezzo in Tuſcany, about the year 1022, though others have traced the origin of it to the eighth century,

it is in vain to ſeek it in the church. The choral muſic, which had its riſe in the church of Antioch, and from thence ſpread through Greece, Italy, France, Spain, and Germany, was brought into Britain by the ſingers who accompanied Auſtin the monk, when he came over, in the year 596, charged with a commiſſion to convert the inhabitants of this country to Chriſtianity. Bede tells us, that when Auſtin and the companions of his miſſion had their firſt audience of king Ethelbert, in the iſle of Thanet, they approached him in proceſſion, ſinging litanies; and that afterwards, when they entered the city of Canterbury, they ſung a litany, and at the end of it Allelujah. But though this was the firſt time the Anglo-Saxons had heard the Gregorian chant, yet Bede likewiſe tells us, that our Britiſh anceſtors had been inſtructed in the rites and ceremonies of the Gallican church by St. Germanus, and heard him ſing Allelujah many years before the arrival of St. Auſtin. In 680, John, præcentor of St. Peter's in Rome, was ſent over by pope Agatho to inſtruct the monks of Weremouth in the art of ſinging; and he was prevailed upon to open ſchools for teaching muſic in other places in Northumberland. Benedict Biſcop, the preceptor of Bede, Adrian the monk, and many others, contributed to diſſeminate the knowledge of the Roman chant. At length the ſucceſſors of St. Gregory, and of Auſtin his miſſionary, having eſtabliſhed a ſchool for eccleſiaſtical muſic at Canterbury, the reſt of the iſland was furniſhed with maſters from that ſeminary. The choral ſervice was firſt introduced in the cathedral church of Canterbury; and till the arrival of Theodore, and his ſettlement in that ſee, the practice of it ſeems to have been confined to the churches of Kent; but after that, it ſpread over the whole kingdom; and we meet with records of very ample endowments for the ſupport of this part of public worſhip. This mode of religious worſhip prevailed in all the European churches till the time of the Reformation: the firſt deviation from it is that which followed the Reformation by Luther, who, being himſelf a lover of muſic, formed a liturgy, which was a muſical ſervice, contained in a work entitled *Pſalmodia*, h. e. *Cantica ſacra Veteris Eccleſiæ ſelecta*, printed at Norimberg in 1553, and at Wittemberg in 1561. But Calvin, in his eſtabliſhment of a church at Geneva, reduced the whole of divine ſervice to prayer, preaching and ſinging; the latter of which he reſtrained. He excluded the offices of the antiphon, hymn, and motet, of the Romiſh ſervice, with that artificial and elaborate muſic to which they were ſung; and adopted only that plain metrical pſalmody, which is now in general uſe among the reformed churches, and in the parochial churches of our own country. For this purpoſe he made uſe of Marot's verſion of the Pſalms, and employed a muſician to ſet them to eaſy tunes only of one part. In 1553, he divided the Pſalms into pauſes or ſmall portions, and appointed them to be ſung in churches. Soon after they were bound up with the Geneva catechiſm; from which time the Catholics, who had been accuſtomed to ſing them, were forbid the uſe of them, under a ſevere penalty. Soon after the Reformation commenced in England, complaints were made by many of the dignified clergy and others of the intricacy and difficulty of the church-muſic of thoſe times; in conſequence of which it was once propoſed, that organs and curious ſinging ſhould be removed from our churches. Latimer, in his dioceſe of Worceſter, went ſtill further, and iſſued injunctions to the prior and convent of St. Mary, forbidding in their ſervice all manner of ſinging. In the reign of Edward VI. a commiſſion was granted to eight biſhops, eight divines, eight civilians, and eight common lawyers, to compile a body of ſuch eccleſiaſtical laws as ſhould in future be obſerved throughout the realm. The reſult of this compilation was a work firſt publiſhed by Fox the martyrologiſt, in 1571, and afterwards in 1640, under the title of *Reformatio Legum Eccleſiaſticarum*. Theſe 32 commiſſioners, inſtead of reprobating church muſic, merely condemned figurative and operoſe muſic, or that kind of ſinging which abounded with fugues, reſponſive paſſages, and a commixture of various and intricate proportions; which, whether extemporary or written, is by muſicians termed *deſcant*. However, notwithſtanding the objections againſt choral muſic, and the practice of ſome of the reformed churches, the compilers of the Engliſh liturgy in 1548, and the king himſelf, determined to retain muſical ſervice. Accordingly the ſtatute 2 & 3 Edw. VI. cap. 1. though it contains no formal obligation on the clergy, or others, to uſe or join in either vocal or inſtrumental muſic in the common prayer, does clearly recogniſe the practice of ſinging; and in leſs than two years after the compiling of King Edward's liturgy, a formula was compoſed, which continues, with ſcarce any variation, to be the rule for choral ſervice even at this day. The author of this work was John Marbecke, or Marbeike; and it was printed by Richard Grafton, in 1550, under the title of the Book of Common Prayer, noted. Queen Mary laboured to re-eſtabliſh the Romiſh choral ſervice; but the acceſſion of Elizabeth was followed by the act of uniformity; in conſequence of which, and of the queen's injunctions, the Book of Common Prayer, noted by Marbecke, was conſidered as the general formula of choral ſervice. In 1560, another muſical ſervice, with ſome additions and improvements, was printed by John Day; and in 1565, another collection of offices, with muſical notes. Many objections were urged by Cartwright and other Puritans againſt the form and manner of cathedral ſervice, to which Hooker replied in his Eccleſiaſtical Polity. In 1664, the ſtatutes of Edward VI. and Elizabeth, for uniformity in the Common Prayer, were repealed; and the Directory for Public Worſhip, which allows only of the ſinging of pſalms, eſtabliſhed. But upon the reſtoration of Charles II. choral ſervice was again revived, and has ſince uniformly continued. See on this ſubject Hawkins's Hiſtory of Muſic, vol. i. p. 404. vol. ii. p. 264. vol. iii. p. 58, 468, &c. vol. iv. p. 44, 347.

SERVICE-*Tree*. See SORBUS.

SERVITES, a religious order in the church of Rome, founded about the year 1233, by ſeven Florentine merchants, who, with the approbation of the biſhop of Florence, renounced the world, and lived together in a religious community on mount Senar, two leagues from that city.

SERVITOR, in the univerſity of Oxford, a ſtudent who attends on another for his maintenance and learning. See the article SIZAR.

SERVITUDE, the condition of a ſervant, or rather ſlave. Under the declenſion of the Roman empire, a new kind of ſervitude was introduced, different from that of the antient Romans: it conſiſted in leaving the lands of ſubjugated nations to the firſt owners, upon condition of certain rents, and ſervile offices, to be paid in acknowledgement. Hence the names of *ſervi cenſiti*, *aſcriptitii*, and *addicti glebæ*; ſome whereof were taxable at the reaſonable diſcretion of the lord; others at a certain rate agreed on; and others were mainmortable, who, having no legitimate children, could not make a will to above the value of five pence, the lord being heir of all the reſt, and others were prohibited marrying, or going to live out of the lordſhip. Moſt of theſe ſervices exiſted lately in France; but they were long ago aboliſhed in England. Such, however, was the original of our tenures, &c. See SLAVE.

SERVIUS (MAURUS HONORATUS), a celebrated grammarian and critic of antiquity, who flouriſhed about the time of Arcadius and Honorius; now chiefly known by his Commentaries on Virgil. There is alſo extant a piece of Servius upon the feet of verſes and the quantity of ſyllables, called *Centimetrum*.

SERUM, a thin, tranſparent, ſaltiſh liquor, which makes a conſiderable part of the maſs of blood. See ANATOMY and BLOOD.

SESAMOIDEA OSSA, certain ſmall bones ſomewhat reſembling the ſeeds of ſeſamum, whence their name. They are

placed at the under part of the bones of the laft joints of the fingers and toes.

SESAMUM, OILY GRAIN, in botany: A genus of plants belonging to the clafs of didynamia, and to the order of angiofpermia; and in the natural fyftem ranging under the 20th order, *Luridæ*. The calyx is divided into five parts. The corolla is campanulated, the tube of which is nearly the length of the calyx; the throat is inflated, and very large; the border is divided into five parts, four of which are fpreading and nearly equal; the fifth is the loweft and largeft. There are four filaments, and the rudiments of a fifth. The ftigma is lanceolated, and the capfule has four cells. There are only two fpecies, the *orientale* and *indicum*. 1. The orientale has ovate, oblong, entire leaves. It is an annual, and grows naturally on the coaft of Malabar and in the ifland of Ceylon; rifing with an herbaceous four-cornered ftalk, two feet high, fending out a few fhort fide-branches; the leaves are oblong, oval, a little hairy, and ftand oppofite. The flowers terminate the ftalks in loofe fpikes; they are fmall, of a dirty white colour, fhaped fomewhat like thofe of the fox-glove. After the flowers are paft, the germen turns to an oval acute-pointed capfule with four cells, filled with oval compreffed feeds, which ripen in autumn. 2. The indicum, with trifid lower leaves, grows naturally in India: this is alfo an annual plant; the ftalk rifes taller than that of the former: the lower leaves are cut into three parts, which is the only difference between them.

The firft fort is frequently cultivated in all the eaftern countries, and alfo in Africa, as a pulfe; and of late years the feeds have been introduced into Carolina by the African negroes, where they fucceed extremely well. The inhabitants of that country make an oil from the feed, which will keep good many years, without having any rancid fmell or tafte, but in two years become quite mild; fo that when the warm tafte of the feed, which is in the oil when firft drawn, is worn off, they ufe it as a fallad-oil, and for all the purpofes of fweet oil. The feeds of this plant are alfo ufed by the negroes for food; which feeds they parch over the fire, and then mix them with water, and ftew other ingredients with them, which makes an hearty food. Sometimes a fort of pudding is made of thefe feeds, in the fame manner as with millet or rice, and is by fome perfons efteemed, but is rarely ufed for thefe purpofes in Europe. This is called *benny* or *bonny* in Carolina. In England thefe plants are preferved in botanic gardens as curiofities. Their feeds muft be fown in the fpring upon a hot-bed; and when the plants are come up, they muft be tranfplanted into a frefh hot-bed, to bring them forward. After they have acquired a tolerable degree of ftrength, they fhould be planted into pots, and plunged into another hot-bed, managing them as hath been directed for amaranths; for if thefe plants are not thus brought forward in the former part of the fummer, they will not produce good feeds in this country.

From nine pounds of this feed which came from Carolina, there were upwards of two quarts of oil drawn, which is as great a quantity as hath been obtained from any vegetable whatever. This might occafion its being called the *oily grain*.

SESELI, MEADOW SAXIFRAGE, in botany: A genus of plants belonging to the clafs of pentandria, and to the order of digynia; and in the natural fyftem ranging under the 45th order, *Umbellatæ*. The umbels are globular; the involucrum confifts of one or two leaflets: the fruit is egg-fhaped and ftreaked. There are 11 fpecies, the *pimpinelloides*, *montanum*, *glaucum*, *annuum*, *ammoides*, *tortuofum*, *turbith*, *hyppomarathrum*, *pyrenæum*, *faxifragum*, and *elatum*. The montanum grows naturally in France and Italy; the glaucum is a native of France; the ammoides and tortuofum grow in the fouth of Europe; and the hyppomarathrum is a native of Auftria.

SESQUI, a Latin participle, fignifying a whole and a half; which, joined with *altera*, *terza*, *quarta*, &c. is much ufed in the Italian mufic to exprefs a kind of ratios, particularly feveral fpecies of triples.

SESQUI-*Alterate*, in geometry and arithmetic, is a ratio between two lines, two numbers, or the like, where one of them contains the other once, with the addition of a half. Thus 6 and 9 are in a fefqui-alterate ratio; fince 9 contains 6 once, and 3, which is half of 6, over; and 20 and 30 are in the fame; as 30 contains 20, and half 20 or 10.

SESQUI-*Duplicate* ratio, is when of two terms the greater contains the lefs twice, and half the lefs remains; as 15 and 6; 50 and 20.

SESQUI-*Tertional* proportion, is when any number or quantity contains another once and one third.

SESSILE, among botanifts. See BOTANY.

SESSION, in general denotes each fitting or affembly of a council, &c.

SESSION *of Parliament*, is the feafon or fpace from its meeting to its prorogation. See PARLIAMENT.

Kirk-SESSION, the name of a petty ecclefiaftical court in Scotland. See KIRK-*Seffion*.

SESSIONS for weights and meafures. In London, four juftices from among the mayor, recorder, and aldermen (of whom the mayor or recorder is to be one), may hold a feffion to inquire into the offences of felling by falfe weights and meafures, contrary to the ftatutes; and to receive indictments, punifh offenders, &c. Char. king Charles I.

Court of Quarter-SESSIONS, an Englifh court that muft be held in every county once in every quarter of a year; which, by ftatute 2 Hen. V. c. 4. is appointed to be in the firft week after Michaelmas-day, the firft week after the epiphany, the firft week after the clofe of Eafter, and in the week after the tranflation of St. Thomas the martyr, or the 7th of July. It is held before two or more juftices of the peace, one of which muft be of the quorum. The jurifdiction of this court, by 34 Edw. III. c. 1. extends to the trying and determining of all felonies and trefpaffes whatfoever: though they feldom, if ever, try any greater offence than fmall felonies within the benefit of clergy; their commiffion providing, that if any cafe of difficulty arifes, they fhall not proceed to judgment, but in the prefence of one of the juftices of the courts of king's-bench or common pleas, or one of the judges of affize: and therefore murders, and other capital felonies, are ufually remitted for a more folemn trial to the affizes. They cannot alfo try any new-created offence, without exprefs power given them by the ftatute which creates it. But there are many offences and particular matters which, by particular ftatutes, belong properly to this jurifdiction, and ought to be profecuted in this court; as, the fmaller mifdemeanors againft the public or commonwealth, not amounting to felony; and efpecially offences relating to the game, highways, alehoufes, baftard children, the fettlement and provifion for the poor, vagrants, fervants wages, and Popifh recufants. Some of thefe are proceeded upon by indictment: others in a fummary way, by motion, and order thereupon; which order may for the moft part, unlefs guarded againft by particular ftatutes, be removed into the court of king's-bench by writ of *certiorari facias*, and be there either quafhed or confirmed. The records or rolls of the feffions are committed to the cuftody of a fpecial officer, denominated *cuftos rotulorum*, who is always a juftice of the quorum; and among them of the quorum (faith Lambard) a man for the moft part efpecially picked out, either for wifdom, countenance, or credit. The nomination of the *cuftos rotulorum* (who is the principal officer in the county, as the lord lieutenant is chief in military command) is by the king's fign-manual: and to him the nomination of the clerk of the peace belongs; which office he is expreffly forbidden to fell for money.

In moft corporation-towns there are quarter-feffions kept be-

fore justices of their own, within their respective limits; which have exactly the same authority as the general quarter-sessions of the county, except in a very few instances; one of the most considerable of which is the matter of appeals from orders of removal of the poor, which, though they be from the orders of corporation-justices, must be to the sessions of the county, by statute 8 and 9 W. III. c. 30. In both corporations and counties at large, there is sometimes kept a special or petty session, by a few justices, for dispatching smaller business in the neighbourhood between the times of the general sessions; as for licensing alehouses, passing the accounts of parish-officers, and the like.

SESTERCE, Sestertius, a silver coin, in use among the antient Romans, called also simply *nummus*, and sometimes *nummus sestertius*. The sestertius was the fourth part of the denarius, and originally contained two asses and a half. It was at first denoted by LLS; the two L's signifying two libræ, and the S half. But the librarii, afterwards converting the two L's into an H, expressed the sestertius by HS. The word *sestertius* was first introduced by way of abbreviation for *semistertius*, which signifies two, and a half of a third, or, literally, only half a third; for in expressing half a third, it was understood that there were two before.

Some authors make two kinds of sesterces; the less, called *sestertius*, in the masculine gender; and the great one, called *sestertium*, in the neuter: the first, that we have already described; the latter containing a thousand of the other. Others will have any such distinction of great and little sesterces unknown to the Romans: *sestertius*, say they, was an adjective, and signified *as sestertius*, or two asses and a half; and when used in the plural, as in *quinquaginta sestertium*, or *sestertia*, it was only by way of abbreviation, and there was always understood *centena, millia*, &c.

This matter has been accurately stated by Mr. Raper, in the following manner. The substantive to which sestertius referred is either *as*, or *pondus*; and *sestertius as* is two asses and a half; *sestertium pondus*, two pondera and a half, or two hundred and fifty denarii. When the denarius passed for ten asses, the sestertius of two asses and a half was a quarter of it; and the Romans continued to keep their accounts in these sesterces long after the denarius passed for sixteen asses; till, growing rich, they found it more convenient to reckon by quarters of the denarius, which they called *nummi*, and used the words *nummus* and *sestertius* indifferently, as synonymous terms, and sometimes both together, as *sestertius. nummus*; in which case the word *sestertius*, having lost its original signification, was used as a substantive; for *sestertius nummus* was not two nummi and a half, but a single nummus of four asses. They called any sum under two thousand sesterces so many *sestertii* in the masculine gender; two thousand sesterces they called *duo* or *bina sestertia*, in the neuter; so many quarters making five hundred denarii, which was twice the sestertium; and they said *dena, vicena*, &c. *sestertia*, till the sum amounted to a thousand sestertia, which was a million of sesterces. But, to avoid ambiguity, they did not use the neuter *sestertium* in the singular number, when the whole sum amounted to no more than a thousand sesterces, or one sestertium. They called a million of sesterces *decies nummûm*, or *decies sestertiûm*, for *decies centena millia nummorum*, or *sestertiorum* (in the masculine gender), omitting *centena millia* for the sake of brevity. They likewise called the same sum *decies sestertium* (in the neuter gender) for *decies centies sestertium*, omitting *centies* for the same reason; or simply *decies*, omitting *centena millia sestertiûm*, or *centies sestertium*; and with the numeral adverbs *decies, vicies, centies, millies*, and the like, either *centena millia* or *centies* was always understood. These were their most usual forms of expression; though for *bina, dena, vicena sestertia*, they frequently said *bina, dena, vicena millia nummûm*. If the consular denarius contained 60 troy grains of fine silver, it was worth somewhat more than eight-pence farthing and a half sterling; and the as, of 16 to the denarius, a little more than a halfpenny. To reduce the antient sesterces of two asses and a half, when the denarius passed for 16, to pounds sterling, multiply the given number by 5454, and cut off six figures on the right hand for decimals. To reduce *nummi sestertii*, or quarters of the denarius, to pounds sterling; if the given sum be consular money, multiply it by 8727, and cut off six figures on the right hand for decimals; but for imperial money diminish the said product by one-eighth of itself. Phil. Trans. vol. lxi. part ii. art. 48. To be qualified for a Roman knight, an estate of 400,000 *sesterces* was required; and for a senator, of 800,000.

Authors also mention a copper *sesterce*, worth about one-third of a penny English.

Sesterce, or *sestertius*, was also used by the antients for a thing containing two wholes and a half of another, as *as* was taken for any whole or integer.

SESTOS, a noted fortress of European Turkey, situated at the entrance of the Hellespont or Dardanelles, 24 miles southwest of Gallipoli. This place is famous for the loves of Hero and Leander, sung by the poet Musæus.

SESUVIUM, in botany; a genus of plants belonging to the class of icosandria, and to the order of trigynia. The calyx is coloured, and divided into five parts; there are no petals; the capsule is egg-shaped, three celled, opening horizontally about the middle, and containing many seeds. There is only one species, the *portulacastrum*, purslane-leaved sesuvium, which is a native of the West Indies.

SET, or Sets, a term used by the farmers and gardeners to express the young plants of the white thorn and other shrubs, with which they use to raise their quick or quick-set hedges. The white thorn is the best of all trees for this purpose; and, under proper regulations, its sets seldom fail of answering the farmer's utmost expectations.

Set *off*, in law, is an act whereby the defendant acknowledges the justice of the plaintiff's demand on the one hand; but, on the other, sets up a demand of his own, to counterbalance that of the plaintiff, either in the whole, or in part: as, if the plaintiff sues for 10l. due on a note of hand, the defendant may set off 9l. due to himself for merchandise sold to the plaintiff; and, in case he pleads such set-off, must pay the remaining balance into court. This answers very nearly to the *compensatio* or stoppage of the civil law, and depends upon the statutes 2 Geo. II. cap. 22. and 8 Geo. II. cap. 24.

SETACEOUS worm, in natural history, a name given by Dr. Lister to that long and slender water-worm, which so much resembles a horse-hair, that it has been supposed by the vulgar to be an animated hair of that creature. These creatures, supposed to be living hairs, are a peculiar sort of insects, which are bred and nourished within the bodies of other insects, as the worms of the ichneumon flies are in the bodies of the caterpillars. Aldrovand describes the creature, and tells us it was unknown to the antients; but called *seta aquatica*, and *vermis setarius*, by the moderns, either from its figure resembling that of a hair, or from the supposition of its once having been the hair of some animal. We generally suppose it, in the imaginary state of the hair, to have belonged to a horse; but the Germans say it was once the hair of a calf, and call it by a name signifying *vitulus aquaticus*, or the "water-calf." Standing and foul waters are most plentifully stored with them; but they are sometimes found in the clearest and purest springs, and sometimes out of the water, on the leaves of trees and plants, as on the fruit-trees in our gardens, and the elms in hedges. They are from three to five inches long, of the thickness of a large hair; and are brown upon the back, and white under the belly, and the tail is white on every part.

SETH, the third son of Adam, the father of Enos, was born 3874 B. C. and lived 912 years.

SETHIANS, in church-hiſtory, Chriſtian heretics; ſo called becauſe they paid divine worſhip to Seth, whom they looked upon to be Jeſus Chriſt the ſon of God, but who was made by a third divinity, and ſubſtituted in the room of the two families of Abel and Cain, which had been deſtroyed by the deluge. Theſe heretics appeared in Egypt in the ſecond century; and as they were addicted to all ſorts of debauchery, they did not want followers; and continued in Egypt above 200 years.

SETIMO, a town of Italy, in the province of Piedmont, ſituated on the river Po, eight miles north of Turin.

SETON, in ſurgery, a few threads drawn through the ſkin by means of a large needle or probe, with a view to produce a diſcharge. Setons are very uſeful in catarrhs, inflammations, and other diſorders, particularly thoſe of the eyes, as a gutta ſerena, cataract, and incipient ſuffuſion; to theſe we may add intenſe headachs, with ſtupidity, drowſineſs, epilepſies, and even the apoplexy itſelf.

SETTEE, in ſea-language, a veſſel very common in the Mediterranean with one deck and a very long and ſharp prow. They carry ſome two maſts, ſome three, without topmaſts. They have generally two maſts, equipped with triangular ſails, commonly called *lateen ſails*. The leaſt of them are of 60 tons burden. They ſerve to tranſport cannon and proviſions for ſhips of war and the like. Theſe veſſels are peculiar to the Mediterranean ſea, and are uſually navigated by Italians, Greeks, or Mahometans.

SETTING, in aſtronomy, the withdrawing of a ſtar or planet, or its ſinking below the horizon. Aſtronomers and poets make three different kinds of ſetting of the ſtars, viz. the Cosmical, Acronycal, and Heliacal. See thoſe articles.

Setting, in the ſea-language. To ſet the land or the ſun by the compaſs, is to obſerve how the land bears on any point of the compaſs, or on what point of the compaſs the ſun is. Alſo, when two ſhips ſail in ſight of one another, to mark on what point the chaſed bears, is termed *ſetting the chace by the compaſs*.

Setting, among ſportſmen, a term uſed to expreſs the manner of taking partridges by means of a dog peculiarly trained to that purpoſe. See Shooting.

Act of SETTLEMENT, in Britiſh hiſtory, a name given to the ſtatute 12 and 13 W. III. cap. 2. whereby the crown was limited to his preſent majeſty's illuſtrious houſe; and ſome new proviſions were added, at the ſame fortunate era, for better ſecuring our religion, laws, and liberties; which the ſtatute declares to be the birthright of the people of England, according to the antient doctrine of the common law.

SEVENTH, in muſic, an interval called by the Greeks *heptacbordon*. See Interval.

SEVERANCE, in law, the ſingling or ſevering two or more that join or are joined in the ſame writ or action. As if two join in a writ, *de libertate probanda*, and the one be afterwards nonſuited; here ſeverance is permitted, ſo as notwithſtanding the nonſuit of the one, the other may ſeverally proceed. There is alſo ſeverance of the tenants in aſſize; when one, two, or more diſſeiſees appear upon the writ, and not the other. And ſeverance in debt, where two executors are named plaintiffs, and the one refuſes to proſecute. We alſo meet with ſeverance of ſummons, ſeverance in attaints, &c. An eſtate in joint tenancy may be ſevered and deſtroyed by deſtroying any of its unities. 1. That of time, which reſpects only the original commencement of the joint eſtate, cannot indeed (being now part) be affected by any ſubſequent tranſaction. But, 2. The joint-tenants eſtate my be deſtroyed without any alienation, by merely diſuniting their poſſeſſion. 3. The jointure may be deſtroyed, by deſtroying the unity of title. And, 4. By deſtroying the unity of intereſt.

SEVERIA, a province of the Ruſſian empire, with the title of a duchy, bounded on the north by Smolenſko and Muſcovy, on the eaſt by Vorotinſby and the country of the Coſſacks, on the ſouth by the ſame, and on the weſt by Zernegovia. It is a country over-run with woods, and on the ſouth part is a foreſt of great length. Novogrodec, or Novogorod, is the capital town.

St. SEVERINA, a town of Italy, in the kingdom of Naples, and in Lower Calabria, with an archbiſhop's ſee. It is very well fortified, and ſeated on a craggy rock, on the river Neeto, in E. lon. 17. 14. N. lat. 39. 15.

SEVERINO, a town of Italy, in the territory of the church and in the Marche of Ancona, with a biſhop's ſee. It has fine vineyards, and is ſeated between two hills on the river Petenza, in E. lon. 13. 6. N. lat. 43. 16.

SEVERN, a river which riſes near Plimlimmon Hill in Montgomeryſhire, and before it enters Shropſhire receives about 30 ſtreams, and paſſes down to Laudring, where it receives the Morda, that flows from Oſweſtry. When it arrives at Monford it receives the river Mon, paſſing on to Shrewſbury, which it almoſt ſurrounds, then to Bridgenorth; afterwards it runs through the ſkirts of Staffordſhire, enters Worceſterſhire, and paſſes by Worceſter; then it runs to Tewkeſbury, where it joins the Avon, and from thence to Glouceſter, keeping a north-weſterly courſe, till it falls into the Briſtol Channel. It begins to be navigable for boats at Welchpool, in Montgomeryſhire, and takes in ſeveral other rivers in its courſe, beſides thoſe already mentioned, and *is the ſecond in England*. By the late inland navigation, it has communication with the rivers Merſey, Dee, Ribble, Ouſe, Trent, Derwent, Humber, Thames, Avon, &c. which navigation, including its windings, extends above 500 miles in the counties of Lincoln, Nottingham, York, Lancaſter, Weſtmoreland, Cheſter, Stafford, Warwick, Leiceſter, Oxford, Worceſter, &c. A canal from Stroud-Water, a branch of the Severn, to join the Thames, has lately been undertaken, and which great undertaking of conveying a tunnel 16 feet high and 16 feet wide, under Sapperton Hill and Hayley-Wood (very high ground), for two miles and a quarter in length, through a very hard rock, lined and arched with brick, is entirely completed, and boats paſſed through it the 21ſt of May 1789. By this opening, a communication is made between the river Severn at Framiload and the Thames near Lechlade, and will be continued over the Thames near Ingleſham, into deep water in the Thames below St. John-Bridge, and ſo to Oxford, &c. and London, for conveyance of coals, goods, &c. It is now navigable from the Severn to Themsford, by way of Stroud, Cirenceſter, Cricklade, &c. being filled with water for that purpoſe near 40 miles.

SEVERUS (Cornelius), an antient Latin poet of the Auguſtan age; whoſe *Ætna*, together with a fragment *De morte Ciceronis*, were publiſhed, with notes and a proſe interpretation, by Le Clerc, 12mo, Amſterdam, 1703. They were before inſerted among the *Catalecta Virgilii* publiſhed by Scaliger; whoſe notes, with others, Le Clerc has received among his own.

Severus (Septimus), a Roman emperor, who has been ſo much admired for his military talents, that ſome have called him the moſt warlike of the Roman emperors. As a monarch he was cruel, and it has been obſerved that he never did an act of humanity or forgave a fault. In his diet he was temperate, and he always ſhowed himſelf an open enemy to pomp and ſplendor. He loved the appellation of a man of letters, and he even compoſed a hiſtory of his own reign, which ſome have praiſed for its correctneſs and veracity. However cruel Severus may appear in his puniſhments and in his revenge, many have endeavoured to exculpate him, and obſerved that there was need of ſeverity in an empire where the morals were ſo corrupted, and where no leſs than 3000 perſons were accuſed of adultery during the ſpace of 17 years. Of him, as of Auguſtus, ſome were fond to ſay, that it would have been better for the world if he had never been born, or had never died.

Severus's *Wall*, in Britiſh topography, the fourth and laſt

barrier erected by the Romans againſt the incurſions of the North Britons. See the article ANTONINUS's *Wall*. We learn from ſeveral hints in the Roman hiſtorians, that the country between the walls of Hadrian and Antoninus continued to be a ſcene of perpetual war and ſubject of contention between the Romans and Britons, from the beginning of the reign of Commodus till the arrival of the emperor Septimius Severus in Britain, A. D. 205. This laſt emperor having ſubdued the Mæatæ, and repulſed the Caledonians, determined to erect a ſtronger and more impenetrable barrier than any of the former againſt their future incurſions.

Though neither Dio nor Herodian make any mention of a wall built by Severus in Britain for the protection of the Roman province, yet we have abundant evidence from other writers of equal authority, that he really built ſuch a wall. "He fortified Britain (ſays Spartian) with a wall drawn acroſs the iſland from ſea to ſea; which is the greateſt glory of his reign. After the wall was finiſhed, he retired to the next ſtation (York), not only a conqueror, but the founder of an eternal peace." To the ſame purpoſe, Aurelius Victor and Oroſius, to ſay nothing of Eutropius and Caſſiodorus: "Having repelled the enemy in Britain, he fortified the country, which was ſuited to that purpoſe, with a wall drawn acroſs the iſland from ſea to ſea."—"Severus drew a great ditch, and built a ſtrong wall, fortified with ſeveral turrets, from ſea to ſea, to protect that part of the iſland which he had recovered from the yet unconquered nations." As the reſidence of the emperor Severus in Britain was not quite four years, it is probable that the two laſt of them were employed in building this wall; according to which account, it was begun A. D. 209, and finiſhed A. D. 210.

This wall of Severus was built nearly on the ſame tract with Hadrian's rampart, at the diſtance only of a few paces north. The length of this wall, from Couſins' houſe near the mouth of the river Tyne on the eaſt, to Boulneſs on the Solway frith on the weſt, hath been found, from two actual menſurations, to be a little more than 68 Engliſh miles, and a little leſs than 74 Roman miles. To the north of the wall was a broad and deep ditch, the original dimenſions of which cannot now be aſcertained, only it ſeems to have been larger than that of Hadrian. The wall itſelf, which ſtood on the ſouth brink of the ditch, was built of free-ſtone, and where the foundation was not good it is built on piles of oak; the interſtices between the two faces of this wall are filled with broad thin ſtones, placed not perpendicularly, but obliquely on their edges; the running mortar or cement was then poured upon them, which by its great ſtrength and tenacity bound the whole together, and made it firm as a rock. But though theſe materials are ſufficiently known, it is not eaſy to gueſs where they were procured, for many parts of the wall are at a great diſtance from any quarry of free ſtone; and though ſtone of another kind was within reach, yet it does not appear to have been any where uſed. The height of this wall was 12 feet beſides the parapet, and its breadth 8 feet, according to Bede, who lived only at a ſmall diſtance from the eaſt end of it, and in whoſe time it was almoſt quite entire in many places. Such was the wall erected by the command and under the direction of the emperor Severus in the north of England; and, conſidering the length, breadth, height, and ſolidity, it was certainly a work of great magnificence and prodigious labour. But the wall itſelf was but a part, and not the moſt extraordinary part, of this work. The great number and different kinds of fortreſſes which were built along the line of it for its defence, and the military ways with which it was attended, are ſtill more worthy of our admiration, and come now to be deſcribed.

The fortreſſes which were erected along the line of Severus's wall for its defence, were of three different kinds, and three different degrees of ſtrength; and were called by three different Latin words, which may be tranſlated *ſtations*, *caſtles*, and *turrets*. Of each of theſe in their order.

The *ſtationes*, ſtations, were ſo called from their ſtability and the ſtated reſidence of garriſons. They were alſo called *caſtra*; which hath been converted into *cheſtres*, a name which many of them ſtill bear. Theſe were by far the largeſt, ſtrongeſt, and moſt magnificent of the fortreſſes which were built upon the wall, and were deſigned for the head-quarters of the cohorts of troops which were placed there in garriſon, and from whence detachments were ſent into the adjoining caſtles and turrets. Theſe ſtations, as appears from the veſtiges of them which are ſtill viſible, were not all exactly of the ſame figure nor of the ſame dimenſions; ſome of them being exactly ſquares, and others oblong, and ſome of them a little larger than others. Theſe variations were no doubt occaſioned by the difference of ſituation and other circumſtances. The ſtations were fortified with deep ditches and ſtrong walls, the wall itſelf coinciding with and forming the north wall of each ſtation. Within the ſtations were lodgings for the officers and ſoldiers in garriſon; the ſmalleſt of them being ſufficient to contain a cohort, or 600 men. Without the walls of each ſtation was a town, inhabited by labourers, artificers, and others, both Romans and Britons, who choſe to dwell under the protection of theſe fortreſſes. The number of the ſtations upon the wall was exactly 18; and if they had been placed at equal diſtances, the interval between every two of them would have been four miles and a few paces: but the intervention of rivers, marſhes, and mountains; the conveniency of ſituations for ſtrength, proſpect, and water; and many other circumſtances to us unknown, determined them to place theſe ſtations at unequal diſtances. The ſituation which was always choſen by the Romans, both here and everywhere elſe in Britain where they could obtain it, was the gentle declivity of a hill, near a river, and facing the meridian ſun. Such was the ſituation of the far greateſt part of the ſtations on this wall. In general we may obſerve, that the ſtations ſtood thickeſt near the two ends and in the middle, probably becauſe the danger of invaſion was greateſt in theſe places. But the reader will form a clearer idea of the number of theſe ſtations, their Latin and Engliſh names, their ſituation and diſtance from one another, by inſpecting the following table, than we can give him with equal brevity in any other way. The firſt column contains the number of the ſtation, reckoning from eaſt to weſt; the ſecond contains its Latin, and the third its Engliſh name; and the three laſt its diſtance from the next ſtation to the weſt of it, in miles, furlongs, and chains.

No	Latin Name.	Engliſh Name.	M	F.	C.
1	Segedunum	Couſins'-houſe	3	5	1½
2	Pons Ælii	Newcaſtle	2	0	9
3	Condercum	Benwell hill	6	6	5
4	Vindobala	Rutcheſter	7	0	3½
5	Hunnum	Halton-cheſters	5	1	7
6	Cilurnum	Walwick-cheſters	3	1	8
7	Procolitia	Carrawbrugh	4	5	3½
8	Borcovicus	Houſeſteeds	1	3	8
9	Vindolana	Little cheſters	3	6	4
10	Æſica	Great cheſters	2	1	6½
11	Magna	Carrvoran	2	6	0
12	Amboglanna	Burdoſwald	6	2	8
13	Petriana	Cambeck	2	6	6
14	Aballaba	Watchcroſs	5	1	9
15	Congavata	Stanwix	3	3	4
16	Axelodunum	Brugh	4	0	9
17	Gabroſentum	Brumbrugh	3	4	1
18	Tunnocelum	Boulneſs	0	0	0
		Length of the wall	68	3	3

The *caſtella*, or caſtles, were the ſecond kind of fortifications which were built along the line of this wall for its defence. Theſe caſtles were neither ſo large nor ſtrong as the ſtations, but much more numerous, being no fewer than 81. The ſhape and dimenſions of the caſtles, as appears from the foundations of many of them which are ſtill viſible, were exact ſquares of 66 feet every way. They were fortified on every ſide with thick and lofty walls, but without any ditch, except on the north ſide; on which the wall itſelf, raiſed much above its uſual height, with the ditch attending it, formed the fortification. The caſtles were ſituated in the intervals between the ſtations, at the diſtance of about ſeven furlongs from each other; though particular circumſtances ſometimes occaſioned a little variation. In theſe caſtles, guards were conſtantly kept by a competent number of men detached from the neareſt ſtations.

The *turres*, or turrets, were the third and laſt kind of fortifications on the wall. Theſe were ſtill much ſmaller than the caſtles, and formed only a ſquare of about 12 feet, ſtanding out of the wall on its ſouth ſide. Being ſo ſmall, they are more entirely ruined than the ſtations and caſtles, which makes it difficult to diſcover their exact number. They ſtood in the intervals between the caſtles; and from the faint veſtiges of a few of them it is conjectured that there were four of them between every two caſtles, at the diſtance of about 300 yards from one another. According to this conjecture, the number of the turrets amounted to 324. They were deſigned for watch-towers and places for ſentinels, who, being within hearing of one another, could convey an alarm or piece of intelligence to all parts of the wall in a very little time.

Such were the ſtations, caſtles, and turrets, on the wall of Severus; and a very conſiderable body of troops was conſtantly quartered in them for its defence. The uſual complement allowed for this ſervice was as follows:

1. Twelve cohorts of foot, conſiſting of 600 men each,	7,200
2. One cohort of mariners in the ſtation at Boulneſs,	600
3. One detachment of Moors, probably equal to a cohort, - - - -	600
4. Four alæ or wings of horſe, conſiſting, at the loweſt computation, of 400 each, - -	1,600
	10,000

For the conveniency of marching theſe troops from one part of the wall to another, with the greater eaſe and expedition, on any ſervice, it was attended with two military ways, paved with ſquare ſtones in the moſt ſolid and beautiful manner. One of theſe ways was ſmaller, and the other larger. The ſmaller military way ran cloſe along the ſouth ſide of the wall, from turret to turret, and caſtle to caſtle, for the uſe of the ſoldiers in relieving their guards and ſentinels, and ſuch ſervices. The larger way did not keep ſo near the wall, nor touch at the turrets or caſtles, but purſued the moſt direct courſe from one ſtation to another, and was deſigned for the conveniency of marching larger bodies of troops.

It is to be regretted, that we cannot gratify the reader's curioſity, by informing him by what particular bodies of Roman troops the ſeveral parts of this great work were executed, as we were enabled to do with regard to the wall of Antoninus Pius from inſcriptions. For though it is probable that there were ſtones with inſcriptions of the ſame kind, mentioning the ſeveral bodies of troops, and the quantity of work performed by each of them, originally inſerted in the face of this wall, yet none of them are now to be found. There have indeed been diſcovered, in or near the ruins of this wall, a great number of ſmall ſquare ſtones, with very ſhort, and generally imperfect, inſcriptions upon them; mentioning particular legions, cohorts, and centuries; but without directly aſſerting that they had built any part of the wall, or naming any number of paces. Of theſe inſcriptions, the reader may ſee no fewer than twenty-nine among the Northumberland and Cumberland inſcriptions in Mr. Horſley's Britannia Romana. As the ſtones on which theſe inſcriptions are cut are of the ſame ſhape and ſize with the other facing-ſtones of this wall, it is almoſt certain that they have been originally placed in the face of it. It is equally certain, from the uniformity of theſe inſcriptions, that they were all intended to intimate ſome one thing, and nothing ſo probable as that the adjacent wall was built by the troops mentioned in them. This was, perhaps, ſo well underſtood, that it was not thought neceſſary to be expreſſed; and the diſtance of theſe inſcriptions from one another ſhowed the quantity of work performed. If this was really the caſe, we know in general, that this great work was executed by the ſecond and ſixth legions, theſe being the only legions mentioned in theſe inſcriptions. Now, if this prodigious wall, with all its appendages of ditches, ſtations, caſtles, turrets, and military ways, was executed in the ſpace of two years by two legions only, which, when moſt complete, made no more than 12,000 men, how greatly muſt we admire the ſkill, the induſtry, and excellent diſcipline of the Roman ſoldiers, who were not only the valiant guardians of the empire in times of war, but its moſt active and uſeful members in times of peace!

This wall of Severus, and its fortreſſes, proved an impenetrable barrier to the Roman territories for near 200 years. But about the beginning of the 5th century, the Roman empire being aſſaulted on all ſides, and the bulk of their forces withdrawn from Britain, the Mæatæ and Caledonians, now called *Scots* and *Picts*, became more daring; and ſome of them breaking through the wall, and others ſailing round the ends of it, they carried their ravages into the very heart of Provincial Britain. Theſe invaders were indeed ſeveral times repulſed by the Roman legions ſent to the relief of the Britons. The laſt of theſe legions, under the command of Gallio of Ravenna, having, with the aſſiſtance of the Britons, thoroughly repaired the breaches of Severus's wall and its fortreſſes, and exhorted the Britons to make a brave defence, took their final farewell of Britain. It ſoon appeared that the ſtrongeſt walls and ramparts are no ſecurity to an undiſciplined and daſtardly rabble, as the unhappy Britons then were. The Scots and Picts met with little reſiſtance in breaking through the wall, while the towns and caſtles were tamely abandoned to their deſtructive rage. In many places they levelled it with the ground, that it might prove no obſtruction to their future inroads.—From this time no attempts were ever made to repair this noble work. Its beauty and grandeur procured it no reſpect in the dark and taſteleſs ages which ſucceeded. It became the common quarry for more than a thouſand years, out of which all the towns and villages around were built; and is now ſo entirely ruined, that the penetrating eyes of the moſt poring and patient antiquarian can hardly trace its vaniſhing foundations.

SEVIGNE (Marie de Rabutin, Marquiſe de), a French lady, celebrated for her wit and her wiſdom, was born in 1626; and was not above a year old when her father was killed at the deſcent of the Engliſh upon the iſle of Rhee. In 1644 ſhe married the marquis of Sevigné, who was killed in a duel in 1651; and had a ſon and daughter by him, to the care of whoſe education ſhe afterwards religiouſly devoted herſelf: they became accordingly moſt accompliſhed perſons, as it was reaſonable to expect. This illuſtrious lady was acquainted with all the wits and learned of her time. She died in 1696, and left us a moſt valuable collection of letters; the beſt edition of which is that of Paris, 1754, in 8 vols. 12mo.

SEVILLE, an antient and conſiderable city of Spain, capital of Andaluſia, and a biſhop's ſee. It is ſeated on the Guadalquiver, and takes up more ground than Madrid, although it has not ſo many inhabitants. It is of a round form, and fortified

with strong walls, flanked by high towers. The Moors built an aqueduct, still to be seen, six miles in length. The cathedral is the largest in Spain: the steeple is of curious workmanship, and extremely high, consisting of three towers, one above another, with galleries and balconies. Of the convents, that of St. Francis is the most curious, adorned with a handsome public square, in the midst of which is a fine fountain. The university consists of many colleges; and the professors enjoy rich pensions. The royal palace, called Alcazar, was partly built after the antique by the Moors, and partly in the modern taste by king Pedro; it is a mile in extent, and flanked by large square towers, built with stones taken from the antient temple of Hercules. The exchange is a square building of the Tuscan order, each front 100 feet in length, and three stories high. The townhouse is adorned with a great number of statues, and there is a large square before it, with a fine fountain in the middle. There are 120 hospitals richly endowed. The suburb stands on the other side of the river, over which is a long bridge of boats. In this suburb the house of the Inquisition is placed; and there are public walks, where most of the inhabitants go to take the air. The situation of Seville renders it one of the most commercial towns of Spain. All the trade of that kingdom with the New World centred originally in its port. Formerly the galleons and the flota took their annual departure hence; but the port of Cadiz having been found more commodious, they have sailed from that place since 1720. Such vast employment did the American trade give at one period, that in Seville alone there were no fewer than 16,000 looms in silk or woollen work, and 130,000 persons were employed in these manufactures; but, before the end of the reign of Philip III. the looms of Seville were reduced to 400. The country about it is extremely fertile in corn, wine, &c. and there is abundance of oil; for to the west of the river is a grove of olive-trees 30 miles in length. Seville is 45 miles from the Atlantic, 112 W. of Granada, and 212 S. by W. of Madrid. W. lon. 5. 22. N. lat. 37. 32.

SEVUM Minerale, mineral tallow; a substance somewhat resembling tallow, found on the sea-coasts of Finland in the year 1736. It burns with a blue flame, and smell of grease, leaving a black viscid matter which cannot easily be consumed. It is extremely light; being only of the specific gravity of 0.770; whereas tallow is not less than 0.969. It is partly soluble in highly rectified spirit of wine; but entirely so in expressed oils when boiling. It is met with in some of the rocky parts of Persia, but there it appears to be mixed with petroleum. Dr. Herman of Strasburg mentions a spring in the neighbourhood of that city which contains a substance of this sort diffused through it, separating, and capable of being collected on ebullition.—A fat mineral matter resembling butter or tallow has lately been extracted from peat in Lancashire. See Peat.

SEWAURY, a Hindoo word used in Bengal, and signifying the train of attendants that accompany a nabob or great man.

SEWER, *in the Household*, an officer who arranges on the table the dishes of a king or nobleman.

Sewer is also a passage or gutter made to carry water into the sea or a river, whereby to preserve the land, &c. from inundations and other annoyances.

Court of Commissioners of Sewers *in England,* a temporary tribunal, erected by virtue of a commission under the great seal; which formerly used to be granted *pro re nata* at the pleasure of the crown, but now at the discretion and nomination of the lord chancellor, lord treasurer, and chief justices, pursuant to the statute 23 Hen. VIII. c. 5. Their jurisdiction is to overlook the repairs of sea-banks and sea-walls, and the cleansing of rivers, public streams, ditches, and other conduits, whereby any waters are carried off; and is confined to such county or particular district as the commission shall expressly name. The commissioners are a court of record, and may fine and imprison for contempts; and in the execution of their duty may proceed by jury, or upon their own view, and may take order for the removal of any annoyances, or the safeguard and conservation of the sewers within their commission, either according to the laws and customs of Romney-marsh, or otherwise at their own discretion. They may also assess such rates or scots upon the owners of lands within their district as they shall judge necessary: and if any person refuses to pay them, the commissioners may levy the same by distress of his goods and chattels; or they may, by statute 23 Hen. VIII. c. 5. sell his freehold-lands (and by the 7 Ann. c. 10 his copyhold also), in order to pay such scots or assessments. But their conduct is under the controul of the court of King's-bench, which will prevent or punish any illegal or tyrannical proceedings. And yet in the reign of king James I. (8th Nov. 1616.) the privy-council took upon them to order, that no action or complaint should be prosecuted against the commissioners unless before that board; and committed several to prison who had brought such actions at common law, till they should release the same: and one of the reasons for discharging Sir Edward Coke from his office of lord chief-justice was for countenancing those illegal proceedings. The pretence for these arbitrary measures was no other than the tyrant's plea of the *necessity* of unlimited powers in works of evident utility to the public, "the supreme reason above all reasons, which is the salvation of the king's lands and people." But now it is clearly held, that this (as well as all other inferior jurisdictions) is subject to the discretionary coercion of his majesty's court of King's bench.

Common Sewers, in Rome, were executed at a great expense. It was proposed that they should be of sufficient dimensions to admit a waggon loaded with hay. When these common sewers came to be obstructed, or out of repair, under the republic, the censors contracted to pay a thousand talents, or about 193,000l. for clearing and repairing them. They were again in disrepair at the accession of Augustus Cæsar, and the reinstating them is mentioned among the great works of Agrippa. He is said to have turned the course of seven rivers into these subterraneous passages, to have made them navigable, and to have actually passed in barges under the streets and buildings of Rome. These works are still supposed to remain; but as they exceed the power and resources of the present city to keep them in repair, they are quite concealed, except at one or two places. They were, in the midst of the Roman greatness, and still are, reckoned among the wonders of the world; and yet they are said to have been works of the elder Tarquin, a prince whose territory did not extend, in any direction, above 16 miles; and, on this supposition, they must have been made to accommodate a city that was calculated chiefly for the reception of cattle, herdsmen, and banditti. Rude nations sometimes execute works of great magnificence, as fortresses and temples, for the purposes of war and superstition; but seldom palaces, and still more seldom works of mere convenience and cleanliness, in which for the most part they are long defective. It is not unreasonable, therefore, to question the authority of tradition in respect to this singular monument of antiquity, which so greatly exceeds what the best accommodated city of modern Europe could undertake for its own conveniency. And as those works are still entire, and may continue so for thousands of years, it may be suspected that they were even prior to the settlement of Romulus, and may have been the remains of a more antient city, on the ruins of which the followers of Romulus settled, as the Arabs now hut or encamp on the ruins of Palmyra and Balbec. Livy owns, that the common sewers were not accommodated to the plan of Rome, as it was laid out in his time; they were carried in directions across the streets, and passed under buildings of the greatest antiquity. This derange-

ment indeed he imputes to the haſty rebuilding of the city after its deſtruction by the Gauls; but haſte, it is probable, would have determined the people to build on their old foundations, or at leaſt not to change them ſo much as to croſs the direction of former ſtreets.

SEX, the property by which any animal is male or female. Lavater has drawn the characteriſtic diſtinctions between the male and female of the human ſpecies. In determining the comparative merit of the two ſexes, it is no derogation from female excellency that it differs in kind from that which diſtinguiſhes the male part of our ſpecies: and if, in general, it ſhould be found (what upon an impartial inquiry will moſt certainly be found) that women fill up their appointed circle of action with greater regularity than men, the claim of preference cannot juſtly be decided in our favour. In the prudential and œconomical parts of life, it is undeniable that they riſe far above us: and if true fortitude of mind is beſt diſcovered by a cheerful reſignation to the meaſures of Providence, we ſhall not find reaſon, perhaps, to claim that moſt ſingular of the human virtues as our peculiar privilege. There are numbers of the other ſex who, from the natural delicacy of their conſtitution, paſs through one continued ſcene of ſuffering from their cradles to their graves, with a firmneſs of reſolution that would deſerve ſo many ſtatues to be erected to their memories, if heroiſm were not eſteemed more by the ſplendour than the merit of actions.

But whatever real difference there may be between the moral or intellectual powers of the male and female mind, Nature does not ſeem to have marked the diſtinction ſo ſtrongly as our vanity is willing to imagine; and after all, perhaps, education will be found to conſtitute the principal ſuperiority. It muſt be acknowledged, at leaſt, that in this article we have every advantage over the ſofter ſex that art and induſtry can poſſibly ſecure to us. The moſt animating examples of Greece and Rome are ſet before us, as early as we are capable of any obſervation; and the nobleſt compoſitions of the antients are given into our hands almoſt as ſoon as we have ſtrength to hold them; while the employments of the other ſex, at the ſame period of life, are generally the reverſe of every thing that can open and enlarge their minds, or fill them with juſt and rational notions. The truth of it is, female education is ſo much worſe than none, as it is better to leave the mind to its natural and uninſtructed ſuggeſtions, than to lead it into falſe purſuits, and contract its views, by turning them upon the loweſt and moſt trifling objects. We ſeem, indeed, by the manner in which we ſuffer the youth of that ſex to be trained, to conſider women agreeably to the opinion of certain Mahometan doctors, and treat them as if we believed they had no ſouls: why elſe are they

> Bred only and completed to the taſte
> Of luſtful appetence, to ſing, to dance,
> To dreſs, and troul the tongue, and roll the eye?
>
> Milton.

This ſtrange neglect of cultivating the female mind can hardly be allowed as good policy, when it is conſidered how much the intereſt of ſociety is concerned in the rectitude of their underſtandings. That ſeaſon of every man's life which is moſt ſuſceptible of the ſtrongeſt impreſſions, is neceſſarily under female direction; as there are few inſtances, perhaps, in which that ſex is not one of the ſecret ſprings which regulates the moſt important movements of private or public tranſactions. What Cato obſerves of his countrymen is in one reſpect true of every nation under the ſun: "The Romans (ſaid he) govern the world, but it is the women that govern the Romans."

If it be true then (as true beyond all peradventure it is) that female influence is thus extenſive, nothing certainly can be of more importance than to give it a proper tendency, by the aſſiſtance of a well-directed EDUCATION. Far are we from recommending any attempts to render women pedants; yet ſurely it is neceſſary they ſhould be raiſed as far above ignorance as the natural limits of their underſtandings will admit of. Such a general tincture of the moſt uſeful ſciences as may ſerve to free the mind from vulgar prejudices, and give it a reliſh for the rational exerciſe of its powers, might very juſtly enter into a plan of female erudition. That ſex might be taught to turn the courſe of their reflections into a proper and advantageous channel, without danger of rendering them too elevated for the feminine duties of life. In a word, they ought to be conſidered as deſigned by Providence for uſe as well as ſhow, and trained up, not only as women, but as rational creatures.

SEXAGENARY, ſomething relating to the number ſixty: thus ſexagenary or ſexageſimal arithmetic is a method of computation proceeding by ſixties; ſuch is that uſed in the diviſion of a degree into ſixty minutes, of the minute into ſixty ſeconds, of the ſecond into ſixty thirds, &c. Alſo ſexagenary tables are tables of proportional parts, ſhowing the product of two ſexagenaries that are to be multiplied, or the quotient of the two that are to be divided.

SEXAGESIMA, the ſecond Sunday before Lent, or the next to Shrove-Sunday, ſo called as being about the 60th day before Eaſter.

SEXAGESIMALS, or Sexagesimal *Fractions*, fractions whoſe denominators proceed in a ſexagecuple ratio; that is, a prime, or the firſt minute, $= \frac{1}{60}$; a ſecond $= \frac{1}{3600}$; a third $= \frac{1}{216000}$. Antiently, there were no other than ſexageſimals uſed in aſtronomy; and they are ſtill retained in many caſes, though decimal arithmetic begins to grow in uſe now in aſtronomical calculations. In theſe fractions, which ſome call *aſtronomical fractions*, the denominator being always 60, or a multiple thereof, is uſually omitted, and the numerator only written down: thus, 4°, 59′, 32″, 50‴, 16⁗, is to be read 4 degrees, 59 minutes, 32 ſeconds, 50 thirds, 16 fourths, &c.

SEXTANS, Sextant, a ſixth part of certain things. The Romans having divided their *as* into 12 ounces or unciæ, the ſixth part of that, or two ounces, was the ſextans.—*Sextans* was alſo a meaſure which contained two ounces of liquor, or two cyathi.

Sextans, in aſtronomy, a conſtellation of the ſouthern hemiſphere, made by Hevelius out of unformed ſtars. In Hevelius's catalogue it contains 11, but in the Britannic catalogue 41 ſtars.

SEXTANT, in mathematics, denotes the ſixth part of a circle, or an arch comprehending 60 degrees. The word *ſextant* is more particularly uſed for an aſtronomical inſtrument made like a quadrant, excepting that its limb only comprehends 60 degrees. The uſe and application of the ſextant is the ſame with that of the quadrant. See Quadrant and Navigation.

SEXTILE, *ſextilis*, the poſition or aſpect of two planets when at 60 degrees diſtance, or at the diſtance of two ſigns, from one another. It is marked thus (*). See Aspect.

SEXTIUS (Quintus), a Pythagorean philoſopher, flouriſhed in the time of Auguſtus. He ſeemed formed to riſe in the republic; but he ſhrunk from civil honours, and declined accepting the rank of ſenator when it was offered him by Julius Cæſar, that he might have time to apply to philoſophy. It appears that he wiſhed to eſtabliſh a ſchool at Rome, and that his tenets, though chiefly drawn from the doctrines of Pythagoras, in ſome particulars reſembled thoſe of the Stoics. He ſoon found himſelf involved in many difficulties. His laws were tinctured with great ſeverity; and in an early period of his eſtabliſhment he found his mind ſo haraſſed, and the harſhneſs of the doctrines which he wiſhed to eſtabliſh ſo repulſive to his feelings, that he had nearly worked himſelf up to ſuch a height of deſperation as to reſolve on putting a period to his exiſtence. Of the ſchool of Sextius were Fabianus, Sotion, Flavianus, Craſ-

ſitius, and Celſus. Of his works only a few fragments remain; and whether any of them formed a part of the work which Seneca admired ſo much, cannot now be determined. Some of his maxims are valuable. He recommended an examination of the actions of the day to his ſcholars when they retired to reſt; he taught, that the road to heaven (*ad aſtra*) was by frugality, temperance, and fortitude. He uſed to reccommend holding a looking-glaſs before perſons diſordered with paſſion. He enjoined his ſcholars to abſtain from animal food.

SEXTON, a church-officer, thus called by corruption of the Latin *ſacriſta*, or Saxon *ſegerſtone*, which denotes the ſame. His office is to take care of the veſſels, veſtments, &c. belonging to the church; and to attend the miniſter, church-warden, &c. at church. He is uſually choſen by the parſon only. Sextons, as well as pariſh-clerks, are regarded by the common law as perſons who have freehold in their offices; and therefore, though they may be puniſhed, yet they cannot be deprived, by eccleſiaſtical cenſures. The office of ſexton in the pope's chapel is appropriated to the order of the hermits of St. Auguſtine. He is generally a biſhop, though ſometimes the pope only gives a biſhopric, *in partibus*, to him on whom he confers the poſt. He takes the title of *Prefect of the Pope's Sacriſty*, and has the keeping the veſſels of gold and ſilver, the relics, &c. When the pope ſays maſs, the ſexton always taſtes the bread and wine firſt. If it be in private he ſays maſs, his holineſs, of two wafers, gives him one to eat; and if in public, the cardinal, who aſſiſts the pope in quality of deacon, of three wafers gives him two to eat. When the pope is deſperately ſick, he adminiſters to him the ſacrament of extreme unction, &c. and enters the conclave in quality of firſt conclaviſt. The office of a ſexton in Sweden is ſomewhat ſingular. During M. Outhier's ſtay at Stockholm in 1736 he viſited the church of St. Clara, and during divine ſervice he obſerved a ſexton going about with a long rod, waking thoſe perſons who had fallen aſleep.

SEXTUPLE, in muſic, denotes a mixed ſort of triple, which is beaten in double time.

SEXTUS Empiricus, a famous Pyrrhonian philoſopher, lived in the ſecond century, under the reign of Antoninus the Debonair. He was a phyſician of the ſect of the Empirics, and is ſaid to have been one of the preceptors of Antoninus the philoſopher. There are ſtill extant his Pyrrhonian Inſtitutions, and a large work againſt the mathematicians, &c. The beſt edition of Sextus Empiricus is that of Fabricius in Greek and Latin, printed at Leipſic in 1718, folio.

SEXUALISTÆ, among botanical writers, thoſe who have eſtabliſhed the claſſes of plants upon the differences of the ſexes and parts of fructification in plants, according to the modern method; as Linnæus, &c.

SEZAWUL, a Hindoo word, uſed in Bengal to expreſs an officer employed at a monthly ſalary to collect the revenues.

SHACK, in antient cuſtoms, a liberty of winter-paſturage. In the counties of Norfolk and Suffolk, the lord of the manor has ſhack, *i. e.* a liberty of feeding his ſheep at pleaſure in his tenants lands during the ſix winter months. In Norfolk, ſhack alſo extends to the common for hogs, in all men's grounds, from the end of harveſt till ſeed-time. Whence to go *a-ſhack*, is to feed at large.

SHACKLES, aboard a ſhip, are thoſe oblong iron rings, bigger at one end than at the other, with which the ports are ſhut faſt, by thruſting the wooden bar of the port through them. There is alſo a ſort of ſhackles to lift the hatches up with, of a like figure, but ſmaller. They are faſtened at the corners of the hatches.

SHAD, in ichthyology, a ſpecies of Clupea.

SHADDOCK, a ſpecies of Citrus.

SHADOW, in optics, a privation or diminution of light by the interpoſition of an opaque body: or it is a plane where the light is either altogether obſtructed, or greatly weakened, by the interpoſition of ſome opaque body between it and the luminary.

Shadow, in painting, an imitation of a real ſhadow, effected by gradually heightening and darkening the colours of ſuch figures as by their diſpoſitions cannot receive any direct rays from the luminary that is ſuppoſed to enlighten the piece.

Shadow, in perſpective, the appearance of an opaque body, and a luminous one, whoſe rays diverge (*e. gr.* a candle, lamp, &c.), being given; to find the juſt appearance of the ſhadow, according to the laws of perſpective. The method is this: From the luminous body, which is here conſidered as a point, let fall a perpendicular to the perſpective plane or table; *i. e.* find the appearance of a point upon which a perpendicular, drawn from the middle of the luminary, falls on the perſpective plane; and from the ſeveral angles, or raiſed points of the body, let fall perpendiculars to the plane. Theſe points, whereon the perpendiculars fall, connect by right lines with the point upon which the perpendicular let fall from the luminary falls; and continue the lines to the ſide oppoſite to the luminary. Laſtly, through the raiſed points draw lines through the centre of the luminary, interſecting the former; the points of interſection are the terms or bounds of the ſhadow.

SHADWELL (Thomas), deſcended of an antient family in Staffordſhire, was born in 1640, and educated at Caius college, Cambridge. He then was placed in the Middle Temple to ſtudy the laws; where having ſpent ſome time, he travelled abroad. Upon his return home, he became acquainted with the moſt celebrated perſons of wit in that age. He applied himſelf chiefly to dramatic writing, in which he had great ſucceſs; and upon the Revolution was made poet laureat and hiſtoriographer to king William and queen Mary, in the room of Mr. Dryden. Theſe employments he enjoyed till his death, which happened in 1692. Beſide his dramatic writings, he compoſed ſeveral other pieces of poetry; the chief of which are his congratulatory poem on the prince of Orange's coming to England; another on queen Mary; his tranſlation of Juvenal's 10th ſatire, &c. Mr. Dryden treats him with great contempt, in his ſatire called *Mac-Fleckno*. The beſt judges of that age, however, gave their teſtimony in favour of his comedies; which have in them fine ſtrokes of humour; the characters are often original, ſtrongly marked, and well ſuſtained. An edition of his works, with ſome account of his life and writings prefixed, was publiſhed, in 172[illegible], in 4 vols. 8vo.

SHAFT *of a* Column, in building, is the body thereof between the baſe and capital; ſo called from its ſtraightneſs. See Architecture.

Shaft, in mining, is the pit or hollow entrance into the mine. In the tin-mines, after this is ſunk about a fathom, they leave a little, long, ſquare place, which is called a *ſhamble*. Shafts are ſunk ſome ten, ſome twenty fathoms deep into the earth, more or leſs. Of theſe ſhafts, there is the landing or working ſhaft, where they bring up the work or ore to the ſurface; but if it be worked by a horſe engine or whim, it is called a *whim-ſhaft*; and where the water is drawn out of the mine, it is indifferently named an *engine-ſhaft*, or the *rod-ſhaft*. See Mine.

Shaft, in ornithology. See Trochilus.

SHAFTSBURY, a borough in Dorſetſhire, with a market on Saturday. It is ſeated on a hill, where water is ſo ſcarce, that the poor get a living by fetching it from a great diſtance; but it enjoys a ſerene wholeſome air, and has a fine proſpect. It ſends two members to parliament, is governed by a mayor, and had formerly 10 pariſh churches, which are now reduced to three. It is 25 miles N. N. E. of Dorcheſter, and 102 W. by S. of London. W. lon. 2. 20. N. lat. 51. 0.

SHAG, in ornithology. See Pelicanus.

SHAGREEN, or Chagreen, in commerce, a kind of grained

leather prepared of the skin of a species of Squalus, much used in covering cases, books, &c.

Manner of preparing Shagreen. The skin, being flayed off, is stretched out, covered over with mustard-seed, and the seed bruised on it; and thus it is exposed to the weather for some days, and then tanned. The best is that brought from Constantinople, of a brownish colour; the white is the worst. It is extremely hard; yet, when steeped in water, it becomes very soft and pliable; whence it is of great use among case-makers. It takes any colour that is given it, red, green, yellow, or black. It is frequently counterfeited by morocco, formed like shagreen; but this is distinguished by its peeling off, which the first does not.

SHAIK properly signifies an old man. In the east it is used to denote a lord or chief, a man of eminence and property. See Schiechs.

SHAKE, in singing. See Trill.

SHAKESPEARE or Shakspeare (William), the prince of dramatic writers, was born at Stratford upon Avon in Warwickshire, on the 23d of April 1564. From the register of that town, it appears that a plague broke out there on the 30th of June following, which raged with great violence; but fortunately it did not reach the house in which this infant prodigy lay. His father, John Shakespeare, enjoyed a small patrimonial estate, and was a considerable dealer in wool; his mother was the daughter and heir of Robert Arden of Wellingcote. Our illustrious poet being designed for the business of his father, received no better education than the instructions which the free-school of Stratford could afford. After applying some time to the study of Latin, he was called home to assist his father, who seems by some accident to have been reduced in his circumstances. Before arriving at the age of 19, he married the daughter of Mr. Hathaway, a substantial yeoman in the neighbourhood of Stratford. This lady was eight years older than her husband. Having the misfortune to fall into bad company, he was seduced into some profligate actions, which drew on him a criminal prosecution, and at length forced him to take refuge in the capital. In concert with his associates, he broke into a park belonging to Sir Thomas Lucy of Charlecote, and carried off some of his deer. Every admirer of Shakespeare will regret that such a blemish should have stained his character: but, perhaps, if any thing can extenuate his guilt, we might ascribe it to the opinions of the age, which, perhaps, as was formerly the case in Scotland, might not distinguish the killing of deer by any mark of disgrace, or any charge of criminality. One thing at least is certain, that Shakespeare himself thought that the prosecution which Sir Thomas raised against him was carried on with too great severity; an opinion which he could not have entertained had this action been at that time viewed in the same criminal light as it is at present. Shakespeare testified his resentment against Sir Thomas, by writing a satirical ballad, which exasperated him so much, that the process was carried on with redoubled violence; and the young poet, in order to avoid the punishment of the law, was obliged to make his escape. This ballad would be considered as a curious relic, on account of its being the first production of Shakespeare; it would also be interesting to peruse a poem which could irritate the baronet to so high a degree. Tradition has preserved the first stanza:

A parliamente member, a justice of peace,
At home a poor scare-crow, at London an asse,
If lowsie is Lucy, as some volke miscalle it,
Then Lucy is lowsie whatever befall it:
He thinks himself greate,
Yet an asse in his state,
We allowe by his ears, but with asses to mate.
If Lucy is lowsie, as some volke miscalle it,
Sing lowsie Lucy whatever befall it.

If the rest of the ballad was of a piece with this stanza, it might assist us to form some opinion of the irritability of the baronet, but will enable us to form no idea of the opening genius of Shakespeare.

Thus expelled from his native village, he repaired to London; where he was glad to accept a subordinate office in the theatre. It has been said that he was first engaged, while the play was acting, in holding the horses of those who rode to the theatre; but this story rests on a slender foundation. As his name is found printed among those of the other players before some old plays, it is probable that he was some time employed as an actor; but we are not informed what characters he played; we are only told, that the part which he acted best was that of the Ghost in Hamlet; and that he appeared in the character of Adam in *As you like it*. If the names of the actors prefixed to Ben Jonson's play of *Every Man in his Humour* were arranged in the same order as the persons represented, which is very probable, Shakespeare played the part of Old Knowell. We have reason therefore to suppose, as far as we can argue from these few facts, that he generally represented old men. See Malone's Chronology, in his edition of Shakespeare.

But though he was not qualified to shine as an actor, he was now in the situation which could most effectually rouse those latent sparks of genius which afterwards burst forth with so resplendent a flame. Being well acquainted with the mechanical business of the theatre and the taste of the times; possessed of a knowledge of the characters of men resembling intuition, an imagination that ranged at large through nature, selecting the grand, the sublime, and the beautiful; a judicious caution, that disposed him to prefer those plots which had already been found to please; an uncommon fluency and force of expression; he was qualified at once to eclipse all who had gone before him.

Notwithstanding the unrivalled genius of Shakespeare, most of his plots were the invention of others; which, however, he certainly much improved, if he did not entirely new-model. We are assured, that prior to the theatrical compositions of Shakespeare, dramatic pieces were written on the following subjects, viz. King John, King Richard II. and III. King Henry IV. and V. King Henry VIII. King Lear, Antony and Cleopatra, Measure for Measure, the Merchant of Venice, the Taming of a Shrew, and the Comedy of Errors.

Among his patrons, the earl of Southampton is particularly honoured by him, in the dedication of two poems, Venus and Adonis, and Lucrece; in the latter especially, he expressed himself in such terms as gives countenance to what is related of that patron's distinguished generosity to him. In the beginning of king James I.'s reign (if not sooner) he was one of the principal managers of the playhouse, and continued in it several years afterwards; till, having acquired such a fortune as satisfied his moderate wishes and views in life, he quitted the stage, and all other business, and passed the remainder of his time in an honourable ease, at his native town of Stratford, where he lived in a handsome house of his own purchasing, to which he gave the name of *New Place*; and he had the good fortune to save it from the flames in the dreadful fire that consumed the greatest part of the town in 1614.

In the beginning of the year 1616, he made his will, wherein he testified his respect to his quondam partners in the theatre: he appointed his youngest daughter, jointly with her husband, his executors, and bequeathed to them the best part of his estate, which they came into the possession of not long after. He died on the 23d of April following, being the 53d year of his age; and was interred among his ancestors on the north side of the chancel, in the great church of Stratford, where there is a handsome monument erected for him, inscribed with the following elegiac distich in Latin:

Judicio Pylium, genio Socratem, arte Maronem,
Terra tegit, Populus mœret, Olympus habet.

In the year 1740, another very noble one was raiſed to his memory, at the public expence, in Weſtminſter-abbey; an ample contribution for this purpoſe being made upon exhibiting his tragedy of Julius-Cæſar, at the theatre-royal in Drury-Lane, April 28th 1738.

Nor muſt we omit mentioning another teſtimony of the veneration paid to his manes by the public in general, which is, that a mulberry-tree planted upon his eſtate by the hands of this revered bard, was cut down not many years ago; and the wood being converted to ſeveral domeſtic uſes, was all eagerly bought at a high price, and each ſingle piece treaſured up by its purchaſer as a precious memorial of the planter.

The character of Shakeſpeare as a dramatic writer has been often drawn, but perhaps never with more accuracy than by the pen of Dr. Johnſon: "Shakeſpeare (ſays he) is above all writers, at leaſt above all modern writers, the poet of nature; the poet that holds up to his readers a faithful mirror of manners and of life. His characters are not modified by the cuſtoms of particular places, unpractiſed by the reſt of the world; by the peculiarities of ſtudies or profeſſions, which can operate but upon ſmall numbers; or by the accidents of tranſient faſhions or temporary opinions: they are the genuine progeny of common humanity, ſuch as the world will always ſupply, and obſervation will always find. His perſons act and ſpeak by the influence of thoſe general paſſions and principles by which all minds are agitated, and the whole ſyſtem of life is continued in motion. In the writings of other poets, a character is too often an individual; in thoſe of Shakeſpeare, it is commonly a ſpecies.

"It is from this wide extenſion of deſign that ſo much inſtruction is derived. It is this which fills the plays of Shakeſpeare with practical axioms and domeſtic wiſdom. It was ſaid of Euripides, that every verſe was a precept; and it may be ſaid of Shakeſpeare, that from his works may be collected a ſyſtem of civil and economical prudence. Yet his real power is not ſhown in the ſplendor of particular paſſages, but by the progreſs of his fable, and the tenor of his dialogue; and he that tries to recommend him by ſelect quotations, will ſucceed like the pedant in Hierocles, who, when he offered his houſe to ſale, carried a brick in his pocket as a ſpecimen.

"Upon every other ſtage the univerſal agent is love, by whoſe power all good and evil is diſtributed, and every action quickened or retarded. But love is only one of many paſſions; and as it has no great influence upon the ſum of life, it has little operation in the dramas of a poet who caught his ideas from the living world, and exhibited only what he ſaw before him. He knew that any other paſſion, as it was regular or exorbitant, was a cauſe of happineſs or calamity.

"Characters thus ample and general were not eaſily diſcriminated and preſerved; yet perhaps no poet ever kept his perſonages more diſtinct from each other.

"Other dramatiſts can only gain attention by hyperbolical or aggravated characters, by fabulous and unexampled excellence or depravity, as the writers of barbarous romances invigorated the reader by a giant and a dwarf; and he that ſhould form his expectations of human affairs from the play, or from the tale, would be equally deceived. Shakeſpeare has no heroes. his ſcenes are occupied only by men, who act and ſpeak as the reader thinks that he ſhould himſelf have ſpoken or acted on the ſame occaſion: Even where the agency is ſupernatural, the dialogue is level with life. Other writers diſguiſe the moſt natural paſſions and moſt frequent incidents; ſo that he who contemplates them in the book will not know them in the world: Shakeſpeare approximates the remote, and familiarizes the wonderful; the event which he repreſents will not happen, but, if it were poſſible, its effects would probably be ſuch as he has aſſigned; and it may be ſaid, that he has not only ſhown human nature as it acts in real exigencies, but as it would be found in trials to which it cannot be expoſed.

"This therefore is the praiſe of Shakeſpeare, that his drama is the mirror of life; that he who has mazed his imagination, in following the phantoms which other writers raiſe up before him, may here be cured of his delirious ecſtaſies, by reading human ſentiments in human language; by ſcenes from which a hermit may eſtimate the tranſactions of the world, and a confeſſor predict the progreſs of the paſſions."

The learning of Shakeſpeare has frequently been a ſubject of inquiry. That he poſſeſſed much claſſical knowledge does not appear, yet he was certainly acquainted with the Latin poets, particularly with Terence, as Colman has juſtly remarked, which appears from his uſing the word *thraſonical*. Nor was he unacquainted with French and Italian. We are indeed told, that the paſſages in which theſe languages occur might be impertinent additions of the players; but is it probable, that any of the players ſo far ſurpaſſed Shakeſpeare?

That much knowledge is ſcattered over his works is very juſtly obſerved by Pope; but it is often ſuch knowledge as books did not ſupply. "There is, however, proof enough (ſays Dr. Johnſon) that he was a very diligent reader; nor was our language then ſo indigent of books, but that he might very liberally indulge his curioſity without excurſion into foreign literature. Many of the Roman authors were tranſlated, and ſome of the Greek; the Reformation had filled the kingdom with theological learning; moſt of the topics of human diſquiſition had found Engliſh writers; and poetry had been cultivated, not only with diligence, but ſucceſs. This was a ſtock of knowledge ſufficient for a mind ſo capable of appropriating and improving it."

The works of Shakeſpeare conſiſt of 35 dramatic pieces. The following is the chronological order which Mr. Malone has endeavoured to eſtabliſh, after a minute inveſtigation, in which he has in general been ſucceſsful:

1. Firſt Part of King Henry VI.	1589
2. Second Part of King Henry VI.	1591
3. Third Part of King Henry VI.	1591
4. A Midſummer Night's Dream	1592
5. Comedy of Errors	1593
6. Taming of the Shrew	1594
7. Love's Labour Loſt	1594
8. Two Gentlemen of Verona	1595
9. Romeo and Juliet	1595
10. Hamlet	1596
11. King John	1596
12. King Richard II.	1597
13. King Richard III.	1597
14. Firſt Part of King Henry IV.	1597
15. Second Part of King Henry IV.	1598
16. The Merchant of Venice	1598
17. All's Well that Ends Well	1598
18. King Henry V.	1599
19. Much Ado About Nothing	1600
20. As you Like It	1600
21. Merry Wives of Windſor	1601
22. King Henry VIII.	1601
23. Troilus and Creſſida	1602
24. Meaſure for Meaſure	1603
25. The Winter's Tale	1604
26. King Lear	1605
27. Cymbeline	1605
28. Macbeth	1606
29. Julius Cæſar	1607
30. Antony and Cleopatra	1608
31. Timon of Athens	1609
32. Coriolanus	1610
33. Othello	1611
34. The Tempeſt	1612
35. Twelfth Night	1614

The three first of these, Mr. Malone thinks, there is very strong reason to believe are not the original productions of Shakespeare; but that he probably altered them, and added some new scenes.

In the first folio edition in 1623, these plays were entitled "Mr. William Shakespeare's Comedies, Histories, and Tragedies." They have been published by various editors. The first folio edition by Isaac Jaggard and Edward Blount; the second, folio, 1632, by Thomas Cotes for Robert Allot; the third, 1664, for P. C.; the fourth, 1685, for H. Herringman, E. Brewster, and R. Bentley. Rowe published an 8vo edition in 1709, in 7 vols. and a 12mo edition in 1714, in 9 vols.; for which he received 36l. 10s. Pope published a 4to edition in 1725, in 6 vols. and a 12mo in 1728, in 10 vols.; for which he was paid 217l. 12s. Theobald gave a new edition in 8vo in 1733, in 7 vols. another in 12mo in 1740, in 8 vols.; and received for his labour 652l 10s. Sir Thomas Hanmer published an edition in 1744, in 6 vols. 4to. Dr. Warburton's 8vo edition came out in 1747, in 8 vols.; for which he was paid 560l. The editions published since that time, are Dr. Johnson's in 1765, in 8 vols. 8vo. Stevens's in 1766, in 4 vols. 8vo. Capell's in 1768, in 10 vols. crown 8vo.; for this the author was paid 300l. A second edition of Hanmer's in 1771, 6 vols. Johnson's and Stevens's in 1773, in 10 vols. 8vo; a second edition in 1778; a third by Reed in 1785; and Malone's crown 8vo edition in 1789, in 10 vols.

The most authentic of the old editions is that of 1623. "At last (says Dr. Johnson) an edition was undertaken by Rowe; not because a poet was to be published by a poet, for Rowe seems to have thought very little on correction or explanation, but that our author's works might appear like those of his fraternity, with the appendages of a life and recommendatory preface. Rowe has been clamorously blamed for not performing what he did not undertake, and it is time that justice be done him, by confessing, that though he seems to have had no thought of corruption beyond the printer's errors, yet he has made many emendations, if they were not made before, which his successors have received without acknowledgment, and which, if they had produced them, would have filled pages with censures of the stupidity by which the faults were committed, with displays of the absurdities which they involved, with ostentatious expositions of the new reading, and self-congratulations on the happiness of discovering it."

The nation had been for many years content enough with Mr. Rowe's performance, when Mr. Pope made them acquainted with the true state of Shakespeare's text, showed that it was extremely corrupt, and gave reason to hope that there were means of reforming it. Mr. Pope's edition, however, he observes, fell below his own expectations; and he was so much offended, when he was found to have left any thing for others to do, that he passed the latter part of his life in a state of hostility with verbal criticism.

The only task, in the opinion of Mr. Malone, for which Pope was eminently and indisputably qualified, was to mark the faults and beauties of his author.—When he undertook the office of a commentator, every anomaly of language, and every expression that was currently in use, were considered as errors or corruptions, and the text was altered or amended, as it was called, at pleasure. Pope is openly charged with being one of the great corrupters of Shakespeare's text.

Pope was succeeded by Theobald, who collated the antient copies, and rectified many errors. He was, however, a man of narrow comprehension and of little learning, and what is worse, in his reports of copies and editions, he is not to be trusted without examination. From the liberties taken by Pope, the edition of Theobald was justly preferred, because he professed to adhere to the antient copies more strictly, and illustrated a few passages by extracts from the writers of our poet's age. Still, however, he was a considerable innovator; and while a few arbitrary changes made by Pope were detected, innumerable sophistications were silently adopted.

Sir Thomas Hanmer, who comes next, was a man of critical abilities, and of extensive learning. His corrections are commonly just, but sometimes capricious. He is censurable, too, for receiving without examination almost all the innovations of Pope.

The original and predominant error of Warburton's commentary, is acquiescence in his first thoughts; that precipitation which is produced by consciousness of quick discernment; and that confidence which presumes to do, by surveying the surface, what labour can only perform by penetrating to the bottom. His notes exhibit sometimes perverse interpretations, and sometimes improbable conjectures; he at one time gives the author more profundity of meaning than the sentence admits, and at another discovers absurdities where the sense is plain to every other reader. But his emendations are likewise often happy and just; and his interpretation of obscure passages learned and sagacious.

It has indeed been said by his defenders, that his great object was to display his own learning; and certainly, in spite of the clamour raised against him for substituting his own chimerical conceits instead of the genuine text of Shakespeare, his work increased his reputation. But as it is of little value as a commentary on Shakespeare, since Warburton is now gone, his work will probably soon sink into oblivion.

In 1765 Dr. Johnson's edition, which had long been impatiently expected, was given to the public His vigorous and comprehensive understanding threw more light on his author than all his predecessors had done. The character which he gave of each play is generally just. His refutation of the false glosses of Theobald and Warburton, and his numerous explications of involved and difficult passages, entitle him to the gratitude of every admirer of Shakespeare.

The last editor is Mr. Malone, who was eight years employed in preparing his edition. By collating the most authentic copies, he has been careful to purify the text. He has been so industrious, in order to discover the meaning of the author, that he has ransacked many volumes, and trusts that, besides his additional illustrations, not a single valuable explication of any obscure passage in these plays has ever appeared, which he has not inserted in his edition. He rejects Titus Andronicus, as well as the three plays formerly mentioned, as not being the authentic productions of Shakespeare. To the whole he has added an appendix, and a copious glossary.—Of this work a less expensive edition has been published in 7 vols. 12mo, in which the general introductory observations prefixed to the different plays are preserved, and the numerous notes abridged.

This judicious commentator has certainly done more for the elucidation and correction of Shakespeare than all who came before him, and has followed with indefatigable patience the only road which a commentator of Shakespeare ought to observe.

Within 50 years after our poet's death, Dryden says that he was become "a little obsolete;" and in the beginning of the present century Lord Shaftesbury complains of his rude unpolished style, and his antiquated phrase and wit. These complaints were owing to the great revolution which the English language has undergone, and to the want of an enlightened commentator. These complaints are now removed, for an enlightened commentator has been found in Mr. Malone.

We have only further to add, that in the year 1790 a copious index to the remarkable passages and words in the plays of Shakespeare was published by the Reverend Mr. Ayscough. In fine, the admirers of Shakespeare are now, by the labours of several eminent men, furnished with every help that can enable them to understand the sense and to taste the beauties of this illustrious poet.

SHALE, in natural history, a species of SCHISTUS. It is a

black slaty substance, or a clay hardened into a stony consistence, and so much impregnated with bitumen that it becomes somewhat like a coal. The acid emitted from shale, during its calcination, uniting itself to the argillaceous earth of the shale, forms alum. About 120 tons of calcined shale will make one ton of alum. The shale, after being calcined, is steeped in water, by which means the alum, which is formed during the calcination of the shale, is dissolved: this dissolved alum undergoes various operations before it is formed into the alum of the shops. Watson's Chemical Essays, vol. ii. p. 315. See ALUM. This kind of slate forms large strata in Derbyshire; and that which lies near the surface of the earth is of a softer and more shivery texture than that which lies deeper. It is also found in large strata, generally above the coal, in most coal counties of this kingdom. Dr. Short informs us, that the shale wastes the lead ore near it, by its strong acid; and that it corrodes and destroys all minerals near it except iron or coal, of whose vitriol it partakes.

SHALLOP, SHALLOOP, or SLOOP, is a small light vessel, with only a small main-mast, and fore-mast, and lug-sails, to hale up, and let down, on occasion.—Shallops are commonly good sailers, and are therefore often used as tenders upon men of war.

SHALLOT, or ESCHALOT. See ALLIUM.

SHAMANS are wizards or conjurers, in high repute among several idolatrous nations inhabiting different parts of Russia. By their enchantments they pretend to cure diseases, to divert misfortunes, and to foretel futurity. They are great observers of dreams, by the interpretation of which they judge of their good or bad fortune. They pretend likewise to chiromancy, and to foretel a man's good or ill success by the lines of his hand. By these and such like means they have a very great ascendency over the understandings, and a great influence on the conduct, of those people.

SHAMBLES, among miners, a sort of niches or landing-places, left at such distances in the adits of the mines, that the shovel-men may conveniently throw up the ore from shamble to shamble, till it comes to the top of the mine.

SHAMOIS, CHAMOIS, or SHAMMY, a kind of leather, either dressed in oil or tanned, much esteemed for its softness, pliancy, &c. It is prepared from the skin of the chamois, or shamois, a kind of rupicapra, or wild goat, called also isard, inhabiting the mountains of Dauphiny, Savoy, Piedmont, and the Pyrenees. Besides the softness and warmth of the leather, it has the faculty of bearing soap without damage; which renders it very useful on many accounts. In France, &c. some wear the skin raw, without any preparation. Shammy leather is used for the purifying of mercury, which is done by passing it through the pores of this skin, which are very close. The true chamois leather is counterfeited with common goat, kid, and even with sheep skins, the practice of which makes a particular profession, called by the French *chamoisure*. The last, though the least esteemed, is yet so popular, and such vast quantities of it are prepared, especially about Orleans, Marseilles, and Thoulouse, that it may not be amiss to give the method of preparation.

Manner of shamoising, or of preparing sheep, goat, or kid skins in oil, in imitation of shammy.—The skins, being washed, drained, and smeared over with quicklime on the fleshy side, are folded in two lengthwise, the wool outwards, and laid on heaps, and so left to ferment eight days, or, if they had been left to dry after flaying, then fifteen days.

Then they are washed out, drained, and half dried; laid on a wooden leg, or horse, the wool stripped off with a round staff for that purpose, and laid in a weak pit, the lime whereof had been used before, and has lost the greatest part of its force.

After 24 hours they are taken out, and left to drain 24 more; they are then put in another stronger pit. This done, they are taken out, drained, and put in again, by turns; which begins to dispose them to take oil; and this practice they continue for six weeks in summer, or three months in winter: at the end whereof they are washed out, laid on the wooden leg, and the surface of the skin on the wool side peeled off, to render them the softer; then made into parcels, steeped a night in the river, in winter more, stretched six or seven over one another on the wooden leg, and the knife passed strongly on the flesh side, to take off any thing superfluous, and render the skin smooth. Then they are steeped, as before, in the river, and the same operation is repeated on the wool side; they are then thrown into a tub of water, with bran in it, which is brewed among the skins till the greatest part sticks to them, and then separated into distinct tubs, till they swell, and rise of themselves above the water. By this means the remains of the lime are cleared out; they are then wrung out, hung up to dry on ropes, and sent to the mill, with the quantity of oil necessary to scour them: the best oil is that of stock-fish. Here they are first thrown in bundles into the river for 12 hours, then laid in the mill-trough, and fulled without oil till they be well softened; then oiled with the hand, one by one, and thus formed into parcels of four skins each, which are milled and dried on cords a second time; then a third; and then oiled again, and dried. This process is repeated as often as necessity requires; when done, if there be any moisture remaining, they are dried in a stove, and made up into parcels wrapped up in wool; after some time they are opened to the air, but wrapped up again as before, till such time as the oil seems to have lost all its force, which it ordinarily does in 24 hours. The skins are then returned from the mill to the chamoiser to be scoured; which is done by putting them in a lixivium of wood-ashes, working and beating them in it with poles, and leaving them to steep till the ley hath had its effect; then they are wrung out, steeped in another lixivium, wrung again; and this is repeated till all the grease and oil be purged out. When this is done, they are half dried, and passed over a sharp-edged iron instrument, placed perpendicular in a block, which opens, softens, and makes them gentle. Lastly, they are thoroughly dried, and passed over the same instrument again; which finishes the preparation, and leaves them in form of shammy.

Kid and goat skins are shamoised in the same manner as those of sheep, excepting that the hair is taken off without the use of any lime; and that when brought from the mill they undergo a particular preparation called *ramalling*, the most delicate and difficult of all the others. It consists in this, that, as soon as brought from the mill, they are steeped in a fit lixivium, taken out, stretched on a round wooden leg, and the hair is scraped off with the knife; this makes them smooth, and in working to cast a kind of fine knap. The difficulty is in scraping them evenly.

SHANK, or SHANK-*Painter*, in a ship, is a short chain fastened under the foremast shrouds, by a bolt, to the ship's sides, having at the other end a rope fastened to it. On this shank-painter the whole weight of the aft part of the anchor rests, when it lies by the ship's side. The rope, by which it is hauled up, is made fast about a timber-head.

SHANK, in the manege, that part of a horse's fore-leg which lies between the knee and the fetlock.

SHANKER, or CHANCRE, in medicine, a malignant ulcer, usually occasioned by some venereal disorder. See SURGERY.

SHANNON, the largest river of Ireland, which issues from Lough Allen, in the county of Leitrim, and running S. divides the provinces of Leinster and Connaught; it then turns S. W. passes by the city of Limerick, and falls into the Atlantic Ocean, between the counties of Clare and Limerick.

SHANSCRIT, the language of the Bramins of Hindoostan. See PHILOLOGY.

SHARE *of a* PLOUGH, that part which cuts the ground;

the extremity forwards being covered with a ſharp-pointed iron, called the *point of the ſhare*, and the end of the wood behind the *tail of the ſhare*.

SHARK, in ichthyology. See SQUALUS.

SHARON, a name common to three cantons of Paleſtine. The firſt lay between mount Tabor and the ſea of Tiberias; the ſecond between the city of Cæſarea of Paleſtine, and Joppa; and the third lay beyond Jordan. To give an idea of perfect beauty, Iſaiah ſaid, the glory of Lebanon and the beauty of Carmel muſt be joined to the abundance of Sharon. (Iſaiah xxxiii. 9. xxxi. 2.) The plains of Sharon are of vaſt extent; and, when ſurveyed by the Abbé Mariti a few years ago, they were ſown with cucumbers; and he informs us, that ſuch a number is annually produced, as not only to ſupply the whole neighbourhood, but alſo all the coaſts of Cyprus and the city of Damietta. In the middle of the plain, between Arſus and Lydda, riſes a ſmall mountain, upon the ridge of which there is a ſmall village called Sharon, from the name of the antient city whoſe king was conquered by Joſhua.

SHARP (Dr. JOHN), archbiſhop of York, was deſcended from the Sharps of Little Norton, a family of Bradford Dale in Yorkſhire; and was ſon of an eminent tradeſman of Bradford, where he was born in 1644. He was educated at Cambridge, and in 1667 entered into orders. That ſame year he became domeſtic chaplain to Sir Heneage Finch, then attorney-general. In 1672 he was collated to the archdeaconry of Berkſhire. In 1675 he was inſtalled a prebendary in the cathedral church of Norwich; and the year following was inſtituted into the rectory of St. Bartholomew near the Royal Exchange, London. In 1681 he was, by the intereſt of his patron Sir Heneage Finch, then lord high chancellor of England, made dean of Norwich; but in 1686 was ſuſpended for taking occaſion, in ſome of his ſermons, to vindicate the doctrine of the church of England in oppoſition to popery. In 1688 he was ſworn chaplain to king James II. being then probably reſtored after his ſuſpenſion; for it is certain that he was chaplain to king Charles II. and attended as a court-chaplain at the coronation of king James II. In 1689 he was declared dean of Canterbury; but never could be perſuaded to fill up any of the vacancies made by the deprived biſhops. Upon the death of Dr. Lamplugh, he was promoted to the ſee of York. In 1702 he preached the ſermon at the coronation of queen Anne; and the ſame year was ſworn of the privy-council, and made lord almoner to her majeſty. He died at Bath in 1713; and was interred in the cathedral of York, where a monument is erected to his memory.—His ſermons, which were collected after his death and publiſhed in 7 vols. 8vo, are juſtly admired.

SHARP, in muſic. See INTERVAL.

SHASTER, or BEDANG, a ſacred book, containing the religion of the Banians: it conſiſts of three tracts; the firſt of which contains the moral law, the ſecond the ceremonial, and the third delivers the peculiar obſervances for each tribe of Indians.—The ſhaſter is looked upon by ſome as a commentary on the vedam, and by others as an original work, an extract of which has been lately publiſhed in England, and has thrown ſome light upon the ſubject. This book teaches, that the Eternal Being, abſorbed in the contemplation of his own eſſence, formed the reſolution of creating beings who might partake of his glory. He ſpoke, and angels roſe into exiſtence; they ſang in concert the praiſes of their Creator, and harmony reigned in the cœleſtial regions; when two of theſe ſpirits having revolted, drew a legion after them. The Supreme Being drove them into a place of torment, from whence they were releaſed at the interceſſion of the faithful angels, upon conditions which at once inſpired them with joy and terror. The rebels were ſentenced, under different forms, to undergo puniſhments in the loweſt of the 15 planets, in proportion to the enormity of their firſt offence; accordingly each angel underwent 87 tranſmigrations upon earth, before he animated the body of a cow, which holds the higheſt rank among the animal tribes. Theſe different tranſmigrations are conſidered as ſo many ſtages of expiation, preparatory to a ſtate of probation, which commences as ſoon as the angel tranſmigrates from the body of the cow into a human body: in this ſituation the Creator enlarges his intellectual faculties, and conſtitutes him a free agent; and his good or bad conduct haſtens or retards the time of his pardon. The good are at their death re-united to the Supreme Being, and the wicked begin anew the æra of their expiation. Thoſe who deſire more information on this ſubject may conſult *Dow's Hiſtory of Indoſtan*, and *Holwell's Intereſting Hiſtorical Events*.

SHAW (Dr. THOMAS), known to the learned world by his travels to Barbary and the Levant, was born at Kendal, in Weſtmoreland, about the year 1692. He was appointed chaplain to the Engliſh conſul at Algiers, in which ſtation he continued for ſeveral years; and from thence took proper opportunities of travelling into different parts. He returned in 1733, was elected fellow of the Royal Society, and publiſhed the account of his travels at Oxford, folio, 1738. In 1740 he was nominated principal of St. Edmond-hall, which he raiſed from a ruinous ſtate by his munificence; and was regius profeſſor of Greek at Oxford until his death, which happened in 1751. Dr. Clayton, biſhop of Clogher, having attacked theſe Travels in his Deſcription of the Eaſt, Dr. Shaw publiſhed a ſupplement, by way of vindication, which is incorporated into the ſecond edition of his Travels, prepared by himſelf, and publiſhed in 4to, 1757.

SHAWLS are woollen handkerchiefs, an ell wide, and near two long. The wool is ſo fine and ſilky, that the whole handkerchief may be contained in the two hands cloſed. It is the produce of a Tibet ſheep; but ſome ſay that no wool is employed but that of lambs torn from the belly of their mother before the time of birth. The moſt beautiful ſhawls come from Caſhmire: their price is from 150 livres (about ſix guineas) to 1200 livres (or 50l. ſterling). The ſhawls of Britiſh manufacture, it is ſaid, can ſcarcely be diſtinguiſhed from Indian ſhawls, though they can be afforded at one twentieth part of the price.

SHEADING, a riding, tything, or diviſion, in the Iſle of Man; the whole iſland being divided into ſix ſheadings; in every one of which is a coroner or chief conſtable, appointed by the delivery of a rod at the annual convention.

SHEARBILL, the *Rhynchops Nigra* of Linnæus, the *Black Skimmer* of Pennant and Latham, and *Cutwater* of Cateſby. Its bill is much compreſſed; the edges are ſharp; the lower mandible is four inches and a half long; the upper only three; the baſe red, the reſt is black; the forehead, chin, front of the neck, the breaſt, and belly are white; the head, and whole upper part of the body are black; the wings are of the ſame colour; the lower part of the inner webs of the primaries is white; the tail is ſhort, and a little forked; the middle feathers are duſky, the others are white on their ſides; the legs are weak and red; the length is one foot eight inches; the extent is three feet ſeven inches. It inhabits America from New York to Guiana. It ſkims nimbly along the water, with its under mandible juſt beneath the ſurface, feeding on the inſects and ſmall fiſh as it proceeds. It frequents alſo oyſter-banks; its bill being partly like that of the oyſter-catcher, adapted for preying on thoſe ſhell-fiſh.

SHEATHING, in the ſea language, is the caſing that part of a ſhip which is to be under water with fir-board of an inch thick; firſt laying hair and tar mixed together under the boards, and then nailing them on, in order to prevent worms from eating the ſhip's bottom. Ships of war are now generally ſheathed with copper; but copper ſheathing is liable to be corroded by

the action of salt water, and something is still wanting to effect this purpose. It is very probable that tar might answer very well.

SHEATS, in a ship, are ropes bent to the clews of the sails; serving in the lower sails to haul aft the clews of the sail; but in top sails they serve to haul home the clew of the sail close to the yard arm.

SHEEP, in zoology. See Ovis.

Sheep *Nose-Worms*, in natural history, a species of fly-worm found in the noses of sheep, goats, and stags, and produced there from the egg of a large two-winged fly. The frontal sinuses above the nose, in sheep and other animals, are the places where these worms live, and attain their full growth. These sinuses are always full of a soft white matter, which furnishes these worms with a proper nourishment, and are sufficiently large for their habitation: and when they have here acquired their destined growth, and come to the condition in which they are fit to undergo their changes for the fly-state, they leave their old habitation, and, falling to the earth, bury themselves there; and when these are hatched into flies, the female, when she has been impregnated by the male, knows that the nose of a sheep, or other animal, is the only place to deposit her eggs in order to their coming to good.

Mr. Vallisnieri, to whom the world owes so many discoveries in the insect class, is the first who has given any true account of the origin of these worms. Though their true history had been till that time unknown, the creatures themselves were very early discovered, and many ages since were esteemed great medicines in epilepsies.

It is very common to find only one worm in the head of the creature that has them, often two are found, and sometimes three, but very seldom any more than that.

Redi has given a very imperfect figure of this creature, nor is that of Mr. Vallisnieri much better. The worm has two brown hooks at the anterior part of its head, placed parallel, or nearly parallel, to one another. It is composed of 11 rings, which together form a conic figure, something flatted, of which the head of the worm is the point. When the worm is young, it is very white; but has two brown spots placed over against each other, in the hinder part of its body, which are its two posterior stigmata. Each of these spots is parted into two by a concentric circle, which is sensible, as it is whitish, the rest of the spot being brown. It is plainly this very separation which gives passage to the air. When the creature pleases, it shows these; but it can also draw them into a sort of purse in its posterior ring. The anus is just below, and is usually hid by the folds of the skin. The hooks are brown and strong; just above these are two little fleshy horns, and between them is placed the mouth. This worm, when at its full growth, is considerably large, and becomes brownish, or of a dirty white. Its belly, examined by the microscope, is seen furnished with a number of fine short prickles between the rings: the points of all these are turned backward, and one may even feel these prickles, in drawing the finger along the belly from the hinder part toward the head.

These worms are capable of moving themselves very swiftly; and it is doubtless owing to their motions in the head of the creature, and to the pain that the sensible membranes there must have, from being wounded by the hooks and prickles of this animal, that sheep are often seen to grow outrageous, and strike their heads against trees and other hard bodies.

When these worms are taken out of the heads of sheep, if they are put upon the earth, they immediately bury themselves very deeply in it; and if not yet at their full growth, or in a proper state for their changes, they die there; but if it be near the time that they would naturally have quitted their antient habitation, which may be known by their being changed from their fine white to a brownish colour, then they undergo all their proper changes under a shell made by the hardening of their own skin. This shell is of the same shape with the animal itself, but is of a deep brown.

It takes some time for the creature to undergo its several changes, and that more or less according to the season. Mr. Vallisnieri had one produced in the perfect fly state, after 40 days from the time of its first change. Mr. Reaumur found those which formed their shell on the 24th of April, not to produce the fly before the 27th of June. When ready to appear in the fly state, it has no great difficulty in the getting out of its case; the swelling and inflating its head, and throwing out its bladder, which is the practice of these creatures on this occasion, easily detaches a piece of the shell, originally loose, and gives the fly a sufficient passage.

The fly produced from this worm has all the time of its life a very lazy disposition, and does not like to make any use either of its legs or wings. Its head and corcelet together are about as long as its body, which is composed of five rings, streaked on the back; a pale yellow and brown are there disposed in irregular spots; the belly is of the same colour; but they are there more regularly disposed, for the brown here makes three lines, one in the middle, and one on each side, and all the intermediate spaces are yellow. The wings are nearly of the same length with the body, and are a little inclined in their position, so as to lie upon the body; they do not, however, cover it, but a naked space is left between them. The ailerons, or petty wings, which are found under each of the wings, are of a whitish colour, and perfectly cover the balancers, so that they are not to be seen without lifting up these. The upper part of the corcelet is full of small black prominences, which, when examined by the microscope, appear as so many corns of gunpowder. Its head is large in proportion to the size of the body, and its reticular eyes are of a deep changeable green. These eyes take up less space in the head than those of most other flies: they leave a considerable space between them; and in that are placed the three smaller or glossy eyes, which are placed in form of a small triangle, and stand so near as to touch one another. The rest of the upper part of the head is yellowish, and, viewed by the microscope, appears cavernous, like a sponge, or morel; and in the bottom of each of these small cavities is a little black prominence. There are other two hollows in the anterior part of the head, in which the antennæ are placed; these are of the battledoor form, but rather round than flat, and have each a large hair going from them. The under part of the head, which is rounder than the upper, is whitish, and very smooth; it has two sorts of bands directed downward, which are the elongations of the rims of the arches where the antennæ are lodged. The smoothness of the under part of the head makes one see very distinctly these three little tubercles; the upper one brown, the under ones of a pale deadish yellow. The mouth of the fly seems to be placed between these, immediately under the upper tubercle.

The fly will live two months after it is first produced from the shell, but will take no nourishment of any kind; and possibly it may be of the same nature with the butterflies, which never take any food during the whole time of their living in that state.

Sheep *Stealing*. See Theft.

Composition for marking Sheep. For this purpose Dr. Lewis recommends tallow mixed with a certain proportion of tar, and the mixture thickened by powder of charcoal. The proportions he tried were an eighth, a sixth, and a fourth part of tar. None of these could be discharged by any washing or rubbing with water, but all of them completely by soap; that which had the smallest proportion, easily enough; the others more difficultly.

SHEERING, in the sea-language. When a ship is not steered steadily, they say she sheers, or goes sheering; or when, at anchor, she goes in and out by means of the current of the tide, they also say she sheers.

SHEERNESS, a fort in Kent, feated on the north point of the Ifle of Shepey, at the principal mouth of the Medway, three miles north of Queenborough. It was built by Charles II. after the infult of the Dutch, who burnt the men of war at Chatham. The buildings belonging to it, in which the officers lodge, make a little neat town, and there is alfo a yard, a dock, and a chapel. E. lon. 0. 48. N. lat. 51. 28.

SHEERS, the name of an engine ufed to hoift, or difplace the loweft mafts of a fhip. In the navy they are compofed of feveral long mafts, whofe heels reft on the fide of the hulk, and having their heads declining outward from the perpendicular, fo as to hang over the veffel whofe mafts are to be fixed or difplaced. The tackles, which extend from the head of the maft to the fheer-heads, are intended to pull in the latter toward the maft-head, particularly when they are charged with the weight of a maft after it is raifed out of any fhip, which is performed by ftrong tackles depending from the fheer-heads. The effort of thefe tackles is produced by two capfterns, fixed on the deck for this purpofe. For merchant-fhips, this machine is compofed of two mafts, or props, erected in the fame veffel in which the maft is to be planted, or from whence it is to be removed. The lower ends of thefe props reft on the oppofite fides of the deck, and their upper parts are faftened acrofs, fo as that a tackle, which hangs from the interfection, may be almoft perpendicularly above the ftation of the maft to which the mechanical powers are applied. Thefe fheers are fecured by ftays, which extend forward and aft to the oppofite extremities of the veffel.

SHEFFIELD, a large and populous town in the Weft-riding of Yorkfhire, with a market on Tuefday. It has been long celebrated for its various hardware manufactures, which confift particularly of cutlery ware, plated goods, and buttons. Here are alfo lead works, and a filk-mill. It is feated on the Don, which is navigable within two or three miles of the town, and its neighbourhood abounds with coal. It has two large churches, and a fpacious market-place, furnifhed with neat fhops for butchers, &c. It is 54 miles S. S. W. of York, and 161 N. N. W. of London. W. lon. 1. 29. N. lat. 53. 20.

SHEFFIELD (John), duke of Buckinghamfhire, and a writer of fome name both in verfe and profe, was born about 1650. He loft his father at nine years of age; and, his mother marrying lord Offulfton, the care of his education was left entirely to a governor, who travelled with him into France, but did not greatly improve him in his ftudies. Having, however, fine parts, and a turn to letters, he made up the defects of his education, and acquired a very competent fhare of learning. He went a volunteer in the fecond Dutch war; and afterwards, between 1673 and 1675, made a campaign in the French fervice. As Tangier was in danger of being taken by the Moors, he offered to head the forces which were fent to defend it, and accordingly was appointed commander of them. He was then earl of Mulgrave, and one of the lords of the bed-chamber to Charles II. May 1674, he was inftalled knight of the garter; and now began to make a figure at court. An affection to the princefs Anne, and an attempt to be more clofely connected with her, involved him, about this time, in fome fmall difgrace with Charles II. whofe favour, however, he foon recovered, and enjoyed ever after. He continued in feveral great pofts during the fhort reign of James II. He had been appointed lord-chamberlain of his majefty's houfehold in 1685, and was alfo one of his privy-council.

He greatly difapproved feveral imprudent and unjuftifiable meafures taken by king James, yet was not a friend to the Revolution; and, though he paid his refpects to king William before he was advanced to the throne, yet was not in any poft of the government till fome years after. Neverthelefs, when it was debated in parliament, whether the prince of Orange fhould be proclaimed king, or the princefs reign folely in her own right, he voted and fpoke for the former. He was created marquis of Normandy by king William, enjoyed fome confiderable pofts under that prince, and was generally pretty well in his favour and confidence. April 1702, after the acceffion of queen Anne, he was fworn lord privy-feal; appointed the fame year one of the commiffioners to treat of an union between England and Scotland; and, in March following, created duke of Normandy firft, and then duke of Buckinghamfhire. He was always attached to Tory principles, and was inftrumental in the change of the miniftry in 1710. Before this time he had been out of place, and did not fo much as pay his compliments at court; but, in 1711, he was made fteward of her majefty's houfehold, and prefident of the council, and fo continued to the end of her reign. Upon her deceafe, Aug. 1, 1714, he was one of the lords juftices of Great Britain, till George I. arrived from Hanover: after which, he feems to have been laid afide, as of principles and a complexion different from the fucceeding miniftry, and therefore of no further ufe. He fpent the remainder of his life in an indolent retirement, and died Feb. 24, 1720-1, aged 75. He was buried in Weftminfter-Abbey, after lying fome days in ftate at Buckingham-Houfe; and a monument was erected over him, agreeable to the manner he defired. The duke had three wives, the laft of which was Catherine, natural daughter to James II. by Catherine Sedley, countefs of Dorchefter. He had only one fon by this lady, who, dying at Rome in 1735, juft when he had entered his 20th year, left the family-eftate to be inherited by natural children, of which the duke had feveral. His writings are in two volumes. The firft contains his poems upon various fubjects: the fecond, his profe works, which confift of hiftorical memoirs, fpeeches in parliament, characters, dialogues, critical obfervations, effays, and letters.—Great eulogiums have been beftowed on our author and his works.

SHEFFIELDIA, in botany; a genus of plants belonging to the clafs of pentandria, and to the order of monogynia. The corolla is bell-fhaped; the filaments are 10, of which every fecond is barren. The capfule confifts of one cell, which has four valves. There is only one fpecies, the *repens*.

SHEIK, in the oriental cuftoms, the perfon who has the care of the mofques in Egypt; his duty is the fame as that of the imams at Conftantinople. There are more or fewer of thefe to every mofque, according to its fize or revenue. One of thefe is head over the reft, and anfwers to a parifh-prieft with us; and has under him, in large mofques, the readers, and people who cry out to go to prayers; but in fmall mofques the fheik is obliged to do all this himfelf. In fuch it is their bufinefs to open the mofque, to cry to prayers, and to begin their fhort devotions at the head of the congregation, who ftand rank and file in great order, and make all their motions together. Every Friday the fheik makes an harangue to his congregation.

Sheik-*Bellet*, the name of an officer in the oriental nations. In Egypt the fheik bellet is the head of a city, and is appointed by the pacha. The bufinefs of this officer is to take care that no innovations be made which may be prejudicial to the Porte, and that they fend no orders which may hurt the liberties of the people. But all his authority depends on his credit and intereft, not his office: for the government of Egypt is of fuch a kind, that often the people of the leaft power by their pofts have the greateft influence; and a caia of the janizaries or Arabs, and fometimes one of their meaneft officers, an oda-bafha, finds means, by his parts and abilities, to govern all things.

SHEKEL, the name of a weight and coin current among the antient Jews. Dr. Arbuthnot makes the weight of the fhekel equal to 9 pennyweights $2\frac{2}{7}$ grains Troy weight; and the value equal to 2s. $3\frac{3}{8}$d. fterling. The golden fhekel was worth 1l. 16s. 6d.

SHELDRAKE, in ornithology. See Anas.

SHELF, among miners, the fame with what they otherwife call *faft ground* or *faft country*; being that part of the internal

ſtructure of the earth which they find lying even and in an orderly manner, and evidently retaining its primitive form and ſituation.

SHELL, in natural hiſtory, a hard, and, as it were, ſtony covering, with which certain animals are defended, and thence called *ſhell-fiſh*. The ſingular regularity, beauty, and delicacy in the ſtructure of the ſhells of animals, and the variety and brilliancy in the colouring of many of them, at the ſame time that they ſtrike the attention of the moſt incurious obſervers, have at all times excited philoſophers to inquire into and detect, if poſſible, the cauſes and manner of their formation. But the attempts of naturaliſts, antient and modern, to diſcover this proceſs, have conſtantly proved unſucceſsful. M. de Reaumur hitherto appears alone to have given a plauſible account, at leaſt, of the formation of the ſhell of the garden-ſnail in particular, founded on a courſe of very ingenious experiments, related in the Paris Memoirs. (See *Mem. de l'Acad. année* 1709, p. 475. *Edit. de Hollande, in* 12*mo*.) He there endeavours to ſhow, that this ſubſtance is produced merely by the perſpirable matter of the animal, condenſing and afterwards hardening on its ſurface, and accordingly taking the figure of its body, which has performed the office of a mould to it; in ſhort, that the ſhell of a ſnail, and, as he ſuppoſed, of all other animals poſſeſſed of ſhells, was only the product of a viſcous tranſudation from the body of the animal, containing earthy particles united by mere juxtapoſition. This hypothesis, however, is liable to very great and inſurmountable difficulties, if we apply it to the formation of ſome of the moſt common ſhells; for how, according to this ſyſtem, it may be aſked, can the oyſter, for inſtance, conſidered ſimply as a mould, form to itſelf a covering ſo much exceeding its own body in dimenſions?

M. Heriſſant, in the memoirs of the academy of ſciences for 1766, has diſcovered the ſtructure of ſhells to be organical. In the numerous experiments that he made on an immenſe number, and a very great variety of animal ſhells, he conſtantly found that they were compoſed of two diſtinct ſubſtances; one of which is a cretaceous, or earthy matter; and the other appeared, from many experiments made upon it, by burning, diſtillation, and otherwiſe, to be evidently of an animal nature. Theſe two ſubſtances he dexterouſly ſeparated from each other by a very eaſy chemical analyſis; by the gentle operation of which they were exhibited diſtinctly to view, without any material alteration from the action of the ſolvent, or inſtrument, employed for that purpoſe. On an entire ſhell, or a fragment of one, contained in a glaſs veſſel, he poured a ſufficient quantity of the nitrous acid, conſiderably diluted either with water or ſpirit of wine. After the liquor has diſſolved all the earthy part of the ſhell (which may be collected, after precipitation by a fixed or volatile alkali), there remains floating in it a ſoft ſubſtance, conſiſting of innumerable membranes of a retiform appearance, and diſpoſed, in different ſhells, in a variety of poſitions, which conſtitutes the animal part of it. This, as it has not been affected by the ſolvent, retains the exact figure of the ſhell; and, on being viewed through a microſcope, exhibits ſatisfactory proofs of a vaſcular and organical ſtructure. He ſhows that this membranous ſubſtance is an appendix to the body of the animal, or a continuation of the tendinous fibres that compoſe the ligaments by which it is fixed to its ſhell; and that this laſt owes its hardneſs to the earthy particles conveyed through the veſſels of the animal, which fix themſelves into, and incruſt, as it were, the meſhes formed by the reticular filaments of which this membranous ſubſtance is compoſed. In the ſhell called *porcelaine*, in particular, the delicacy of theſe membranes was ſo great, that he was obliged to put it into ſpirit of wine, to which he had the patience to add a ſingle drop of ſpirit of nitre, day by day, for the ſpace of two months; leſt the air, generated, or let looſe by the action of the acid on the earthy ſubſtance, ſhould tear the compages of its fine membranous ſtructure into ſhatters; as it certainly would have done, in a more haſty and leſs gentle diſſolution. The delicate reticulated film, left after this operation, had all the tenuity of a ſpider's web; and accordingly he does not attempt to delineate its organization. In other ſhells, he employed five or ſix months in demonſtrating the complicated membranous ſtructure of this animal ſubſtance by this kind of chemical anatomy. In general, however, the proceſs does not require much time.

Of the many ſingular configurations and appearances of the membranous part of different ſhells, which are deſcribed in this memoir, and are delineated in ſeveral well-executed plates, we ſhall mention only, as a ſpecimen, the curious membranous ſtructure obſerved in the laminæ of mother-of-pearl, and other ſhells of the ſame kind, after having been expoſed to the operation of the author's ſolvent. Beſide the great variety of fixed or permanent colours with which he found the animal-filaments of theſe ſhells to be adorned, it is known that the ſhell itſelf preſents to the view a ſucceſſion of rich and changeable colours, the production of which he eaſily explains from the configurations of their membranes. Nature, he obſerves, always magnificent in her deſigns, but ſingularly frugal in the execution of them, produces theſe brilliant decorations at a very ſmall expenſe. The membranous ſubſtance above mentioned is plaited and rumpled, as it were, in ſuch a manner, that its exterior laminæ, incruſted with their earthy and ſemi-tranſparent matter, form an infinite number of little priſms, placed in all kinds of directions, which refract the rays of light, and produce all the changes of colour obſervable in theſe ſhells.

Foſſile SHELLS. Thoſe found buried at great depths in the earth. Of theſe ſome are found remaining almoſt entirely in their native ſtate, but others are variouſly altered by being impregnated with particles of ſtone and of other foſſils; in the place of others there is found mere ſtone or ſpar, or ſome other native mineral body, expreſſing all their lineaments in the greateſt nicety, as having been formed wholly from them, the ſhell having been firſt depoſited in ſome ſolid matrix, and thence diſſolved by very ſlow degrees, and this matter left in its place, on the cavities of ſtone and other ſolid ſubſtances, out of which ſhells had been diſſolved and waſhed away, being afterwards filled up leſs ſlowly with theſe different ſubſtances, whether ſpar or whatever elſe; theſe ſubſtances, ſo filling the cavities, can neceſſarily be of no other form than that of the ſhell, to the abſence of which the cavity was owing, though all the nicer lineaments may not be ſo exactly expreſſed. Beſides theſe, we have alſo in many places maſſes of ſtone formed within various ſhells; and theſe having been received into the cavities of the ſhells while they were perfectly fluid, and having therefore nicely filled all their cavities, muſt retain the perfect figures of the internal part of the ſhell, when the ſhell itſelf ſhould be worn away or periſhed from their outſide. The various ſpecies we find of theſe are, in many genera, as numerous as the known recent ones; and as we have in our own iſland not only the ſhells of our own ſhores, but thoſe of many other very diſtant ones, we have alſo many ſpecies, and thoſe in great numbers, which are in their recent ſtate the inhabitants of other yet unknown or unſearched ſeas and ſhores. The cockles, muſcles, oyſters, and the other common bivalves of our own ſeas, are very abundant: but we have alſo an amazing number of the nautilus kind, particularly of the nautilus græcorum, which though a ſhell not found living in our own or any neighbouring ſeas, yet is found buried in all our clay-pits about London and elſewhere; and the moſt frequent of all foſſile ſhells, in ſome of our countries, are the conchæ anomiæ, which yet we know not of in any part of the world in their recent ſtate. Of this ſort alſo are the cornua ammonis and the gryphitæ, with ſeveral of the echinitæ and others.

The exact ſimilitude of the known ſhells, recent and foſſile, in

their several kinds, will by no means suffer us to believe, that these, though not yet known to us in their living state, are, as some have idly thought, a sort of *lusus naturæ*. It is certain, that of the many known shores, very few, not even those of our own island, have been yet carefully searched for the shell-fish that inhabit them; and as we see in the nautilus græcorum an instance of shells being brought from very distant parts of the world to be buried here, we cannot wonder that yet unknown shores, or the unknown bottoms of deep seas, should have furnished us with many unknown shell-fish, which may have been brought with the rest; whether that were at the time of the general deluge, or the effect of any other catastrophe of a like kind, or by whatever other means, to be left in the yet unhardened matter of our stony and clayey strata.

Shells, in gunnery, are hollow iron balls to throw out of mortars or howitzers, with a fuse-hole of about an inch diameter, to load them with powder, and to receive the fuse. The bottom, or part opposite to the fuse, is made thicker than the rest, that the fuse may fall uppermost. But in small elevations this does not always happen, nor indeed is it necessary; for, let the shell fall as it will, the fuse sets fire to the powder within, which bursts the shell, and causes great devastation. The shells had much better be of an equal thickness; for then they burst into more pieces.

Message Shells, are nothing more than howitz-shells, in the inside of which a letter or other papers are put; the fuse-hole is stopped up with wood or cork, and the shells are fired out of a royal or howitz, either into a garrison or camp. It is supposed, that the person to whom the letter is sent knows the time, and accordingly appoints a guard to look out for its arrival.

Shell-*Fish*. These animals are in general oviparous, very few instances having been found of such as are viviparous. Among the oviparous kinds, anatomists have found that some species are of different sexes, in the different individuals of the same species; but others are hermaphrodites, every one being in itself both male and female. In both cases their increase is very numerous, and scarce inferior to that of plants, or of the most fruitful of the insect class. The eggs are very small, and are hung together in a sort of clusters by means of a glutinous humour, which is always placed about them, and is of the nature of the jelly of frog's spawn. By means of this, they are not only kept together in the parcel, but the whole cluster is fastened to the rocks, shells, or other solid substances; and thus they are preserved from being driven on shore by the waves, and left where they cannot succeed. See Testacea.

Shell-*Gold*. See Gold.

SHELTIE, a small but strong kind of horse, so called from Shetland, or Zetland, where they are produced.

SHELVES, in sea-language, a general name given to any dangerous shallows, sand-banks, or rocks, lying immediately under the surface of the water, so as to intercept any ship in her passage, and endanger her destruction.

SHENAN. See *Dyeing of* Leather, foot-note.

SHENSTONE (William), eldest son of a plain uneducated country gentleman, of Hales Owen, Shropshire, who farmed his own estate, was born in Nov. 1714. He learned to read of an old dame, whom his poem of the "School-Mistress" has delivered to posterity; and soon received such delight from books, that he was always calling for new entertainment, and expected that, when any of the family went to market, a new book should be brought him, which when it came, was in fondness carried to bed and laid by him. As he grew older, he went for a while to the grammar-school in Hales-Owen, and was placed afterwards with Mr. Crumpton, an eminent school-master at Solihul, where he distinguished himself by the quickness of his progress. At ten years of age, he was deprived of his father, and two years after, of his grandfather; and was, with his brother, who died afterwards unmarried, left to the care of his grandmother, who managed the estate. From school he was sent in 1732 to Pembroke-College in Oxford, a society which for half a century has been eminent for English poetry and elegant literature. Here it appears that he found delight and advantage; for he continued his name there ten years, though he took no degree. After the first four years he put on the Civilian's gown, but without showing any intention to engage in the profession. At Oxford, he employed himself upon English poetry; and, in 1737, published a small miscellany, without his name. He then for a time wandered about, to acquaint himself with life; and was sometimes at London, sometimes at Bath, or any place of public resort; but he did not forget his poetry. He published in 1740, his "Judgment of Hercules," addressed to Mr. Lyttelton, whose interest he supported with great warmth at an election; this was two years afterwards followed by the "School-Mistress." On the death of his guardian, Mr. Dolman, in 1745, the care of his own fortune fell upon him. He tried to escape it a while, and lived at his house with his tenants, who were distantly related; but, finding that imperfect possession inconvenient, he took the whole estate into his own hands, more to the improvement of its beauty than the increase of his produce. Now began his delight in rural pleasures, and his ambition of rural elegance. But in time his expenses brought clamours about him: he spent his estate in adorning it, and his death was probably hastened by his anxieties. He died at the Leasowes, of a putrid fever, about five on Friday morning, Feb. 11, 1763; and was buried by the side of his brother in the church-yard of Hales-Owen. He was never married, though he might have obtained the lady, whoever she was, to whom his "Pastoral Ballad" was addressed. His "Works" were collected by Mr Dodsley, in three volumes, 8vo. They consist of odes, elegies, songs, ballads, &c.

SHEPPEY; an island at the mouth of the river Medway, about 20 miles in circumference. It is separated from the main land by a narrow channel, and has a fertile soil, which feeds great flocks of sheep. The borough-town of Queenborough is seated thereon; besides which it has several villages.

SHERARDIA, in botany: A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 47th order, *Stellatæ*. The calyx is small, quadridentate; the corolla monopetalous, long, and funnel-shaped. The two seeds are naked, and crowned with the calyx. There are three species, viz. 1. Arvensis; 2. Muralis; 3. Fruticosa.

SHERBET, or Sherbit, a compound drink, first brought into England from Turkey and Persia, consisting of water, lemon-juice, and sugar, in which are dissolved perfumed cakes made of excellent Damascus fruit, containing an infusion of some drops of rose water. Another kind of it is made of violets, honey, juice of raisins, &c.

SHERIDAN (Thomas), D. D. is said to have been born about 1684, in the county of Cavan, where his parents lived in no very elevated state. They are described as being unable to afford their son the advantages of a liberal education; but he, being observed to give early indications of genius, attracted the notice of a friend to his family, who sent him to the college of Dublin, and contributed towards his support while he remained there. He afterwards entered into orders, and set up a school in Dublin, which long maintained a very high degree of reputation, and is thought to have produced in some years the sum of one thousand pounds. It does not appear that he had any considerable preferment; but his intimacy with Swift, in 1725, procured for him a living in the South of Ireland, worth about 150l. a year, which he went to take possession of; and, by an act of inadvertence, destroyed all his future expectations of rising in the church; for being at Cork on the first of August, the anniversary of king

George's birth-day, he preached a fermon, which had for its text, "Sufficient for the day is the evil thereof." On this being known he was ftruck out of the lift of chaplains to the lord-lieutenant, and forbidden the caftle.

This living Dr. Sheridan afterwards changed for that of Dunboyne, which, by the knavery of the farmers and power of the gentlemen in the neighbourhood, fell as low as 80l. per annum. He gave it up for the free-fchool of Cavan, where he might have lived well in fo cheap a country on 80l. a year falary, befides his fcholars; but the air being as he faid too moift and unwholefome, and being difgufted with fome perfons who lived there, he fold the fchool for about 400l. and having foon fpent the money, fell into difeafes, and died Sept. 10, 1738, in his 55th year.

One of the volumes of Swift's Mifcellanies confifts almoft entirely of letters between him and the dean. He publifhed a profe tranflation of Perfius; to which he added the beft notes of former editors, together with many judicious ones of his own. This work was printed in London, 1739, in 12mo.

SHERIDAN (Mrs. Frances), wife to Thomas Sheridan, M. A. was born in Ireland about the year 1724, but defcended from a good Englifh family which had removed thither. Her maiden name was Chamberlaine, and fhe was grand-daughter of Sir Oliver Chamberlaine. The firft literary performance by which fhe diftinguifhed herfelf was a little pamphlet at the time of a violent party-difpute relative to the theatre, in which Mr. Sheridan had newly embarked his fortune. So well-timed a work exciting the attention of Mr. Sheridan, he by an accident difcovered his fair patronefs, to whom he was foon afterwards married. She was a perfon of the moft amiable character in every relation of life, with the moft engaging manners. After lingering fome years in a very weak ftate of health, fhe died at Blois, in the fouth of France, in the year 1767. Her "Sidney Biddulph" may be ranked with the firft productions of that clafs in ours or in any other language. She alfo wrote a litle romance in one volume called *Nourjabad*, in which there is a great deal of imagination productive of an admirable moral. And fhe was the authorefs of two comedies, "The Difcovery" and "The Dupe."

SHERIFF, an officer, in each county in England, nominated by the king, invefted with a judicial and minifterial power, and who takes place of every nobleman in the county during the time of his office.

The fheriff is an officer of very great antiquity in this kingdom, his name being derived from Saxon words, fignifying the *reeve*, *bailiff*, or *officer* of the fhire. He is called in Latin *vice-comes*, as being the deputy of the earl or *comes*, to whom the cuftody of the fhire is faid to have been committed at the firft divifion of this kingdom into counties. But the earls, in procefs of time, by reafon of their high employments and attendance on the king's perfon, not being able to tranfact the bufinefs of the county, were delivered of that burden; referving to themfelves the honour, but the labour was laid on the fheriff. So that now the fheriff does all the king's bufinefs in the county; and though he be ftill called *vice-comes*, yet he is entirely independent of, and not fubject to, the earl; the king, by his letters patent, committing *cuftodiam comitatus* to the fheriff, and to him alone.

Sheriffs were formerly chofen by the inhabitants of the feveral counties. In confirmation of which it was ordained, by ftatute 28 Edw. I. c. 8. that the people fhould have an election of fheriffs in every fhire where the fhrievalty is not of inheritance. For antiently in fome counties the fheriffs were hereditary; as we apprehend they were in Scotland till the ftatute 20 Geo. II. c. 43; and ftill continue in the county of Weftmoreland to this day; the city of London having alfo the inheritance of the fhrievalty of Middlefex vefted in their body by charter. The reafon of thefe popular elections is affigned in the fame ftatute, c. 13. "that the commons might choofe fuch as would not be a burden to them." And herein appears plainly a ftrong trace of the democratical part of our conftitution; in which form of government it is an indifpenfable requifite, that the people fhould choofe their own magiftrates. This election was in all probability not abfolutely vefted in the commons, but required the royal approbation. For in the Gothic conftitution, the judges of their county-courts (which office is executed by the fheriff) were elected by the people, but confirmed by the king: and the form of their election was thus managed; the people, or *incolæ territorii*, chofe twelve electors, and they nominated three perfons, *ex quibus rex unum confirmabat*. But, with us in England, thefe popular elections growing tumultuous were put an end to by the ftatute 9 Edw. II. ft. 2. which enacted, that the fheriffs fhould from thenceforth be affigned by the chancellor, treafurer, and the judges; as being perfons in whom the fame truft might with confidence be repofed. By ftatutes 14 Edw. III. c. 7. 23 Hen. VI. c. 8. and 21 Hen. VIII. c. 20. the chancellor, treafurer, prefident of the king's council, chief juftices, and chief baron, are to make this election; and that on the morrow of All Souls, in the exchequer. And the king's letters patent, appointing the new fheriffs, ufed commonly to bear date the fixth day of November. The ftatute of Cambridge, 12 Ric. II. c. 2. ordains, that the chancellor, treafurer, keeper of the privy feal, fteward of the king's houfe, the king's chamberlain, clerk of the rolls, the juftices of the one bench and the other, barons of the exchequer, and all other that fhall be called to ordain, name, or make juftices of the peace, fheriffs, and other officers of the king, fhall be fworn to act indifferently, and to name no man that fueth to be put in office, but fuch only as they fhall judge to be the beft and moft fufficient. And the cuftom now is (and has been at leaft ever fince the time of Fortefcue, who was chief juftice and chancellor to Henry the fixth), that all the judges, together with the other great officers, meet in the exchequer chamber on the morrow of All Souls yearly, (which day is now altered to the morrow of St. Martin by the laft act for abbreviating Michaelmas term), and then and there propofe three perfons to the king, who afterwards appoints one of them to be fheriff. This cuftom of the twelve judges propofing three perfons feems borrowed from the Gothic conftitution before mentioned: with this difference, that among the Goths the 12 nominors were firft elected by the people themfelves. And this ufage of ours, at its firft introduction, there is reafon to believe, was founded upon fome ftatute, though not now to be found among our printed laws; firft, becaufe it is materially different from the direction of all the ftatutes before mentioned; which it is hard to conceive that the judges would have countenanced by their concurrence, or that Fortefcue would have inferted in his book, unlefs by the authority of fome ftatute; and alfo, becaufe a ftatute is exprefsly referred to in the record, which Sir Edward Coke tells us he tranfcribed from the council-book of 3d March, 34 Hen. VI. and which is in fubftance as follows:—The king had of his own authority appointed a man fheriff of Lincolnfhire, which office he refufed to take upon him; whereupon the opinions of the judges were taken, what fhould be done in this behalf. And the two chief juftices, Sir John Fortefcue and Sir John Prifot, delivered the unanimous opinion of them all; "that the king did an error when he made a perfon fheriff that was not chofen and prefented to him according to the ftatute; that the perfon refufing was liable to no fine for difobedience, as if he had been one of the three perfons chofen according to the tenor of the ftatute; that they would advife the king to have recourfe to the three perfons that were chofen according to the ftatute, or that fome other thrifty man be entreated to occupy the office for this year; and that, the next year, to efchew fuch inconveniences, the order of the ftatute in this behalf made be obferved." But, not-

withstanding this unanimous resolution of all the judges of England, thus entered in the council-book, and the statute 34 and 35 Hen. VIII. c. 26. § 61. which expressly recognizes this to be the law of the land, some of our writers have affirmed, that the king, by his prerogative, may name whom he pleases to be sheriff, whether chosen by the judges or not. This is grounded on a very particular case in the fifth year of queen Elizabeth, when, by reason of the plague, there was no Michaelmas term kept at Westminster; so that the judges could not meet there *in crastino animarum* to nominate the sheriffs: whereupon the queen named them herself, without such previous assembly, appointing for the most part one of two remaining in the last year's list. And this case, thus circumstanced, is the only authority in our books for the making these extraordinary sheriffs. It is true, the reporter adds, that it was held that the queen by her perrogative might make a sheriff without the election of the judges, *non obstante aliquo statuto in contrarium*; but the doctrine of *non obstante* which sets the prerogative above the laws, was effectually demolished by the bill of rights at the Revolution, and abdicated Westminster-hall when king James abdicated the kingdom. However, it must be acknowledged, that the practice of occasionally naming what are called *pocket sheriffs*, by the sole authority of the crown, hath uniformly continued to the reign of his present majesty; in which, it is believed, few (if any) instances have occurred.

Sheriffs, by virtue of several old statutes, are to continue in their office no longer than one year; and yet it hath been said that a sheriff may be appointed *durante bene placito*, or during the king's pleasure; and so is the form of the royal writ. Therefore, till a new sheriff be named, his office cannot be determined, unless by his own death, or the demise of the king; in which last case it was usual for the successor to send a new writ to the old sheriff; but now, by statute 1 Anne st. 1. c. 8. all officers appointed by the preceding king may hold their offices for six months after the king's demise, unless sooner displaced by the successor. We may further observe, that by statute 1 Ric. II. c. 11. no man that has served the office of sheriff for one year can be compelled to serve the same again within three years after.

We shall find it is of the utmost importance to have the sheriff appointed according to law, when we consider his power and duty. These are either as a judge, as the keeper of the king's peace, as a ministerial officer of the superior courts of justice, or as the king's bailiff.

In his judicial capacity he is to hear and determine all causes of 40 shillings value and under, in his county-court: and he has also a judicial power in divers other civil cases. He is likewise to decide the elections of knights of the shire, (subject to the controul of the house of commons,) of coroners and of verderors; to judge of the qualifications of voters, and to return such as he shall determine to be duly elected.

As the keepers of the king's peace, both by common law and special commission, he is the first man in the county, and superior in rank to any nobleman therein, during his office. He may apprehend, and commit to prison, all persons who break the peace, or attempt to break it; and may bind any one in a recognizance to keep the king's peace. He may, and is bound, *ex officio*, to pursue and take all traitors, murderers, felons, and other misdoers, and commit them to gaol for safe custody. He is also to defend his county against any of the king's enemies when they come into the land; and for this purpose, as well as for keeping the peace and pursuing felons, he may command all the people of his county to attend him; which is called the *posse comitatus*, or power of the county: which summons every person above 15 years old, and under the degree of a peer, is bound to attend upon warning, under pain of fine and imprisonment. But though the sheriff is thus the principal conservator of the peace in his county, yet, by the express directions of the great charter, he, together with the constable, coroner, and certain other officers of the king, are forbidden to hold any pleas of the crown, or, in other words, to try any criminal offence. For it would be highly unbecoming, that the executioners of justice should be also judges; should impose, as well as levy, fines and amercements; should one day condemn a man to death, and personally execute him the next. Neither may he act as an ordinary justice of the peace during the time of his office; for this would be equally inconsistent, he being in many respects the servant of the justices.

In his ministerial capacity, the sheriff is bound to execute all process issuing from the king's courts of justice. In the commencement of civil causes, he is to serve the writ, to arrest, and to take bail; when the cause comes to trial, he must summon and return the jury; when it is determined, he must see the judgment of the court carried into execution. In criminal matters, he also arrests and imprisons, he returns the jury, he has the custody of the delinquent, and he executes the sentence of the court, though it extend to death itself.

As the king's bailiff, it is his business to preserve the rights of the king within his bailiwick; for so his county is frequently called in the writs: a word introduced by the princes of the Norman line; in imitation of the French, whose territory is divided into bailiwicks, as that of England into counties. He must seize to the king's use all lands devolved to the crown by attainder or escheat; must levy all fines and forfeitures, must seize and keep all waifs, wrecks, estrays, and the like, unless they be granted to some subject; and must also collect the king's rents within his bailiwick, if commanded by process from the exchequer.

To execute these various offices, the sheriff has under him many inferior-officers: an under-sheriff, bailiffs, and gaolers, who must neither buy, sell, nor farm their offices, on forfeiture of 500l.

The under-sheriff usually performs all the duties of the office; a very few only excepted, where the personal presence of the high-sheriff is necessary. But no under-sheriff shall abide in his office above one year; and if he does, by statute 23 Hen. VI. c. 8. he forfeits 200l.; a very large penalty in those early days. And no under sheriff or sheriff's officer shall practise as an attorney during the time he continues in such office: for this would be a great inlet to partiality and oppression. But these salutary regulations are shamefully evaded, by practising in the names of other attorneys, and putting in sham deputies by way of nominal under-sheriffs: by reason of which, says Dalton, the under-sheriffs and bailiffs do grow so cunning in their several places, that they are able to deceive, and it may well be feared that many of them do deceive, both the king, the high-sheriff, and the county.

SHERLOCK (William), a learned English divine in the 17th century, was born in 1641, and educated at Eton school, where he distinguished himself by the vigour of his genius and his application to study. Thence he was removed to Cambridge, where he took his degrees. In 1669, he became rector of the parish of St. George, Botolph-lane, in London; and in 1681 was collated to the prebend of Pancras, in the cathedral of St. Paul's. He was likewise chosen master of the Temple, and had the rectory of Therfield, in Hertfordshire. After the Revolution he was suspended from his preferment, for refusing the oaths to king William and queen Mary; but at last he took them, and publicly justified what he had done. In 1691 he was installed dean of St. Paul's. His Vindication of the Doctrine of the Trinity engaged him in a warm controversy with Dr. South and others. Bishop Burnet tells us, he was "a clear, a polite, and a strong writer; but apt to assume too much to himself, and to treat his adversaries with contempt." He died in 1707. His works are very numerous; among these are, 1. A Discourse con-

cerning the Knowledge of Jeſus Chriſt, againſt Dr. Owen. 2. Several pieces againſt the Papiſts, the Socinians, and Diſſenters. 3. A practical Treatiſe on Death, which is much admired. 4. A practical Diſcourſe on Providence. 5. A practical Diſcourſe on the future Judgment; and many other works.

Sherlock (Dr. Thomas), late biſhop of London, was the elder ſon of Dr. William Sherlock, and born in 1678. He was ſent, after a proper preparation, to Catherine-hall, Cambridge, where he took his degrees, and of which he became maſter. He was made maſter of the Temple very young, upon the reſignation of his father; and, what is very remarkable, this maſterſhip was held ſucceſſively by father and ſon for more than ſeventy years. He was likewiſe dean of Chicheſter. His firſt appearance as an author, as far as we are able to diſcover, was in the way of controverſy; and that too carried on with uncommon warmth and ſpirit. He was at the head of the oppoſition againſt Hoadly, then biſhop of Bangor; during which conteſt he publiſhed a great number of pieces. In 1728, he was preferred to the biſhopric of Bangor; and tranſlated thence to Saliſbury in 1734. In 1747, upon the death of Potter, he had an offer made him of the archbiſhopric of Canterbury, but declined it, on account of the very ill ſtate of health he was then in; yet, recovering in a good degree, he ventured to ſucceed Gibſon in the ſee of London, the year after. But bodily infirmities began to affect him very much; and, though for three or four years he applied himſelf to buſineſs, and made one general viſitation of his dioceſe in perſon, yet he was then viſited with a very terrible illneſs, which deprived him almoſt firſt of the uſe of his limbs, and then of his ſpeech, inſomuch that he could not be underſtood but by thoſe who were conſtantly about him. Still the powers of his underſtanding continued in their full vigour; and under this weak ſtate of body, in which he lay many years, he reviſed, corrected, and publiſhed, four volumes of ſermons in 8vo. which, beſides the excellencies they have in common with the beſt productions in this way, are particularly to be admired for their ingenuity and elegance. He died July 18, 1761, in his 84th year.

SHERRIFFE of Mecca, the title of the deſcendants of Mahomet by Haſſan Ibn Ali. Theſe are divided into ſeveral branches, of which the family of Ali Bunemi, conſiſting at leaſt of three hundred individuals, enjoy the ſole right to the throne of Mecca. The Ali Bunemi are, again, ſubdivided into two ſubordinate branches, Darii Sajid, and Darii Barkad; of whom ſometimes the one, ſometimes the other, have given ſovereigns to Mecca and Medina, when theſe were ſeparate ſtates. Not only is the Turkiſh Sultan indifferent about the order of ſucceſſion in this family, but he ſeems even to foment the diſſenſions which ariſe among them, and favours the ſtrongeſt, merely that he may weaken them all. As the order of ſucceſſion is not determinately fixed, and the ſherriffes may all aſpire alike to the ſovereign power, this uncertainty of right, aided by the intrigues of the Turkiſh officers, occaſions frequent revolutions. The grand ſherriffe is ſeldom able to maintain himſelf on the throne; and it ſtill ſeldomer happens that his reign is not diſturbed by the revolt of his neareſt relations. There have been inſtances of a nephew ſucceeding his uncle, an uncle ſucceeding his nephew; and ſometimes of a perſon, from a remote branch, coming in the room of the reigning prince of the antient houſe.

When Niebuhr was in Arabia, in 1763, the reigning ſherriffe Meſad had ſitten fourteen years on the throne, and, during all that period, had been continually at war with the neighbouring Arabs, and with his own neareſt relations ſometimes. A few years before, the Pacha of Syria had depoſed him, and raiſed his younger brother to the ſovereign dignity in his ſtead. But after the departure of the caravan, Jafar, the new ſherriffe, not being able to maintain himſelf on the throne, was obliged to reſign the ſovereignty again to Meſad. Achmet, the ſecond brother of the ſherriffe, who was much beloved by the Arabs, threatened to attack Mecca while Niebuhr was at Jidda. Our traveller was ſoon after informed of the termination of the quarrel, and of Achmet's return to Mecca, where he continued to live peaceably in a private character.

Theſe examples ſhow that the Muſſulmans obſerve not the law which forbids them to bear arms againſt their holy places. An Egyptian Bey even preſumed, a few years ſince, to plant ſome ſmall cannons within the compaſs of the Kaba, upon a ſmall tower, from which he fired over that ſacred manſion, upon the palace of ſherriffe Meſad, with whom he was at variance.

The dominions of the ſherriffe comprehend the cities of Mecca, Medina, Jambo, Taaif, Sadie, Ghunfude, Hali, and thirteen others leſs conſiderable, all ſituated in Hedjas. Near Taaif is the lofty mountain of Gazvan, which, according to Arabian authors, is covered with ſnow in the midſt of ſummer. As theſe dominions are neither opulent nor extenſive, the revenue of their ſovereign cannot be conſiderable.

He finds a rich reſource, however, in the impoſts levied on pilgrims, and in the gratuities offered him by Muſſulman monarchs. Every pilgrim pays a tax of from ten to a hundred crowns, in proportion to his ability. The Great Mogul remits annually ſixty thouſand rupees to the ſherriffe, by an aſſignment upon the government of Surat. Indeed, ſince the Engliſh made themſelves maſters of this city, and the territory belonging to it, the Nabob of Surat has no longer been able to pay the ſum. The ſherriffe once demanded it of the Engliſh, as the poſſeſſors of Surat; and till they ſhould ſatisfy him, forbade their captains to leave the port of Jidda. But the Engliſh diſregarding this prohibition, the ſherriffe complained to the Ottoman Porte, and they communicated his complaints to the Engliſh ambaſſador. He at the ſame time opened a negotiation with the nominal Nabob, who reſides in Surat. But theſe ſteps proved all fruitleſs: and the ſovereign of Mecca ſeems not likely to be ever more benefited by the contribution from India.

The power of the ſherriffe extends not to ſpiritual matters; theſe are entirely managed by the heads of the clergy, of different ſects, who are reſident at Mecca. Rigid Muſſulmans, ſuch as the Turks, are not very favourable in their ſentiments of the ſherriffes, but ſuſpect their orthodoxy, and look upon them as ſecretly attached to the tolerant ſect of the Zeidi.

SHETLAND, the general name of about forty iſlands, lying 100 miles N. N. E. of Caithneſsſhire, in Scotland, between 59. 56. and 61. 11. N. lat. The names of the principal are Mainland, Yell, Unſt, and Fula or Thule. The deſcription given of the largeſt, or Mainland, will enable the reader to form an idea of the others; and as the particulars of the climate, inhabitants, &c. are much the ſame as in the Orcades, we muſt refer to that article for them; adding, however, ſome curious particulars of the Auroræ Boreales, or *Merry Dancers*, as they are called in theſe iſlands. Theſe are the conſtant attendants of clear evenings, and prove great reliefs amid the gloom of the long winter nights. They commonly appear at twilight, near the horizon, of a dun colour, approaching to yellow, ſometimes continuing in that ſtate for ſeveral hours, without any apparent motion; after which they break out into ſtreams of ſtronger light, ſpreading into columns, and altering ſlowly into ten thouſand different ſhapes, varying their colours from all the tints of yellow to the moſt obſcure ruſſet. They often cover the whole hemiſphere, and then make the moſt brilliant appearance. Their motions, at theſe times, are amazingly quick; and they aſtoniſh the ſpectator with the rapid change of their form. They break out in places where none were ſeen before, ſkimming briſkly along the heavens; are ſuddenly extinguiſhed, and leave an uniform duſky track. This again is brilliantly illuminated in the ſame manner, and as ſuddenly left a dull blank. In certain nights, they aſſume the appearance of vaſt columns; on one ſide

of the deepeft yellow, on the other declining away till it becomes undiftinguifhed from the fky. They have generally a ftrong tremulous motion from end to end, which continues till the whole vanifhes. According to the ftate of the atmofphere, they differ in colours: they often affume the colour of blood, and make a very dreadful appearance. Shetland, with Orkney, forms one of the counties of Scotland.

SHEW BREAD, the loaves of bread which the prieft of the week put every Sabbath-day upon the golden table in the fanctuary, before the Lord, in the temple of the Jews. They were twelve in number, and were offered to God in the name of the twelve tribes of Ifrael. They were fhaped like a brick, were ten palms long and five broad, weighing about eight pounds each. They were unleavened, and made of fine flour by the Levites. The priefts fet them on the table in two rows, fix in a row, and put frankincenfe upon them, to preferve them from moulding. They were changed every Sabbath, and the old ones belonged to the prieft upon duty. Of this bread none but the priefts might eat, except in cafes of neceffity. It was called the *bread of faces*, becaufe the table of the fhew-bread, being almoft over againft the ark of the covenant, the loaves might be faid to be fet before the face of God. The original table was carried away to Babylon, but a new one was made for the fecond temple. It was of wood overlaid with gold. This, with the candleftick and fome other fpoils, was carried by Titus to Rome.

SHIELD, an antient weapon of defence, in form of a light buckler, borne on the arm to fend off lances, darts, &c. The form of the fhield is reprefented by the efcutcheon in coats of arms. The fhield was that part of the antient armour on which the perfons of diftinction in the field of battle always had their arms painted; and moft of the words ufed at this time to exprefs the fpace that holds the arms of families are derived from the Latin name for a fhield, *fcutum*. The French *efcu* and *efcuffion*, and the Englifh word *efcutcheon*, or, as we commonly fpeak it, *fcutcheon*, are evidently from this origin; and the Italian *fcudo* fignifies both the fhield of arms, and that ufed in war. The Latin name *clypeus*, for the fame thing, feems alfo to be derived from the Greek word γλυφειν, *to engrave*; and it had this name from the feveral figures engraved on it, as marks of diftinction of the perfon who wore it.

The fhield in war, among the Greeks and Romans, was not only ufeful in the defence of the body, but it was alfo a token, or badge of honour to the wearer; and he who returned from battle without it, was always treated with infamy afterwards. People have at all times thought this honourable piece of the armour, the propereft place to engrave, or figure on the figns of dignity of the poffeffor of it; and hence, when arms came to be painted for families in aftertimes, the heralds always chofe to reprefent them upon the figure of a fhield, but with feveral exterior additions and ornaments; as the helmet, fupporters, and the reft.

The form of the fhield has not only been found different in various nations, but even the people of the fame nation, at different times, have varied its form extremely; and among feveral people there have been fhields of feveral forms and fizes in ufe, at the fame period of time, and fuited to different occafions. The moft antient and univerfal form of fhields, in the earlier ages, feems to have been the triangular. This we fee inftances of in all the monuments and gems of antiquity: our own moft early monuments fhow it to have been the moft antique fhape alfo with us, and the heralds have found it the moft convenient for their purpofes, when they had any odd number of figures to reprefent; as if three, then two in the broad bottom part, and one in the narrow upper end, it held them very well; or if five, they ftood as conveniently, as three below, and two above. The other form of a fhield, now univerfally ufed, is fquare, rounded, and pointed at the bottom: this is taken from the figure of the Samnitic fhield ufed by the Romans, and fince copied very generally by the Englifh, French, and Germans.

The Spaniards and Portuguefe have the like general form of fhields, but they are round at the bottom without the point; and the Germans, befide the Samnite fhield, have two others pretty much in ufe: thefe are, 1. The bulging fhield, diftinguifhed by its fwelling or bulging out at the flanks; and, 2. The indented fhield, or fhield chancree, which has a number of notches and indentings all round its fides. The ufe of the antient fhield of this form was, that the notches ferved to reft the lance upon, that it might be firm while it gave the thruft; but this form being lefs proper for the receiving armorial figures, the two former have been much more ufed in the heraldry of that nation.

Befide this different form of the fhields in heraldry, we find them alfo often diftinguifhed by their different pofitions, fome of them ftanding erect, and others flanting in various ways, and in different degrees; this the heralds exprefs by the word *pendant*, "hanging," they feeming to be hung up not by the centre, but by the right or left corner. The French call thefe *ecu pendant*, and the common antique triangular ones *ecu ancien*. The Italians call this *fcuto pendente;* and the reafon given for exhibiting the fhield in thefe figures in heraldry is, that in the antient tilts and tournaments, they who were to juft at thefe military exercifes, were obliged to hang up their fhields with their armories, or coats of arms on them, out at the windows and balconies of the houfes near the place; or upon trees, pavilions, or the barriers of the ground, if the exercife was to be performed in the field.

Thofe who were to fight on foot, according to Columbier, had their fhields hung up by the right corner, and thofe who were to fight on horfeback had theirs hung up by the left. This pofition of the fhields in heraldry is called *couche* by fome writers, though by the generality *pendant*.

It was very frequent in all parts of Europe, in arms given between the 11th and 14th centuries; but it is to be obferved, that the hanging by the left corner, as it was the token of the owner's being to fight on horfeback, fo it was efteemed the moft honourable and noble fituation; and all the pendant fhields of the fons of the royal family of Scotland and England, and of our nobility at that time, are thus hanging from the left corner. The hanging from this corner was a token of the owner's being of noble birth, and having fought in the tournaments before; but no fovereign ever had a fhield pendant any way, but always erect, as they never formally entered the lifts of the tournament.

The Italians generally have their fhields of arms of an oval form; this feems to be done in imitation of thofe of the popes and other dignified clergy: but their herald, Petro Sancto, feems to regret the ufe of this figure of the fhield, as an innovation brought in by the painters and engravers as moft convenient for holding the figures, but derogatory to the honour of the poffeffor, as not reprefenting either antiquity or honours won in war, but rather the honours of fome citizen or perfon of learning. Some have carried it fo far as to fay, that thofe who either have no antient title to nobility, or have fullied it by any unworthy action, cannot any longer wear their arms in fhields properly figured, but were obliged to have them painted in an oval or round fhield. In Flanders, where this author lived, the round and oval fhields are in the difrepute he fpeaks of; but in Italy, befides the popes and dignified prelates, many of the firft families of the laity have them. The fecular princes, in many other countries, alfo retain this form of the fhield, as the moft antient and truly expreffive of the Roman clypeus.

SHIELD, in heraldry, the efcutcheon or field on which the bearings of coats of arms are placed. See HERALDRY.

SHIELDS, North and South, two fea-port towns, the one north of the Tyne in Northumberland, the other on the fouth of the Tyne in the county of Durham. South Shields contains

above 200 ſalt-pans, and on both banks of the river are many convenient houſes for the entertainment of ſeamen and colliers, moſt of the Newcaſtle coal fleet having their ſtation here uſually till their coals are brought down in the barges and lighters from Newcaſtle. A very large Roman altar, of one entire ſtone, was found ſome years ago near this place, and put into the hands of the learned Dr. Liſter, who, in his account of it ſent to the Royal Society, ſays it was erected to Marcus Aurelius Antoninus Caracalla, when he took upon him the command of the empire and the whole army (after his father's death at York), for his ſafe return from his ſucceſsful expedition againſt the Scots and Picts. W. lon. 1. 12. N. lat. 55. 44.

SHIFTERS, on board a man of war, certain men who are employed by the cooks to ſhift and change the water in which the fleſh or fiſh is put, and laid for ſome time, in order to fit it for the kettle.

SHIFTING A TACKLE, in ſea-language, the act of removing the blocks of a tackle to a greater diſtance from each other, on the object to which they are applied, in order to give a greater ſcope or extent to their purchaſe. This operation is otherwiſe called *fleeting*. Shifting the helm denotes the alteration of its poſition, by puſhing it towards the oppoſite ſide of the ſhip. Shifting the voyal, ſignifies changing its poſition on the capſtern, from the right to the left, and *vice verſa*.

SHILLING, an Engliſh ſilver coin, equal to twelve pence, or the twentieth part of a pound. Freherus derives the Saxon *ſcilling*, whence our ſhilling, from a corruption of *ſiliqua;* proving the derivation by ſeveral texts of law, and, among others, by the 26th law, *De annuis legatis*. Skinner deduces it from the Saxon *ſcild* "ſhield," by reaſon of the eſcutcheon of arms thereon.

Biſhop Hooper derives it from the Arabic *ſchecle*, ſignifying *a weight*; but others, with greater probability, deduce it from the Latin *ſicilicus*, which ſignified in that language *a quarter of an ounce*, or the 48th part of a Roman pound. In confirmation of this etymology it is alleged, that the ſhilling kept its original ſignification, and bore the ſame proportion to the Saxon pound as ſicilicus did to the Roman and the Greek, being exactly the 48th part of the Saxon pound; a diſcovery which we owe to Mr. Lambarde.

However, the Saxon laws reckon the pound in the round number at 50 ſhillings, but they really coined out of it only 48; the value of the ſhilling was five pence; but it was reduced to four pence above a century before the conqueſt; for ſeveral of the Saxon laws, made in Athelſtan's reign, oblige us to take this eſtimate. Thus it continued to the Norman times, as one of the Conqueror's laws ſufficiently aſcertains; and it ſeems to have been the common coin by which the Engliſh payments were adjuſted. After the conqueſt, the French *ſolidus* of twelve pence, which was in uſe among the Normans, was called by the Engliſh name of ſhilling; and the Saxon ſhilling of four pence took a Norman name, and was called the *groat*, or great coin, becauſe it was the largeſt Engliſh coin then known in England.

It has been the opinion of the biſhops Fleetwood and Gibſon, and of the antiquaries in general, that, though the method of reckoning by pounds, marks, and ſhillings, as well as by pence and farthings, had been in conſtant uſe even from the Saxon times, long before the Norman conqueſt, there never was ſuch a coin in England as either a pound or a mark, nor any ſhilling, till the year 1504 or 1505, when a few ſilver ſhillings or twelvepences were coined, which have long ſince been ſolely confined to the cabinets of collectors.

Mr. Clarke combats this opinion, alleging that ſome coins mentioned by Mr. Folkes, under Edward I. were probably Saxon ſhillings new minted, and that archbiſhop Aelfric expreſsly ſays, that the Saxons had three names for their money, *viz.* mancuſes, ſhillings, and pennies. He alſo urges the different value of the Saxon ſhilling at different times, and its uniform proportion to the pound, as an argument that their ſhilling was a coin; and the teſtimony of the Saxon goſpels, in which the word we have tranſlated *pieces of ſilver*, is rendered *ſhillings*, which, he ſays, they would hardly have done, if there had been no ſuch coin then in uſe. Accordingly the Saxons expreſſed their ſhilling in Latin by *ſiclus* and *argenteus*. He further adds, that the Saxon ſhilling was never expreſſed by *ſolidus* till after the Norman ſettlements in England; and howſoever it altered during the long period that elapſed from the conqueſt to the time of Henry VII. it was the moſt conſtant denomination of money in all payments, though it was then only a ſpecies of account, or the twentieth part of the pound ſterling: and when it was again revived as a coin, it leſſened gradually as the pound ſterling leſſened, from the 28th of Edward III. to the 43d of Elizabeth.

In the year 1560 there was a peculiar ſort of ſhilling ſtruck in Ireland, of the value of nine pence Engliſh, which paſſed in Ireland for twelve pence. The motto on the reverſe was, *Poſui Deum adjutorem meum*. Eighty-two of theſe ſhillings, according to Malynes, went to the pound; they therefore weighed 20 grains one-fourth each, which is ſomewhat heavier in proportion than the Engliſh ſhilling of that time, 62 whereof went to the pound, each weighing 92 grains ſeven-eighths; and the Iriſh ſhilling being valued at the Tower at nine pence Engliſh, that is one-fourth part leſs than the Engliſh ſhilling, it ſhould therefore proportionably weigh one fourth part leſs, and its full weight be ſomewhat more than 62 grains; but ſome of them found at this time, though much worn, weighed 69 grains. In the year 1598, five different pieces of money of this kind were ſtruck in England for the ſervice of the kingdom of Ireland. Theſe were ſhillings to be current in Ireland at twelve pence each; half ſhillings to be current at ſix pence, and quarter ſhillings at three pence. Pennies and halfpennies were alſo ſtruck of the ſame kind, and ſent over for the payment of the army in Ireland. The money thus coined was of a very baſe mixture of copper and ſilver; and two years after there were more pieces of the ſame kinds ſtruck for the ſame ſervice, which were ſtill worſe; the former being three ounces of ſilver to nine ounces of copper; and theſe latter only two ounces eighteen pennyweights to nine ounces two pennyweights of the alloy.

The Dutch, Flemiſh, and Germans have likewiſe their ſhilling, called *ſchelin*, *ſchilling*, *ſcalin*, &c. but theſe not being of the ſame weight or fineneſs with the Engliſh ſhilling, are not current at the ſame value. The Engliſh ſhilling is worth about 23 French ſols; thoſe of Holland and Germany about 11 ſols and a half; thoſe of Flanders about nine. The Dutch ſhillings are alſo called *ſols de gros*, becauſe equal to twelve gros. The Danes have copper ſhillings worth about one-fourth of a farthing ſterling.

SHILOH is a term famous among interpreters and commentators upon Scripture. It is found (Gen. xlix. 10.) to denote the Meſſiah. The patriarch Jacob foretels his coming in theſe words: "The ſceptre ſhall not depart from Judah, nor a lawgiver from between his feet, until Shiloh come; and unto him ſhall the gathering of the people be." The Hebrew text reads, עד כי יבא שלה *until Shiloh come*. All Chriſtian commentators agree, that this word ought to be underſtood of the Meſſiah, or Jeſus Chriſt; but all are not agreed about its literal and grammatical ſignification. St. Jerome, who tranſlates it by *Qui mittendus eſt*, manifeſtly reads *Shiloach* "ſent," inſtead of *Shiloh*. The Septuagint have it Εως αν ελθη τα αποκειμενα αυτω; or, Εως αν ελθη ω αποκειται, (as if they had read שלו inſtead of שלה), *i. e.* "Until the coming of him to whom it is reſerved;" or, "Till we ſee arrive that which is reſerved for him."

It muſt be owned, that the ſignification of the Hebrew word *Shiloh* is not well known. Some tranſlate, "the ſceptre ſhall not depart from Judah, till he comes to whom it belongs;" שלה

or שלי instead of שלו לי: Others, "till the coming of the peacemaker;" or, "the pacific;" or, "of proſperity," שלה *proſperatus eſt.* *Shalah* ſignifies "to be in peace, to be in proſperity;" others, "till the birth of him who ſhall be born of a woman that ſhall conceive without the knowledge of a man;" שלי or שליא *ſecundina fluxus*; otherwiſe, "the ſceptre ſhall not depart from Judah, till its end, its ruin; till the downfall of the kingdom of the Jews," שאל or שלה *it has ceaſed, it has finiſhed.* Some Rabbins have taken the name *Siloh* or *Shiloh*, as if it ſignified the city of this name in Paleſtine: "The ſceptre ſhall not be taken away from Judah till it comes to Shiloh; till it ſhall be taken from him to be given to Saul at Shiloh." But in what part of Scripture is it ſaid, that Saul was acknowledged as king, or conſecrated at Shiloh? If we would underſtand it of Jeroboam, the ſon of Nebat, the matter is ſtill as uncertain. The Scripture mentions no aſſembly at Shiloh that admitted him as king. A more modern author derives *Shiloh* from שלה, *fatigare*, which ſometimes ſignifies *to be weary, to ſuffer*; "till his labours, his ſufferings, his paſſion ſhall happen."

But not to amuſe ourſelves about ſeeking out the grammatical ſignification of Shiloh, it is ſufficient for us to ſhow, that the antient Jews are in this matter agreed with the Chriſtians: they acknowledge that this word ſtands for the *Meſſiah the king.* It is thus that the paraphraſts Onkelos and Jonathan, that the antient Hebrew commentaries upon Geneſis, and that the Talmudiſts themſelves, explain it. If Jeſus Chriſt and his apoſtles did not make uſe of this paſſage to prove the coming of the Meſſiah, it was becauſe then the completion of this prophecy was not ſufficiently manifeſt. The ſceptre ſtill continued among the Jews: they had ſtill kings of their own nation in the perſons of the Herods; but ſoon after the ſceptre was entirely taken away from them, and has never been reſtored to them ſince.

The conceited Jews ſeek in vain to put forced meanings upon this prophecy of Jacob; ſaying, for example, that the ſceptre intimates the dominion of ſtrangers, to which they have been in ſubjection, or the hope of ſeeing one day the ſceptre, or ſupreme power, ſettled again among themſelves. It is eaſy to perceive that all this is contrived to deliver themſelves out of perplexity. In vain likewiſe they take refuge in certain princes of the captivity, whom they pretend to have ſubſiſted beyond the Euphrates, exerciſing an authority over their nation little differing from abſolute, and being of the race of David. This pretended ſucceſſion of princes is perfectly chimerical; and though at certain times they could ſhow a ſucceſſion, it continued but a ſhort time, and their authority was too obſcure, and too much limited, to be the object of a prophecy ſo remarkable as this was.

SHINGLES, in building, ſmall pieces of wood, or quartered oaken boards, ſawn to a certain ſcantling, or, as is more uſual, cleft to about an inch thick at one end, and made like wedges, four or five inches broad, and eight or nine inches long. Shingles are uſed inſtead of tiles or ſlates, eſpecially for churches and ſteeples; however, this covering is dear; yet, where tiles are very ſcarce, and a light covering is required, it is preferable to thatch; and where they are made of good oak, cleft, and not ſawed, and well ſeaſoned in water and the ſun, they make a ſure, light, and durable covering. The building is firſt to be covered all over with boards, and the ſhingles nailed upon them.

SHIP, a general name for all large veſſels, particularly thoſe equipped with three maſts and a bowſprit; the maſts being compoſed of a lowermaſt, topmaſt, and top-gallant-maſt: each of theſe being provided with yards, ſails, &c. Ships, in general, are either employed for war or merchandize.

Ships *of War* are veſſels properly equipped with artillery, ammunition, and all the neceſſary martial weapons and inſtruments for attack or defence. They are diſtinguiſhed from each other by their ſeveral ranks or claſſes, called *rates*, as follows: Ships of the firſt rate mount from 100 guns to 110 guns and upwards; ſecond rate, from 90 to 98 guns; third rate, from 64 to 74 guns; fourth rate, from 50 to 60 guns; fifth rate, from 32 to 44 guns; and ſixth rate, from 20 to 28 guns. See the article Rate. Veſſels carrying leſs than 20 guns are denominated *ſloops, cutters, fire-ſhips*, and *bombs*. It has lately been propoſed to reduce the number of theſe rates, which would be a ſaving to the nation, and alſo productive of ſeveral material advantages.

In Plate 8, is the repreſentation of a firſt rate, with rigging, &c. the ſeveral parts of which are as follow:

Parts of the *hull*.—A, The cat head; B, The fore-chain-wales, or chains; C, The main-chains; D, The mizen-chains; E, The entering port; F, The hawſe-holes; G, The poop-lanterns; H, The cheſs tree; I, The head; K, The ſtern.

1, The bowſprit. 2, Yard and ſail. 3, Gammoning. 4, Manrop. 5, Bobſtay. 6, Spritſail-ſheets. 7, Pendants. 8, Braces and pendants. 9, Halliards. 10, Lifts. 11, Cluelines. 12, Spritſail-horſes. 13, Buntlines. 14, Standing-lifts. 15, Bowſprit-ſhroud. 16, Jib-boom. 17, Jibſtay and ſail. 18, Halliards. 19, Sheets. 20, Horſes. 21, Jib guy. 22, Spritſail-topſail yard. 23, Horſes. 24, Sheets. 25, Lifts. 26, Braces and pendants. 27, Cap of bowſprit. 28, Jack-ſtaff. 29, Truck. 30, Jack flag.—31, *Fore-maſt.* 32, Runner and tackle. 33, Shrowds. 34, Laniards. 35, Stay and laniard. 36, Preventer-ſtay and laniard. 37, Woolding of the maſt. 38, Fore yard and ſail. 39, Horſes. 40, Top. 41, Crow-foot. 42, Jeers. 43, Yard-tackles. 44, Lifts. 45, Braces and pendants. 46, Sheets. 47, Foretacks. 48, Bow-lines and bridles. 49, Fore bunt-lines. 50, Fore leech-lines. 51, Preventer brace. 52, Futtock-ſhrouds.—53, *Foretop-maſt.* 54, Shrouds and laniards. 55, Fore-top-ſail yard and ſail. 56, Stay and ſail. 57, Runner. 58, Back-ſtays. 59, Halliards. 60, Lifts. 61, Braces and pendants. 62, Horſes. 63, Clew-lines. 64, Bow-lines and bridles. 65, Reef-tackles. 66, Sheets. 67, Buntlines. 68, Croſs trees. 69, Cap. 70, Foretop-gallant-maſt. 71, Shrouds. 72, Yard and ſail. 73, Backſtays. 74, Stay. 75, Lifts. 76, Clew-lines. 77, Braces and pendants. 78, Bowlines and bridles. 79, Flag-ſtaff. 80, Truck. 81, Flag-ſtay-ſtaff. 82, Flag of the lord high admiral. 83, *Mainmaſt.* 84, Shrouds. 85, Laniards. 86, Runner and tackle. 87, Futtock-ſhrouds. 88, Top-lantern. 89, Crank of ditto. 90, Stay. 91, Preventer ſtay. 92, Stay-tackles. 93, Woolding of the maſt. 94, Jeers. 95, Yard-tackles. 96, Lifts. 97, Braces and pendants. 98, Horſes. 99, Sheets. 100, Tacks. 101, Bowlines and bridles. 102, Crow-foot. 103, Cap. 104, Top. 105, Buntlines. 106, Leech-lines. 107, Yard and ſail.—108, *Main-topmaſt.* 109, Shrouds and laniards. 110, Yard and ſail. 111, Futtock ſhrouds. 112, Backſtays. 113, Stay. 114, Stayſail and halliards. 115, Tye. 116, Halliards. 117, Lifts. 118, Clew-lines. 119, Braces and pendants. 120, Horſes. 121, Sheets. 122, Bowlines and bridles. 123, Buntlines. 124, Reef-tackles. 125, Croſs trees. 126, Cap. 127, *Main-top-gallant-maſt.* 128, Shrouds and laniards. 129, Yard and ſail. 130, Backſtays. 131, Stay. 132, Stay-ſail and halliards. 133, Lifts. 134, Braces and pendants. 135, Bowlines and bridles. 136, Clew-lines. 137, Flagſtaff. 138, Truck. 139, Flagſtaff-ſtay. 140, Flag ſtandard.—141, *Mizen-maſt.* 142, Shrouds and laniards. 143, Cap. 144, Yard and ſail. 145, Block for ſignal halliards. 146, Sheet. 147, Pendant-lines. 148, Peck-brails. 149, Stayſail. 150, Stay. 151, Derrick and ſpan. 152, Top. 153, Croſs-jack-yards. 154, Croſs-jack lifts. 155, Croſs-jack braces. 156, Croſs-jack ſlings.—157, *Mizen-top-maſt.* 158, Shrouds and laniards. 159, Yard and ſail. 160, Backſtays. 161, Stay. 162, Halliards. 163, Lifts. 164, Braces and pendants. 165, Bowlines and bridles. 166, Sheets. 167, Clew-lines. 168, Stayſail. 169, Croſs trees. 170, Cap. 171, Flagſtaff.

172, Flagstaff-stay. 173, Truck. 174, Flag, union. 175, Ensign staff. 176, Truck. 177, Ensign. 178, Stern ladder. 179, Bower cable.

In pl. 9, fig. 2. is a vertical longitudinal section of a first rate ship of war, with references to the principal parts; which are as follow: A, Is the *head*, containing—1, The stem; 2, The knee of the head or cutwater.; 3, The lower and upper cheek; 4, The trail-board; 5, The figure; 6, The gratings; 7, The brackets; 8, The false stem; 9, The breast hooks; 10, The hause holes; 11, The bulk head forward; 12, The cathead; 13, The cat hook; 14, Necessary seats; 15, The manger within board; 16, The bowsprit. B, *Upon the forecastle*. 17, The gratings; 18, The partners of the mast; 19, The gunwale; 20, The belfry; 21, The funnel for smoke; 22, The gangway going off the forecastle; 23, The forecastle guns. C, *In the forecastle*—24, The door of the bulkhead forward; 25, Officers cabins; 26, Staircase; 27, Fore-top-sail sheet bits; 28, The beams; 29, The carlings. D, The middle gundeck forward—30, The fore-jeer bits; 31, The oven and furnace of copper; 32, The captain's cook room; 33, The ladder or way to the forecastle. E, The lower gun-deck forward— 34, The knees fore and aft; 35, The spirketings, or the first streak next to each deck, the next under the beams being called *clamps*; 36, The beams of the middle gun deck fore and aft; 37, The carlings of the middle gun-deck fore and aft; 38, The fore-bits; 39, The after or main bits; 40, The hatchway to the gunner's and boatswain's store-rooms; 41, The jeer capstan. F, The orlop—42, 43, 44, The gunner's, boatswain's, and carpenter's store-rooms; 45, The beams of the lower gun-deck; 46, 47, The pillars and the riders, fore and aft; 48, The bulkhead of the store-rooms. G, The hold—49, 50, 51, The foothook rider, the floor rider, and the standard, fore and aft; 52, The pillars; 53, The step of the foremast; 54, The kelson, or false keel, and dead rising; 55, The dead-wood. H, At midships in the hold—56, The floor timbers; 57, The keel; 58, The well; 59, The chain-pump; 60, The step of the mainmast; 61, 62, Beams and carlings of the orlop fore and aft. I, The orlop amidships—63, The cable tire; 64, The main hatchway. K, The lower gun-deck amidships—65, The ladder leading up to the middle gun-deck; 66, The lower tire of ports. L, The middle gun-deck amidship—67, The middle tire of ports; 68, The entering port; 69, The main jeer bits; 70, Twisted pillars or stanchions; 71, The capstan; 72, Gratings; 73, The ladder leading to the upper deck. M, The upper gundeck amidships—74, The main topsail-sheet bits; 75, The upper partners of the mainmast; 76, The gallows on which spare topmasts, &c. are laid; 77, The foresheet blocks; 78, The rennets; 79, The gun wale; 80, The upper gratings; 81, The drift brackets; 82, The piss dale; 83, The capstan pall. N, Abaft the mainmast—84, The gangway off the quarterdeck; 85, The bulkhead of the coach; 86, The staircase down to the middle gun-deck; 87, The beams of the upper deck; 88, The gratings about the mainmast; 89, The coach or council-chamber; 90, The staircase up to the quarterdeck. O, The quarterdeck—91, The beams; 92, The carlings; 93, The partners of the mizenmast; 94, The gangway up to the poop; 95, The bulkhead of the cuddy. P, The poop—96, The trumpeter's cabin; 97, The tafforel. Q, The captain's cabin. R, The cuddy, usually divided for the master and secretary's officers. S, The state-room, out of which is made the bed chamber and other conveniences for the commander in chief; 98, The entrance into the gallery; 99, The bulkhead of the great cabin; 100, The stern lights and after galleries. T, The ward room, allotted for the lieutenants and marine officers; 101, The lower gallery; 102, The steerage and bulkhead of the wardroom; 103, The whip-staff, commanding the tiller; 104, The after staircase leading down to the lower gun deck. V, Several officers cabins abaft the mainmast, where the soldiers generally keep guard. W, The gun-room—105, The tiller commanding the rudder; 106, The rudder; 107, The stern-post; 108, The tiller transom; 109, The several transoms, viz. 1, 2, 3, 4, 5,; 110, The gunroom ports, or stern-chase; 111, The bread-room scuttle, out of the gun-room; 112, The main capstan; 113, The pall of the capstan; 114, The partner; 115, The bulk head of the bread-room. X, The bread-room. Y, The steward's room, where all provisions are weighed and served out. Z, The cockpit, where are subdivisions for the purser, the surgeon and his mates. AA, The platform or orlop, where provision is made for the wounded in the time of service; 116, The hold abaft the main-mast; 117, The step of the mizen-mast; 118, The kelson or false keel; 119, The dead wood, or rising.

Ships of war are fitted out either at the expense of the state or by individuals. Those fitted out at the public expense are called *King's ships*, and are divided into *ships of the line, frigates, sloops*, &c. For an account of each of these, see the respective articles. Ships of war fitted out by individuals are called *privateers*. See the article Privateer.

Armed-Ship. See Armed *Ship*.

Bomb-Ship. See Bomb-*Vessels*.

Double-Ship. See Ship-*Building*.

Fire-Ship. See Fire *Ship*.

Hospital-Ship, a vessel fitted up to attend on a fleet of men of war, and receive their sick or wounded; for which purpose her decks should be high, and her ports sufficiently large. Her cables ought also to run upon the upper deck, to the end that the beds or cradles may be more commodiously placed between decks, and admit a free passage of the air to disperse that which is offensive or corrupted.

Merchant-Ship, a vessel employed in commerce to carry commodities of various sorts from one port to another. The largest merchant ships are those employed by the different companies of merchants who trade to the East Indies. They are in general larger than our 40 gun ships; and are commonly mounted with 20 guns on their upper-deck, which are nine pounders; and six on their quarter-deck, which are six pounders.

Register-Ship. See Register-*Ship*.

Store-Ship, a vessel employed to carry artillery or naval stores for the use of a fleet, fortress, or garrison.

Transport-Ship, is generally used to conduct troops from one place to another. Besides the different kinds of ships above mentioned, which are denominated from the purpose for which they are employed, vessels have also, in general, been named according to the different manner of rigging them. It would be an endless, and at the same time an unnecessary task, to enumerate all the different kinds of vessels with respect to their rigging; and therefore a few only are here taken notice of. Fig. 3. pl 9 c is a *ship* which would be converted into a *bark* by stripping the mizen-mast of its yards and the sails belonging to them. If each mast, its corresponding topmast and topgallant-mast, instead of being composed of separate pieces of wood, were all of one continued piece, then this vessel with very little alteration would be a *polacre*. Fig. 4. Plate 9, represents a *snow*; fig. 5. a *bilander*; fig. 6. a *brig*; fig. 7. a *ketch*; fig. 8. a *schooner*; fig. 9. a *sloop*; fig. 10. a *xebec*; fig. 11. a *galliot*; fig. 12. a *dogger*; fig. 13. a *galley* under sail; fig. 14. ditto rowing.

Ships are also sometimes named according to the different modes of their construction. Thus we say, a *cat*-built ship, &c.

To Ship, is either used actively, as to embark any person or put any thing aboard ship: or passively, to receive any thing into a ship; as, "we shipped a heavy sea at three o'clock in the morning."

To Ship, also implies to fix any thing in its place; as, to ship the oars, that is, to put them in their rowlocks; to ship the swivel guns, is to fix them in their sockets; to ship the bandspokes, &c.

Machine for drawing bolts out of Ships, an inſtrument invented by Mr. William Hill for this purpoſe. His account of which is as follows. "Firſt, The uſe of this machine is to draw the kelſon and dead wood bolts out, and to draw the knee of the head bolts.—Secondly, The heads of the kelſon bolts heretofore were all obliged to be driven through the kelſon, floor-timbers and keel, to get them out: by this means the kelſon is often entirely deſtroyed, and the large hole the head makes materially wounds the floors; and frequently, when the bolt is much corroded, it ſcarfs. and the bolt comes out of the ſide of the keel.—Thirdly, The dead wood-bolts that are driven with two or three drifts, are ſeldom or never got out, by which means the dead-wood is condemned, when ſome of it is really ſerviceable.—Fourthly, In drawing the knee of the head-bolts, ſometimes the knee ſtarts off, and cannot be got to again, but furs up, and with this machine may be drawn in; for it has been proved to have more power in ſtarting a bolt than the maul."

In plate II. fig. 1. "A, A, repreſent two ſtrong male ſcrews, working in female ſcrews near the extremities of the cheeks, againſt plates of iron E, E. C C is the bolt to be drawn; which, being held between the chaps of the machine at DD, is, by turning the ſcrews by the lever B, forced upwards out of the wood or plank of the ſhip. F, F, are two dogs, with hooks at their lower extremities; which, being driven into the plank, ſerve to ſupport the machine till the chaps have got faſt hold of the bolt. At the upper part of theſe dogs are rings paſſing through holes in a collar, moveable near the heads of the ſcrews. Fig. 2. is a view of the upper ſide of the cheeks when joined together; *a, a,* the holes in which the ſcrews work; *b,* the chaps by which the bolts are drawn. Fig. 3. The under ſide of the cheek: *a, a,* the holes in which the ſcrews work; *b,* the chaps by which the bolts are drawn, and where the teeth that gripe the bolt are more diſtinctly ſhown. Fig. 4. One of the cheeks ſeparated from the other, the letters referring as in fig. 2. and 3.

This machine was tried in his majeſty's yard at Deptford, and was found of the greateſt utility.—'Firſt, it drew a bolt that was driven down ſo tight as only to go one inch in fixteen blows with a double headed maul, and was well clenched below: the bolt drew the ring a conſiderable way into the wood, and wire drew itſelf through, and left the ring behind. Secondly, it drew a bolt out of the Venus's dead-wood that could not be got out by the maul. That part of it which went through the keel was bent cloſe up to the lower part of the dead-wood, and the machine drew the bolt ſtraight, and drew it out with eaſe. It alſo drew a kelſon bolt out of the Stanley Weſt Indiaman, in Meſſrs. Wells's yard. Deptford; which being a bolt of two drifts, could not be driven out.

Management of Ships *at ſingle anchor,* is the method of taking care of a ſhip while riding at ſingle anchor in a tide-way, by preventing her from fouling her anchor, &c. The following rules for this purpoſe will be found of the utmoſt conſequence.

Riding in a tide-way, with a freſh-of-wind, the ſhip ſhould have what is called *a ſhort* or *windward ſervice,* ſay 45 or 50 fathoms of cable, and always ſheered to windward, not always with the helm hard down, but more or leſs ſo according to the ſtrength or weakneſs of the tide. It is a known fact, that many ſhips ſheer their anchors home, drive on board of other ſhips, and on the ſands near which they rode, before it has been diſcovered that the anchor had been moved from the place where it was let go.

When the wind is croſs, or nearly croſs, off ſhore, or in the oppoſite direction, ſhips will always back. This is done by the mizen-topſail, aſſiſted, if needful, by the mizen-ſtayſail; ſuch as have no mizen-topſail commonly uſe the main-topſail, or if it blows freſh, a top gallant-ſail, or any ſuch ſail at the gaff.

In backing, a ſhip ſhould always wind with a taught cable, that it may be certain the anchor is drawn round. In caſe there is not a ſufficiency of wind for that purpoſe, the ſhip ſhould be hove apeak.

Riding with the wind afore the beam, the yards ſhould be braced forward; if abaft the beam, they are to be braced all aback.

If the wind is ſo far aft that the ſhip will not back (which ſhould not be attempted if, when the tide eaſes, the ſhip forges ahead, and brings the buoy on the lee quarter), ſhe muſt be ſet ahead: if the wind is far aft, and blows freſh, the utmoſt care and attention is neceſſary, as ſhips riding in this ſituation often break their ſheer, and come to windward of their anchors again. It ſhould be obſerved, that when the ſhip lies in this ticklifh ſituation, the after yards muſt be braced forward, and the fore yards the contrary way: ſhe will lie ſafe, as the buoy can be kept on the lee quarter, or ſuppoſe the helm is aport, as long as the buoy is on the larboard quarter. With the helm thus, and the wind right aft, or nearly ſo, the ſtarboard main and fore braces ſhould be hauled in. This ſuppoſes the main braces to lead forward.

When the ſhip begins to tend to leeward, and the buoy comes on the weather-quarter, the firſt thing to be done is to brace about the fore-yard; and when the wind comes near the beam, ſet the fore-ſtayſail, and keep it ſtanding until it ſhakes; then brace all the yards ſharp forward, eſpecially if it is likely to blow ſtrong.

If lying in the aforeſaid poſition, and ſhe breaks her ſheer, brace about the main-yard immediately; if ſhe recovers and brings the buoy on the lee or larboard quarter, let the main yard be again braced about; but if ſhe come to a ſheer the other way, by bringing the buoy on the other quarter, change the helm and brace the fore yard to.

Riding leeward tide with more cable than the windward ſervice, and expecting the ſhip will go to windward of her anchor, begin as ſoon as the tide eaſes to ſhorten in the cable. This is often hard work; but it is neceſſary to be done, otherwiſe the anchor may be fouled by the great length of cable the ſhip has to draw round; but even if that could be done, the cable would be damaged againſt the bows or cut-water. It is to be obſerved, that when a ſhip rides windward tide the cable ſhould be cackled from the ſhort ſervice towards the anchor, as far as will prevent the bare part touching the ſhip.

When the ſhip tends to windward and muſt be ſet ahead, hoiſt the fore-ſtayſail as ſoon as it will ſtand, and when the buoy comes on the leequarter, haul down the fore-ſtayſail, brace to the fore-yard and put the helm a-lee; for till then the helm muſt be kept a-weather and the yards full.

When the ſhip rides leeward tide, and the wind increaſes, care ſhould be taken to give her more cable in time, otherwiſe the anchor may ſtart, and probably it will be troubleſome to get her brought up again; and this care is the more neceſſary when the ſhip rides in the hauſe of another ſhip. Previous to giving a long ſervice it is uſual to take a weather-bit, that is, a turn of the cable over the windlaſs end, ſo that in veering away the ſhip will be under command. The ſervice ought to be greaſed, which will prevent its chafing in the hauſe.

If the gale continues to increaſe, the topmaſts ſhould be ſtruck in time; but the fore-yard ſhould ſeldom, if ever, be lowered down, that in caſe of parting the foreſail may be ready to be ſet. At ſuch times there ſhould be more on deck than the common anchor-watch, that no accident may happen from inattention or falling aſleep.

In a tide-way a ſecond anchor ſhould never be let go but when abſolutely neceſſary; for a ſhip will ſometimes ride eaſier and ſafer, eſpecially if the ſea runs high, with a very long ſcope of cable and one anchor, than with leſs length and two cables; however, it is adviſable, as a preventative, when ſhips have not room to drive, and the night is dark, to let fall a ſecond anchor

under foot, with a range of cable along the deck. If this is not thought neceſſary to be done, the deep-ſea lead ſhould be thrown overboard, and the line frequently handled by the watch, that they may be aſſured ſhe rides faſt.

If at any time the anchor-watch, preſuming on their own knowledge, ſhould wind the ſhip, or ſuffer her to break her ſheer without calling the mate, he ſhould immediately, or the very firſt opportunity, oblige the crew to heave the anchor in ſight; which will prevent the commiſſion of the like fault again; for, beſides the ſhare of trouble the watch will have, the reſt of the crew will blame them for neglecting their duty.

Prudent mates ſeldom lie a week in a road-ſtead without heaving their anchor in ſight: even though they have not the leaſt ſuſpicion of its being foul. There are other reaſons why the anchor ſhould be looked at; ſometimes the cable receives damage by ſweeping wrecks or anchors that have been loſt, or from rocks or ſtones; and it is often neceſſary to trip the anchor, in order to take a clearer birth, which ſhould be done as often as any ſhip brings up too near.

Method for the ſafe removal of ſuch Ships *as have been driven on ſhore.* For this purpoſe empty caſks are uſually employed to float off the veſſel, eſpecially if ſhe is ſmall, and at the ſame time near the port to which it is propoſed to conduct her. In other caſes, the following method adopted by Mr. Barnard will anſwer. See Philoſophical Tranſactions, vol. lxx. part 1.

"On January 1, 1779 (ſays Mr. Barnard), in a moſt dreadful ſtorm, the York Eaſt Indiaman, of eight hundred tons, homeward bound, with a pepper cargo, parted her cables in Margate roads, and was driven on ſhore, within one hundred feet of the head and thirty feet of the ſide of Margate pier, then drawing twenty-two feet ſix inches water, the flow of a good ſpring tide being only fourteen feet at that place.

"On the third of the ſame month I went down, as a ſhip-builder, to aſſiſt, as much as lay in my power, my worthy friend Sir Richard Hotham, to whom the ſhip belonged. I found her perfectly upright, and her ſheer (or ſide appearance) the ſame as when firſt built, but ſunk to the twelve feet water mark fore and aft in a bed of chalk mixed with a ſtiff blue clay, exactly the ſhape of her body below that draft of water; and from the rudder being torn from her as ſhe ſtruck coming on ſhore, and the violent agitation of the ſea after her being there, her ſtern was ſo greatly injured as to admit free acceſs thereto, which filled her for four days equal to the flow of the tide. Having fully informed myſelf of her ſituation and the flow of ſpring-tides, and being clearly of opinion ſhe might be again got off, I recommended, as the firſt neceſſary ſtep, the immediate diſcharge of the cargo; and, in the progreſs of that buſineſs, I found the tide always flowed to the ſame height on the ſhip; and when the cargo was half diſcharged, and I knew the remaining part ſhould not make her draw more than eighteen feet water, and while I was obſerving the water at twenty-two feet ſix inches by the ſhip's marks, ſhe inſtantly lifted to ſeventeen feet eight inches; the water and air being before excluded by her preſſure on the clay, and the atmoſphere acting upon her upper part equal to ſix hundred tons, which is the weight of water diſplaced at the difference of theſe two drafts of water.

"The moment the ſhip lifted, I diſcovered ſhe had received more damage than was at firſt apprehended, her leaks being ſuch as filled her from four to eighteen feet water in an hour and a half. As nothing effectual was to be expected from pumping, ſeveral ſcuttles or holes in the ſhip's ſide were made, and valves fixed thereto, to draw off the water at the loweſt ebb of the tide, to facilitate the diſcharge of the remaining part of the cargo; and, after many attempts, I ſucceeded in an external application of ſheep-ſkins ſewed on a ſail and thruſt under the bottom, to ſtop the body of water from ruſhing ſo furiouſly into the ſhip. This buſineſs effected, moderate pumping enabled us to keep the ſhip to about ſix feet water at low water, and by a vigorous effort we could bring the ſhip ſo light as (when the cargo ſhould be all diſcharged) to be eaſily removed into deeper water. But as the external application might be diſturbed by ſo doing, or totally removed by the agitation of the ſhip, it was abſolutely neceſſary to provide ſome permanent ſecurity for the lives of thoſe who were to navigate her to the river Thames. I then recommended as the cheapeſt, quickeſt, and moſt effectual plan, to lay a deck in the hold, as low as the water could be pumped to, framed ſo ſolidly and ſecurely, and caulked ſo tight, as to ſwim the ſhip independent of her own leaky bottom.

"Beams of fir-timber twelve inches ſquare were placed in the hold under every lower-deck beam in the ſhip, as low as the water would permit; theſe were in two pieces, for the conveniency of getting them down, and alſo for the better fixing them of an exact length, and well bolted together when in their places. Over theſe were laid long Dantzic deals of two inches and a half thick, well nailed and caulked. Againſt the ſhip's ſide, all fore and aft, was well nailed a piece of fir, twelve inches broad and ſix inches thick on the lower and three inches on the upper edge, to prevent the deck from riſing at the ſide. Over the deck, at every beam, was laid a croſs piece of fir timber ſix inches deep and twelve inches broad, reaching from the pillar of the hold to the ſhip's ſide, on which the ſhores were to be placed to reſiſt the preſſure of the water beneath. On each of theſe, and againſt the lower-deck beam, at equal diſtances from the ſide and middle of the ſhip, was placed an upright ſhore, ſix inches by twelve, the lower end let two inches into the croſs piece. From the foot of this ſhore to the ſhip's ſide, under the end of every lower deck beam, was placed a diagonal ſhore ſix inches by twelve, to eaſe the ſhip's deck of part of the ſtrain by throwing it on the ſide. An upright ſhore of three inches by twelve was placed from the end of every croſs piece to the lower deck beams at the ſide, and one of three inches by twelve on the midſhip end of every croſs piece to the lower-deck beam, and nailed to the pillars in the hold. Two firm tight bulkheads or partitions were made as near the extremes of the ſhip as poſſible. The ceiling or inſide plank of the ſhip was very ſecurely caulked up to the lower deck, and the whole formed a complete ſhip with a flat bottom within ſide, to ſwim the outſide leaky one; and that bottom being depreſſed ſix feet below the external water, reſiſted the ſhip's weight above it equal to five hundred and eighty-one tons, and ſafely conveyed her to the dry-dock at Deptford."

SHIP-BUILDING.

Ship-building may be defined, The manner of conſtructing ſhips, or the work itſelf; as diſtinguiſhed from Naval Architecture, which may be conſidered as the theory or art of delineating ſhips on a plane. The latter was referred to this place, that we might avoid the impropriety of giving the theory and practice under different articles.

Part I. ART of DELINEATING SHIPS on a PLANE.

ALL edifices, whether civil or military, are known to be erected in consequence of certain established plans, which have been previously altered or improved till they have arrived at the desired point of perfection. The construction of ships appears also to require at least as much correctness and precision as the buildings which are founded upon *terra firma:* it is therefore absolutely necessary that the mechanical skill of the shipwright should be assisted by plans and sections, which have been drawn with all possible exactness, examined by proper calculations, and submitted to the most accurate scrutiny.

Naval architecture may be distinguished into three principal parts. 1. To give the ship such an exterior form as may be most suitable to the service for which she is designed. 2. To give the various pieces of a ship their proper figures; to assemble and unite them into a firm compact frame, so that by their combination and disposition they may form a solid fabric, sufficient to answer all the purposes for which it is intended. And, 3. To provide convenient accommodations for the officers and crew, as well as suitable apartments for the cargo, furniture, provisions, artillery, and ammunition.

The exterior figure of a ship may be divided into the bottom and upper works. The *bottom*, or quick-work, contains what is termed the *hold*, and which is under water when the ship is laden. The upper works, called also the dead work, comprehend that part which is usually above the water when the ship is laden. The figure of the bottom is therefore determined by the qualities which are necessary for the vessel, and conformable to the service for which she is proposed.

The limits of our design will not admit of a minute description and enumeration of all the pieces of timber which enter into the construction of a ship, nor of a particular description of their assemblage and union, or the manner in which they reciprocally contribute to the solidity of those floating citadels. It nevertheless appears necessary to give a general idea of the use, figure, and station of the principal pieces, to those who are entirely unacquainted with the subject. As our definitions will be greatly illustrated by the proper figures, we have annexed to this article a plate, which comprehends some of the most material draughts, as well as a representation of the principal pieces employed in naval architecture.

It is usual among shipwrights to delineate three several draughts. 1. The whole length of the ship is represented according to a side-view, perpendicular to the keel, and is termed the *plane of elevation*, or *sheer draught*. Plate 12. fig. 1. 2. The ship is exhibited according to an end view, and stripped of her planks, so as to present the outlines of the principal timbers; and this is properly termed the *plane of projection*, or the *vertical plane of the timbers*, (fig. 4.) because it shows the projection of their frames relatively to each other. 3. It is not sufficient to have the vertical curves of the bottom in different places, for a distinct idea of the horizontal curves is also equally necessary and useful: this is obtained by means of water-lines, traced upon what is called the *horizontal plane*, (fig. 2.) In this draught the curves of the transoms called the *round-aft* are also marked, and sometimes the breadth and thickness of the timbers.

The plane of elevation (fig. 1.) determines the length and depth of the keel; the difference of the draughts of water; the length and projection, or rake, of the stem and stern-post; the position of the mid-ship-frame upon the keel, together with that of the principal frames afore and abaft; the load-water line; the wales; the dimensions and situations of the gun-ports; the projection of the rails of the head and stern-gallery; with the stations of the masts and channels.

This draught, however, conveys no idea of the vertical curve of the ribs or timbers; for, as their projection will be only represented in a plane elevated upon the length of the keel, they will appear in this direction no otherwise than as straight lines. To perceive these curves accurately, they must be regarded in another point of view; which will represent their projection upon a vertical plane, supposed to cut the keel at right angles in the place where the ship is broadest. For, as all ships are broader near the middle of their length than towards the extremities, it is evident that the timbers are more extended in proportion. The most capacious of these represents what is called the *mid-ship frame*; and upon the area of this frame is delineated the projection of all the others.

Thus the plane of projection limits the different breadths of a ship in various points of her length, and exhibits the outline of the timbers respectively to each other as they are erected upon the keel. Accordingly, this draught ought to present a variety of sections of the ship in different places of her length, and always perpendicular to the surface of the water; so that the eye of the observer, when placed in what may be properly termed the *axis* of the ship, may perceive the several sections at one glance; that is to say, when looking full on the stem from before the ship, he shall discover the fore-timbers; and when looking from behind, directly on the stern, he shall perceive the form of the after-timbers. See in the Plate Stern, fig. 6. in which figure the sections of the inferior timbers are expressed by curved black lines drawn upon the area of the midship-frame, which is already described to be a plane elevated perpendicularly upon the keel at the extreme breadth of the vessel. See Midship-*Frame.*

To form a just idea of this plane, therefore, we ought to suppose a ship resting upon the stocks, in the same position as when afloat upon the water. Thus a variety of black vertical lines may be drawn at equal distances upon the bottom, which is white, to form different outlines of the ship corresponding to the timbers within. It is to be observed, that the fashion of the inferior timbers must conform to the figure of the midship-frame, which is placed in the fullest part of the ship; and as the planes of all the other timbers diminish in a certain progression as they approach the stem and stern, they are properly delineated on the plane of the midship-frame, which also represents the depth of the keel and length of the midship-beam.

As the two sides of a ship ought to be exactly alike, it is judged sufficient to represent the sections of the fore-part of the ship on the left side, and those in the after-part on the right side, so as to perceive all the sections, as well afore as abaft, upon one plane. See the Plate, fig. 4.

However necessary it may be to understand precisely the vertical curves of the bottom, it is no less requisite to have a just idea of those which are horizontal.

The horizontal or floor-plane is that upon which the whole frame is erected, and will be more clearly understood by previously describing the water-lines and ribands of which it is composed.

When a ship floats upon the stream, it is evident that her upper works will be separated from the bottom by the surface of the water, which will accordingly describe an imaginary horizontal line upon the bottom from the stem to the stern-post.

The most elevated of those lines is termed the *load water-line*, which is supposed to be drawn by the surface of the water on the upper part of the bottom, when she is sufficiently laden for a sea-voyage. For if we suppose this surface a rule, and thereby describe a corresponding black line along the vessel's bottom,

that line will be diſtinguiſhed upon the bottom, which is white, and repreſent what is called the *load water-line*.

If the ſhip is lightened of any part of her lading, and preſerves the ſame difference in her draught of water at the two ends; or, what is the ſame thing, if ſhe is lightened ſo as to preſerve the ſame equilibrium of the keel with regard to the ſurface of the water, it is evident that ſhe will riſe higher out of the water, ſo that the black line already deſcribed will be elevated above it; and another black line may be delineated upon the bottom, cloſe to the ſurface of the water, which will exhibit a ſecond water-line parallel to the firſt, but nearer the keel in proportion to the number of feet which the ſhip has riſen.

Thus by lightening a ſhip gradually, and at the ſame time preſerving the direction of her keel, or the angle which the keel makes with the ſurface of the water, a variety of water-lines may be drawn parallel to each other and to the load water-line. See a further illuſtration of theſe lines in the article WATER-LINE.

The ribands are likewiſe of great utility in ſhip building; they are narrow and flexible planks placed on the bottom at different heights, ſo as to form a ſort of mould for ſtationing the inferior timbers between the principal ones. They differ from the water-lines, inaſmuch as the latter have only one curve, which is horizontal; whereas the ribands, beſides their horizontal one, have a vertical curve. To convey a juſt idea of theſe curves, which cannot be repreſented on one draught at their full length, without an oblique ſection of the ſhip's length, it will be neceſſary to have recourſe to two planes; that of the elevation, which exhibits their vertical curve; and to the floor-plane, upon which the horizontal curve is expreſſed. See RIBAND, and TIMBER.

Theſe different lines are extremely uſeful in exhibiting the various curves of a ſhip's bottom, that, as they are gradually diminiſhed, their uniformity or irregularity may be diſcovered by the ſkilful artiſt.

The qualities required in a ſhip ought to determine the figure of the bottom. A ſhip of war, therefore, ſhould be able to ſail ſwiftly, and carry her lower tier of guns ſufficiently out of the water; otherwiſe a ſmall ſhip will have the advantage of a large one, inaſmuch as the latter cannot open her lower battery in a freſh ſide-wind without being expoſed to extreme danger by receiving a great quantity of water in at her ports between decks. A merchant-ſhip ought to contain a large cargo of merchant-goods, and be navigated with few hands: and both ſhould be able to carry ſail firmly; ſteer well; drive little to leeward; and ſuſtain the ſhocks of the ſea without being violently ſtrained.

The firſt thing to be eſtabliſhed in the draught of a ſhip is her length; and as a ſhip of war, according to her rate, is furniſhed with a certain number of cannon, which are placed in battery on her decks, it is neceſſary that a ſufficient diſtance ſhould be left between their ports to work the guns with facility; and particularly to leave ſpace enough between the foremoſt gun and the ſtem, and between the aftmoſt gun and the ſtern-poſt on each ſide, on account of the arching or inward curve of the ſhip toward her extremities.

When the length of a ſhip is determined, it is uſual to fix her breadth by the dimenſions of the midſhip-beam. On this occaſion the ſhipwrights, for the moſt part, are conducted by rules founded on their own obſervation; for, having remarked, that ſome veſſels, which by repeated experience have been found to anſwer all the purpoſes of navigation, have a certain breadth in proportion to their length, they have inferred that it would be improper to depart from this proportion: but as other ſhips have been conſtructed with different breadths, which were equally perfect, a variety of different general rules have been adopted by theſe artiſts; who are accordingly divided in their opinions about the breadth which ought to be aſſigned to a ſhip relatively with her length, whilſt each one produces reaſons and experience in ſupport of his own ſtandard. Thoſe who would diminiſh the breadth, allege, 1. That a narrow veſſel meets with leſs reſiſtance in paſſing through the water: 2dly, That by increaſing the length ſhe will drive leſs to leeward: 3dly, That, according to this principle, the water-lines will be more conveniently formed to divide the fluid: 4thly, That a long and narrow ſhip will require leſs ſail to advance ſwiftly; that her maſts will be lower, and her rigging lighter; and, by conſequence, the ſeamen leſs fatigued with managing the ſails, &c. Thoſe, on the contrary, who would enlarge the breadth, pretend, 1ſt, That this form is better fitted to preſerve a good battery of guns: 2dly, That there will be more room to work the guns conveniently: 3dly, That, by carrying more ſail, the ſhip will be enabled to run faſter; or, that this quality will at leaſt overbalance the advantage which the others have of more eaſily dividing the fluid: 4thly, That being broader at the load water-line, or place where the ſurface of the water deſcribes a line round the bottom, they will admit of being very narrow on the floor, particularly towards the extremities: And, 5thly, That a broad veſſel will more readily riſe upon the waves than a narrow one. From ſuch oppoſite principles has reſulted that variety of ſtandards adopted by different ſhipwrights.

It has been remarked above, that a ſhip of war muſt carry her lower tier of cannon high enough above the water, otherwiſe a great ſhip which cannot open her lower battery, when ſailing with a freſh ſide-wind, may be taken by a ſmall one that can make uſe of her cannon.

A ſhip ſhould be duly poiſed, ſo as not to dive or pitch heavily, but go ſmooth and eaſy through the water, riſing to the waves when they run high and the ſhip has reduced her ſail to the ſtorm; otherwiſe they will break aboard, and ſtrain the decks or carry away the boats; the maſts are likewiſe in great danger from the ſame cauſe.

A ſhip ſhould ſail well when large and before the wind, but chiefly cloſe hauled, or with a ſide-wind, and her ſails ſharp-trimmed, and then not fall off to the leeward.

Now, the great difficulty lies in uniting ſo many different qualities in one ſhip; which ſeems to be nearly impoſſible: the whole art, therefore, conſiſts in forming the body in ſuch a manner that none of theſe qualities ſhould be entirely deſtroyed, and in giving a preference to that which is chiefly required in the particular ſervice for which the veſſel is deſigned. We ſhall briefly ſhow the poſſibility of uniting them all in one ſhip, that each of them may be eaſily diſcerned: when it happens otherwiſe, the fault muſt lie in the builder, who has not applied himſelf to ſtudy the fundamental rules and principles of his art.

To make a ſhip carry a good ſail. A flat floor-timber, and ſomewhat long, or the lower futtock pretty round, a ſtraight upper futtock, the top-timber to throw the breadth out aloft; at any rate, to carry her main breadth as high as the lower deck. Now, if the rigging be well adapted to ſuch a body, and the upper works lightened as much as poſſible, ſo that they all concur to lower the centre of gravity, there will be no room to doubt of her carrying a good ſail.

To make a ſhip ſteer well, and anſwer the helm quickly. If the faſhion-pieces be well formed, the tuck, or ſpreading parts under the ſtern, carried pretty high, the midſhip-frame well forward, a conſiderable difference in the draught of water abaft more than afore, a great rake forward and none abaft, a ſnug quarter-deck and fore-caſtle; all theſe will make a ſhip ſteer well. A ſhip which ſails well will certainly ſteer well.

To make a ſhip carry her guns well out of the water. A long floor-timber, and not of great riſing; a very full midſhip-frame, and low tuck, with light upper works.

To make a ſhip go ſmoothly through the water without pitching hard. A long keel, a long floor, not to riſe too high afore and abaft; but the area or ſpace continued in the fore-body, ac-

cording to the refpective weights they are to carry; all thefe are neceffary to make a fhip go fmoothly through the water.

To make a fhip keep a good wind, and drive little to the leeward. A good length by the keel; not too broad, but pretty deep in the hold, which will occafion her to have a fhort floor-timber and a great rifing. As fuch a fhip will meet with great refiftance in the water going over the broadfide, and little when going ahead, fhe will not fall much to the leeward.

Now, fome builders imagine it is impoffible to make a fhip carry her guns well, bear a good fail, and be a prime failer; becaufe it would require a very full bottom to gain the firft two qualities, whereas a fharp fhip will anfwer better for the latter: but when it is confidered that a full fhip will carry a great deal more fail than a fharp one, a good artift may fo form the body, as to have all thefe three good qualities, and alfo fteer well.

We fhall now proceed to defcribe the principal pieces of which a fhip is compofed, and to explain the principal draughts ufed in the conftruction thereof.

As the feveral lines exhibited in the planes of elevation, projection, &c. will be rendered more intelligible by a previous account of thofe pieces, it may not be improper to begin with reciting their names, and giving a fummary defcription of their ufes and ftations. They are for the moft part reprefented according to the order of their difpofition in that part of Plate 12. which is termed *pieces of the hull.*

A. The pieces which compofe the keel, to be fecurely bolted together, and clinched. B. The ftern-poft, which is tenanted into the keel, and connected to it by a knee, G. It fupports the rudder, and unites the fides of the fhip abaft. C. The ftem, which is compofed of two pieces fcarfed together: it is an arching piece of timber, into which the fhip's fides are united forwards. D. The beams, which are ufed to fupport the decks, and confine the fides to their proper diftance. E. The falfe poft, which ferves to augment the breadth of the ftern-poft, being alfo tenanted into the keel. F. The knees which connect the beams to the fides. G. The knee of the ftern-poft, which unites it to the keel. H. The apron, in two pieces: it is fayed on the infide of the ftem, to fupport the fcarf thereof; for which reafon the fcarf of the former muft be at fome diftance from that of the latter. I. The ftemfon, in two pieces, to reinforce the fcarf of the apron. K. The wing-tranfom: it is fayed acrofs the ftem-poft, and bolted to the head of it, having its two ends let into the fafhion-pieces. L. The deck-tranfom, parallel to the wing-tranfom, and fecured in the fame manner. M N. The lower tranfoms. O. The fafhion-piece on one fide; the heel of it is connected with the dead-wood, and the head is fecured to the wing-tranfom. P. The top-timbers, or upper parts of the fafhion-pieces. Q. The knees, which fafhion the tranfoms to the fhip's fide. R. The breaft-hooks, in the hold; they are fayed acrofs the ftem, to ftrengthen the fore-part of the fhip. S. The breaft-hooks of the deck: they are placed immediately above the former, and ufed for the fame purpofes. T. The rudder, which is joined to the ftern-poft by hinges, and ferves to direct the fhip's courfe. U. The floor-timbers; they are laid acrofs the keel, to which they are firmly bolted. V. The lower futtocks, and, W. The top-timbers, which are all united to the floor-timbers, forming a frame that reaches from the keel to the top of the fide. X. The pieces which compofe the kelfon: they are fcarfed together like the keel-pieces, and placed over the middle of the floor-timbers, upon each of which they are fcored about an inch and a half, as exhibited by the notches. Y. The feveral pieces of the knee of the head; the lower part of which is fayed to the ftem; the heel being fcarfed to the fore-foot. Z. The cheeks of the head or knees, which connect the head to the bows on each fide. &. The ftandard of the head, which faftens it to the ftem. *a.* The cat-heads, one of which lies on each bow, projecting outwards like the arm of a crane. They are ufed to draw the anchors up to the top of the fide without injuring the bow. *b.* The bits, to which the cable is faftened when the fhip rides at anchor. *c.* The falfe poft, in two pieces, fayed to the forepart of the ftern poft. *d.* The fide-counter-timbers, which terminate the fhip abaft within the quarter-gallery. *e, e.* Two pieces of dead-wood, one afore and another abaft, fayed on the keel.

In veffels of war, the general dimenfions are eftablifhed by authority of officers appointed by the government to fuperintend the building of fhips. In the merchant-fervice, the extreme breadth, length of the keel, depth in the hold, height between decks and in the wafte, are agreed on by contract; and from thefe dimenfions the fhipwright is to form a draught fuitable to the trade for which the fhip is defigned.

In projecting the draught of a veffel of war, the firft article to be confidered is her length. As all fhips are much longer above than below, it is alfo neceffary to diftinguifh the precife part of her height from which her length is taken: this is ufually the lower gun-deck, or the load water-line. It has been already obferved, that water-lines are defcribed longitudinally on a fhip's bottom by the furface of the water in which fhe floats, and that the line which determines her depth under the water is ufually termed the load water-line. In this draught it will be particularly neceffary to leave fufficient diftance between the ports.

The next object is to eftablifh the breadth by the midfhip beam. Although there is great difference of opinion about proportioning the breadth to the length, yet it is moft ufual to conform to the dimenfions of fhips of the fame rate. After the dimenfions of the breadth and length are determined, the depth of the hold muft be fixed, which is generally half the breadth: but the form of the body fhould be confidered on this occafion; for a flat floor will require lefs depth in the hold than a fharp one. The diftance between the decks muft alfo be fettled.

We may then proceed to fix the length of the keel, by which we fhall be enabled to judge of the rake of the ftem and ftern-poft. The rake is known to be the projection of the fhip at the height of the ftem and ftern-poft beyond the ends of the keel afore and abaft, or the angle by which the length is increafed as the fabric rifes. To thefe we may alfo add the height of the ftem and wing-tranfom.

After thefe dimenfions are fettled, the timbers may be confidered which form the fides of the fhip. A frame of timbers, which appears to be one continued piece, is compofed of one floor-timber, U, whofe arms branch outward to both fides of the fhip; two or three futtocks, V V; and a top-timber, W. The futtocks are connected to the upper arms of the floor-timbers on each fide of the fhip, and ferve to prolong the timber in a vertical direction: and the top-timbers are placed at the upper part of the futtocks for the fame purpofe. All thefe being united, and fecured by crofs-bars, or a circular inclofure, which is called a frame of timbers. And as a fhip is much broader at the middle than at the extremities, the arms of the floor-timber will form a very obtufe angle at the extreme breadth: but this angle decreafes in proportion to the diftance of the timbers from the midfhip-frame, fo that the foremoft and aftmoft ones will form a very acute angle. Floor-timbers of the latter fort are ufually called *crutches.*

Shipwrights differ extremely in determining the ftation of the midfhip-frame; fome placing it at the middle of the fhip's length, and others further forward. They who place it before the middle allege, that if a fhip is full forwards, fhe will meet with no refiftance after fhe has opened a column of water; and that the water fo difplaced will eafily unite abaft, and by that means force the fhip forward; befides having more power on the rud-

der, in proportion to its diſtance from the centre of gravity: this alſo comes nearer the form of fiſhes, which ſhould ſeem the moſt advantageous for dividing the fluid.

When the riſing of the midſhip floor-timber is decided, we may then proceed to deſcribe the riſing-line of the floor, on the ſtern-poſt abaft, and on the ſtem afore.

The height of the lower-deck is the next thing to be conſidered: it is determined in the middle by the depth of the hold; and ſome builders make it no higher than the ſtem; but they raiſe it abaft as much above its height in the middle as the load water-mark, or draught of water abaft, exceeds that afore. With regard to the height between decks, it is altogether arbitrary, and muſt be determined by the rate of the ſhip and the ſervice ſhe is deſigned for.

It is alſo neceſſary to remember the ſheer of the wales, and to give them a proper hanging; becauſe the beauty and ſtatelineſs of a ſhip greatly depend upon their figure and curve, which, if properly drawn, will make her appear airy and graceful on the water.

We come now to conſider the upper works, and all that is above water, called the *dead-work*: and here the ſhip muſt be narrower, ſo that all the weight lying above the load water-line will thereby be brought nearer the middle of the breadth, and of courſe the ſhip will be leſs ſtrained by the working of her guns, &c. But although ſome advantages are acquired by diminiſhing the breadth, above water, we muſt be careful not to narrow her too much; as there muſt be ſufficient room left on the upper deck for the guns to recoil. The ſecurity of the maſts ſhould likewiſe be remembered, which requires ſufficient breadth to ſpread the ſhrouds. A deficiency of this ſort may indeed be in ſome meaſure ſupplied by enlarging the breadth of the channels.

We come to explain the ſheer-draught, or plane of ELEVATION of a ſixty-gun ſhip; wherein we have been attentive to make the ſame letters refer to the ſame objects, as in the explanation of the PIECES, as above; at leaſt when the ſame objects are in both figures.

A A, fig. 1. Is the keel, whoſe upper edge is prolonged by the dotted line *p q*, upon the extremities of which are erected perpendiculars which determine the height of the wing-tranſom K, and the length of the gun deck K C. A B, The ſtern-poſt. A C, The ſtem. D D, The quarter-gallery, with its windows. E F, The quarter pieces, which limit the ſtern on each ſide. F, The taffarel, or upper piece of the ſtern. F G, Profile of the ſtern, with its galleries. H, The gun-ports. I, The channels, with their dead eyes and chain-plates. K, The wing-tranſom. K G, The counter. L B, The deck-tranſom. M N O, The firſt, ſecond, and third tranſoms, of which O *k* is the third or loweſt. *m* O L P, The direction of the faſhion-piece, having its breadth canted aft towards the ſtern. Q R, The main ſkeeds, for hoiſting in the boats clear of the ſhip's ſide. L Q Z, The main-wale, with its ſheer afore and abaft. D R X, The channel-wales, parallel to the main-wale. S U S, The ſheer rail parallel to the wales. T *t*, The rudder. A t F, The rake of the ſtern. V W V, The waiſt-rail. P *i i*, The drift-rails abaft; and *i* a, the drift-rails forward. T U C, The water-line. X X, The rails of the head. Y, The knee of the head, or cutwater. Z Z, The cheeks of the head. a a, The cat head. M ⊕ C, The riſing line of the floor. *k u* C, The cutting down line, which limits the thickneſs of all the floor-timbers, and likewiſe the height of the dead wood afore and abaft. ⊕ *u* U W, The midſhip-frame. *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, The frames or timbers in the fore body of the ſhip, *i. e.* before the midſhip-frame. 1, 2, 3, 4, 5, 6, 7, 8, 9, The timbers in the after-body, or which are erected abaft the midſhip-frame.

As the eye of a ſpectator is ſuppoſed in this projection to view the ſhip's ſide in a line perpendicular to the plane of elevation, it is evident that the convexity will vaniſh, like that of a cylinder or globe, when viewed at a conſiderable diſtance; and that the frames will conſequently be repreſented by ſtraight lines, except the faſhion-piece abaft and the knuckle-timber forward.

It has been already obſerved, that the plane of projection may be defined a vertical delineation of the curves of the timbers upon the plane of the midſhip-frame, which is perpendicular to that of the elevation. It is neceſſary to obſerve here, that the various methods by which theſe curves are deſcribed, are equally mechanical and arbitrary. In the latter ſenſe, they are calculated to make a ſhip fuller or narrower, according to the ſervice for which ſhe is deſigned; and in the former they are drawn according to thoſe rules which the artiſt has been implicitly taught to follow, or which his fancy or judgment has eſteemed the moſt accurate and convenient. They are generally compoſed of ſeveral arches of a circle, reconciled together by moulds framed for that purpoſe. The radii of thoſe arches, therefore, are of different lengths, according to the breadth of the ſhip in the place where ſuch arches are ſwept; and they are expreſſed on the plane of projection either by horizontal or perpendicular lines: the radii of the breadth-ſweeps being always in the former, and the radii of the floor-ſweeps in the latter direction. Theſe two arches are joined by a third, which coincides with both, without interſecting either. The curve of the top timber is either formed by a mould which correſponds to the arch of the breadth-ſweep, or by another ſweep whoſe centre and radius are without the plane of projection. The breadth of the ſhip, at every top-timber, is limited by a horizontal line drawn on the floor-plane, called the *half-breadth of the top timbers*. The extreme breadth is alſo determined by another horizontal line on the floor-plane; and the lines of half-breadth are thus mutually transferable, from the projection and floor-planes, to each other.

The neceſſary data by which the curves of the timbers are delineated, then, are the perpendicular height from the keel; the main, or principal breadth; and the top-timber breadth: for as a ſhip is much broader near the middle of her length than towards the end, ſo ſhe is broader in the middle of her height than above and below; and this latter difference of breadth is continued throughout every point of her length. The main breadth of each frame of timbers is therefore the ſhip's breadth nearly in the middle of her height in that part: and the top-timber breadth is the line of her breadth near the upper ends of each timber. It has been already obſerved, that as both ſides of a ſhip are alike, the artificers only draw one ſide, from which both ſides of the ſhip are built: therefore the timbers abaft the midſhip-frame are exhibited on one ſide of the plane of projection, and the timbers before it on the other.

Plane of PROJECTION.

Fig. 4. A, The keel. B C, The line which expreſſes the upper edge of the keel, from which the height of each timber and height of its different breadths are meaſured. B D, and C E, Perpendiculars raiſed on the line B C, to limit the ſhip's extreme breadth and height amid-ſhips; or, in other words, to limit the breadth and height of the midſhip-frame. A F, A perpendicular erected from the middle of the keel to biſect the line of the ſhip's breadth in two equal parts. F * 9, The half-breadth line of the aftmoſt top-timber; being the uppermoſt horizontal line in this figure.

Note, The ſeven lines parallel to and immediately under this, on the right-ſide of the line A F, are all top timber half-breadths, abaft the midſhip frame; the loweſt of which coincides with the horizontal line D E.

The parallel horizontal lines nearly oppoſite to theſe, on the left ſide of the line A F, repreſent the top timber half-breadths in the fore body, or the half breadths of the top-timbers before the midſhip-frame.

G, H, I, Q, R, S, T, The radii of the breadth ſweeps abaft

the midſhip-frame; thoſe of the breadth-ſweeps in the fore-body, or before the midſhip-frame, are directly oppoſite on the right-ſide.

⊕ A ſhow the midſhip-frame, from the extreme breadth downwards.

1, 2, 3, 4, 5, 6, 7, 8, 9, The outlines of the timbers abaft the midſhip-frame, in different parts of their height. *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, The outlines of the timbers before the midſhip-frame, in different parts of their height, *h* being the foremoſt or knuckle-timber. K *i*, the wing-tranſom, whoſe ends reſt upon the faſhion piece. L, The deck-tranſom, parallel to and under the wing-tranſom. M N O, the lower tranſoms, of which O *k* is the third and loweſt. *m k* P, The dotted line, which expreſſes the figure of the faſhion-piece, without being canted aft. P, The upper-part, or top-timber of the faſhion-piece. *n*, *o*, *p*, *q*, *r*, *ſ*, The radii of the floor-ſweeps, abaft the midſhip-frame; thoſe before the midſhip-frame are on the oppoſite ſide of the line A F, to which they are all parallel.

1ſt R^d^, 2d R^d^, 3d R^d^, 4th R^d^, The diagonal ribands abaft the midſhips *t*, *u*, *x*, *y*. The ſame ribands expreſſed in the fore body.

It has been remarked above, that the horizontal plane is compoſed of water-lines and ribands; it alſo contains the main and top-timber-breadth lines, or the longitudinal lines by which the main-breadth and top-timber-breadth are limited in every point of the ſhip's length. The horizontal curve of the tranſoms and harpins are alſo repreſented therein; together with the planes of the principal timbers, the cant of the faſhion-piece, the length of the rake afore and abaft, the projection of the cat-heads, and the curve of the upper rail of the head, to which the curves of the lower ones are uſually parallel.

Horizontal Plane.

B A C, Fig. 2, The line of the ſhip's length, paſſing through the middle of the ſtem and ſtern-poſt. B, The upper-end of the ſtern-poſt. C, The upper end of the ſtem. B F, The length of the rake abaft. D W X, The top-timber-breadth line, or the line which limits the breadth of each top-timber.

D F, The breadth of the aftmoſt timber at the taffarel. B K, The wing-tranſom. B L P, The horizontal curve of the deck-tranſom. M M, The horizontal curve, or round aft, of the firſt tranſom. M N, The horizontal curve of the ſecond tranſom: it is prolonged into a water-line, N 8 7. *k* O, The horizontal curve of the third tranſom, which is alſo prolonged into another water-line, O, *n*, U, *p*, Q. *m* O P, The plane of the faſhion-piece, as canted aft. ⊕ W U, The plane of the midſhip-frame. *a*, *b*, *c*, *d*, *e*, *f*, *h*, The planes of the timbers before the midſhip-frame. 1, 2, 3, 4, 5, 6, 7, 8, 9, The planes of the timbers abaft the midſhip-frame. X X, The figure of the upper-rail of the head. C Y, The projection of the knee of the head.

The third horizontal riband is marked on the plate. a a, The projection of the cat-head.

Thus we have endeavoured briefly to explain the nature and uſes of the principal draughts uſed in the conſtruction of a ſhip, which reciprocally correſpond with each other in the dimenſions of length, breadth, and depth. Thus the plane of elevation is exactly of the ſame length with the horizontal or floor-plane. The ſeveral breadths of the timbers in the floor-plane, and that of the projection, are mutually transferable; and the real height of the timbers in the projection exactly conforms to their height in the elevation. Thus, let it be required to transfer the height of the wing-tranſom from the elevation to the projection:

Extend the compaſſes from the point K, in the elevation, down to the dotted line prolonged from the upper edge of the keel, and ſetting the other foot in the point *p*, then ſhall the line K *p* be the perpendicular height in the wing tranſom: transfer this from the middle of the line B A C, in the projection, to the point K in the perpendicular A F, then will A K be the height of the wing-tranſom in the plane of projection: and thus the height of all the tranſoms may be laid from the former upon the latter.

Again: Let it be required to transfer the main-breadth of the midſhip-frame from the projection to the horizontal plane: Set one foot of the compaſſes in the point ⊕ on the perpendicular C E, and extend the other along the main-breadth-ſweep ⊕ G, till it touches the perpendicular A F parallel to C E: lay this diſtance upon the horizontal plane from the point *u* in the line of the ſhip's length, B A C, along the plane of the midſhip-frame to the point ⊕; ſo ſhall the line ⊙ W U be the breadth of the midſhip-frame on the horizontal plane.

Thus alſo the top-timber-breadth, or the diſtance of each top-timber from the middle of the ſhip's breadth, may be in the ſame manner transferred, by extending the compaſſes from the line B A C, in the horizontal plane, to the top timber-breadth line, upon any particular timber, as 1, 2, 3, &c. which will give its proper dimenſions thereon.

In the ſame manner the breadths of all the timbers may be laid from the projection to the horizontal plane, and, *vice verſa*, from that to the projection. Thus the height of each timber may alſo be transferred from the elevation to the projection, &c.

The principal utility of theſe draughts, therefore, is to exhibit the various curves of the ſhip's body, and of the pieces of which it is framed, in different points of view, which are either tranſverſe or longitudinal, and will accordingly preſent them in very different directions. Thus the horizontal curves of the tranſoms and water-lines are repreſented on the floor-plane, all of which are nearly ſtraight lines in the elevation and projection; and thus the vertical curves of the timbers are all exhibited on the projection, although they appear as ſtraight lines in the elevation and floor-plane.

Part II. Of CONSTRUCTING SHIPS.

THE pieces by which this complicated machine, a ſhip, is framed, are joined together in various places by *ſcarfing*, *rabitting*, *tenanting*, and *ſcoring*. See thoſe articles.

During the conſtruction of a ſhip, ſhe is ſupported in the dock, or upon a wharf, by a number of ſolid blocks of timber placed at equal diſtances from, and parallel to, each other, as may be ſeen in the article Lanching; ſhe is then ſaid to be on the ſtocks.

The firſt piece of timber laid upon the blocks is generally the keel: we ſay *generally*, becauſe, of late, a different method has been adopted in ſome of the royal dock-yards, by beginning with the floor timbers; the artiſts having found that the keel is often apt to rot during the long period of building a large ſhip of war. The pieces of the keel are ſcarfed together, and bolted, forming one entire piece, A A, which conſtitutes the length of the veſſel below. At one extremity of the keel is erected the ſtem. It is a ſtrong piece of timber incurvated nearly into a circular arch, or, according to the technical term, *compaſſing*, ſo as to project outwards at the upper-end, forming what is called the *rake forward*. In ſmall veſſels this is framed of one piece; but in large ſhips it is compoſed of ſeveral pieces ſcarfed and bolted together, as expreſſed in the explanation of fig. 3. and in thoſe terms ſeparately. At the other extremity of the keel is elevated the ſtern-poſt, which is always of one

entire ſtraight piece. The heel of it is let into a mortiſe in the keel, and having its upper end to hang outwards, making an obtuſe angle with the keel, like that of the ſtem: this projection is called the *rake abaft*. The ſtern poſt, which ought to ſupport the ſtern, contains the iron-work, or hinges of the rudder, which are called *googings*, and unites the lower part of the ſhip's ſides abaft. See the connection of thoſe pieces in the *Elevation*, fig. 1.

Towards the upper-end of the ſtern-poſt, and at right angles with its length, is fixed the middle of the wing-tranſom, where it is firmly bolted. Under this is placed another piece parallel thereto, and called the *deck-tranſom*, upon which the after-end of the lower-deck is ſupported. Parallel to the deck tranſom, and at a proper diſtance under it, another piece is fixed to the ſtern-poſt, called the *firſt tranſom*; all of which ſerve to connect the ſtern-poſt to the faſhion-pieces. Two more tranſoms, called the *ſecond* and *third*, are alſo placed under theſe, being likewiſe attached to the faſhion pieces, into which the extremities of all the tranſoms are let. The faſhion-pieces are formed like the other timbers of the ſhip, and have their heels reſting on the upper-part of the kelſon, at the after-extremity of the floor-ribands.

All theſe pieces, viz. the tranſoms, the faſhion-pieces, and their top-timbers, being ſtrongly united into one frame, are elevated upon the ſtern-poſt; and the whole forms the ſtructure of the ſtern, upon which the galleries and windows, with their ornaments, are afterwards built.

The ſtem and ſtern-poſt being thus elevated upon the keel, to which they are ſecurely connected by knees and arched pieces of timber bolted to both; and the keel being raiſed at its two extremities by pieces of dead-wood, the midſhip floor-timber is placed acroſs the keel, whereto it is bolted through the middle. The floor-timbers before and abaft the midſhip-frame are then ſtationed in their proper places upon the keel; after which the kelſon, which, like the keel, is compoſed of ſeveral pieces ſcarfed together, is fixed acroſs the middle of the floor-timbers, to which it is attached by bolts driven through the keel, and clinched on the upper part of the kelſon. The futtocks are then raiſed upon the floor-timbers, and the hawſe-pieces erected upon the cant-timbers in the fore-part of the ſhip. The top-timbers on each ſide are next attached to the head of the futtocks, as already explained in Part I. The frames of the principal timbers being thus completed, are ſupported by ribands. See RIBANDS.

The ribs of the ſhip being now ſtationed, they proceed to fix on the planks, of which the wales are the principal, being much thicker and ſtronger than the reſt; as is repreſented in the MIDSHIP-*Frame*. The harpins, which may be conſidered as a continuation of the wales at their fore-ends, are fixed acroſs the hawſe-pieces, and ſurround the fore-part of the ſhip. The planks that incloſe the ſhip's ſides are then brought about the timbers; and the clamps, which are of equal thickneſs with the wales, fixed oppoſite to the wales within the ſhip: theſe are uſed to ſupport the ends of the beams, and accordingly ſtretch from one end of the ſhip to the other. The thick-ſtuff, or ſtrong planks of the bottom within-board, are then placed oppoſite to the ſeveral ſcarfs of the timbers, to reinforce them throughout the ſhip's length. The planks employed to line the ſhip, called the *ceiling*, or *foot-waling*, is next fixed in the intervals between the thick-ſtuff of the hold The beams are afterwards laid acroſs the ſhip to ſupport the decks, and are connected to the ſide by lodging and hanging knees; the former of which are exhibited in their proper ſtations in Plate 12. F; and the hanging ones, together with the breadth, thickneſs, and poſition of the keel, floor-timbers, futtocks, top-timbers, wales, clamps, thick-ſtuff, planks within and without, beams decks, &c. are ſeen in the MIDSHIP *Frame*.

The cable-bits being next erected, the *carlings* *, and *ledges* †, which are repreſented in Plate 12. are diſpoſed between the beams to ſtrengthen the deck. The water-ways are then laid on the ends of the beams throughout the ſhip's length, and the ſpirketting fixed cloſe above them. The upper deck is then planked, and the ſtring placed under the gunnel or planſheer in the waiſt. The diſpoſition of thoſe latter pieces on the timbers, viz. the water-ways, ſpirketting, upper-deck, ſtring, and gunnel, are alſo repreſented in the MIDSHIP-*Frame*.

They proceed next to plank the quarter-deck and forecaſtle, and to fix the partners of the maſts and capſterns with the coamings of the hatches. The breaſt-hooks are then bolted acroſs the ſtem and bow within board; the ſtep of the fore-maſt placed on the kelſon; and the riders, exhibited in the MIDSHIP-*Frame*, fayed on the inſide of the timbers to reinforce the ſides in different places of the ſhip's length. The pointers, if any, are afterwards fixed acroſs the hold diagonally to ſupport the beams; and the crotches ſtationed in the after-hold to unite the half-timbers. The ſteps of the main-maſt and capſterns are next placed; the planks of the lower-decks and orlop laid; the navel-hoods fayed on the hawſe-holes; and the knee of the head, or cutwater, connected to the ſtem. The figure of the head is then erected, and the trail-board and cheeks are fixed on the ſides of the knee.

The taffarel and quarter-pieces, which terminate the ſhip abaft, the former above and the latter on each ſide, are then diſpoſed; and the ſtern and quarter galleries framed and ſupported by their brackets. The pumps, with their well, are next fixed in the hold; the limber-boards laid on each ſide of the kelſon; and the garboard ſtrake fixed on the ſhip's bottom next to the keel without.

The hull being thus fabricated, they proceed to ſeparate the apartments by bulk-heads, or partitions; to frame the port-lids; to fix the cat-heads and cheſs-trees; to form the hatchways and ſcuttles, and fit them with proper covers or gratings. They next fix the ladders whereby to mount or deſcend the different hatchways; and build the manger on the lower deck, to carry off the water that runs in at the hawſe-holes when the ſhip rides at anchor in a ſea. The bread-room and magazines are then lined; and the gunnel, rails, and gangways, fixed on the upper part of the ſhip. The cleats, kevels, and ranges, by which the ropes are faſtened, are afterwards bolted or nailed to the ſides in different places.

The rudder, being fitted with its irons, is next hung to the ſtern-poſt; and the tiller, or bar, by which it is managed, let into a mortiſe at its upper-end. The ſcuppers, or leaden tubes, that carry the water off from the decks, are then placed in holes cut through the ſhip's ſides; and the ſtandards, repreſented in the MIDSHIP *Frame*, bolted to the beams and ſides above the decks to which they belong. The poop-lanthorns are laſt fixed upon their cranes over the ſtern; and the bilge-ways, or cradles, placed under the bottom, to conduct the ſhip ſteadily into the water whilſt launching.

As the various pieces which have been mentioned above, are explained at large in their proper places, it would have been ſuperfluous to have entered into a more particular deſcription of them here.

* Theſe are ſhort pieces of timber ranging fore and aft, from one of the deck-beams to another, into which their ends are ſcored: they are uſed to ſuſtain and fortify the ſmaller beams of the ſhip.

† Theſe are certain ſmall pieces of timber placed athwart-ſhips, under the decks of a ſhip, in the interval between the beams; as exhibited in the repreſentation of the deck, Plate 12.

Ship's *Form Gauge*, an inſtrument recommended by Mr. Hutchinſon as fit to aſcertain any alteration in the bottom of a ſhip, by its hogging or ſagging; and alſo to regulate the ſtowage of a ſhip. "All ſhips (ſays he) of any conſequence are built with ſtaunchions fixed from the kelſon to the middle of all the lower-deck beams fore and aft, in order to ſupport them in their exact, regular height, as well as the whole frame of the ſhip in the regular form in which ſhe was built upon the ſtocks; yet notwithſtanding theſe ſtaunchions, it is proved from experience that our ſhips' bottoms, hitherto, by the preſſure of water, and improper ſtowage, have generally been hogged upwards, or ſagged downwards, and moſt about the midſhip frame or main body of the ſhip, which is commonly about the fore part of the main hatchway; which naturally makes it the beſt place at which to fix the ſhip's form gauge, where either the hogging or ſagging of her bottom may be obſerved and ſeen ſooneſt and beſt, to regulate the ſtowage of heavy materials to the greateſt advantage, ſo as to keep her bottom nearly in the ſame form in which ſhe was built. The gauge I recommend is nothing more than a narrow plate of iron divided into inches and quarters like the ſlide of a carpenter's rule. Let this be fixed to the after-ſide of the ſtaunchion now mentioned, with its upper end projecting two or three inches above the ſtaunchion; a groove being cut out for it in the after ſide of the lower-deck beam, and a mark being made (when the ſhip is on the ſtocks) at the part of the beam which correſponds to the o on the gauge. When the ſhip alters in her ſhape, the gauge will ſlide up and down in this groove, and the quantity of hogging or ſagging will be pointed out on the gauge by the mark on the beam. The ſtowage may then be ſo managed as to bring this mark to coincide again with the o, or to approach it as near as we ſee neceſſary."

Ship-*Money*, was an impoſition charged upon the ports, towns, cities, boroughs, and counties of this realm, in the reign of king Charles I. by writs, commonly called *ſhip-writs*, under the great ſeal of England, in the years 1635 and 1636, for the providing and furniſhing of certain ſhips for the king's ſervice, &c. which was declared to be contrary to the laws and ſtatutes of this realm, the *petition of right* and liberty of the ſubject, by ſtat. 17 Car. I. c. 14. See *Blackſtone's Commentaries*, vol. iv. p. 30.

Ship-*Shape*, according to the faſhion of a ſhip, or in the manner of an expert ſailor; as, The maſt is not rigged ſhip-ſhape; Trim your ſails ſhip-ſhape.

Stowing and Trimming of Ships, the method of diſpoſing of the cargo in a proper and judicious manner in the hold of a ſhip. A ſhip's ſailing, ſteering, ſtaying, and wearing, and being lively and comparatively eaſy at ſea in a ſtorm, depends greatly on the cargo, ballaſt, or other materials, being properly ſtowed, according to their weight and bulk, and the proportional dimenſions of the built of the ſhip, which may be made too crank or too ſtiff to paſs on the ocean with ſafety. Theſe things render this branch of knowledge of ſuch conſequence, that rules for it ought to be endeavoured after, if but to prevent, as much as poſſible, the danger of a ſhip overſetting at ſea, or being ſo labourſome as to roll away her maſts, &c. by being improperly ſtowed, which is often the caſe.

When a ſhip is new, it is prudent to conſult the builder, who may be ſuppoſed beſt acquainted with a ſhip of his own planning, and moſt likely to judge what her properties will be, to adviſe how the cargo or materials, according to the nature of them, ought to be diſpoſed of to advantage, ſo as to put her in the beſt ſailing trim; and at every favourable opportunity afterwards it will be proper to endeavour to find out her beſt trim by experiment.

Ships muſt differ in their form and proportional dimenſions; and to make them anſwer their different purpoſes, they will require different management in the ſtowage, which ought not to be left to mere chance, or done at random, as goods or materials happen to come to hand, which is too often the cauſe that ſuch improper ſtowage makes ſhips unfit for ſea: therefore the ſtowage ſhould be conſidered, planned, and contrived, according to the built and properties of the ſhip, which if they are not known ſhould be inquired after. If ſhe is narrow and high built in proportion, ſo that ſhe will not ſhift herſelf without a great weight in the hold, it is a certain ſign ſuch a ſhip will require a great part of heavy goods, ballaſt, or materials, laid low in the hold, to make her ſtiff enough to bear ſufficient ſail without being in danger of overſetting. But if a ſhip be built broad and low in proportion, ſo that ſhe is ſtiff and will ſupport herſelf without any weight in the hold, ſuch a ſhip will require heavy goods, ballaſt, or materials, ſtowed higher up, to prevent her from being too ſtiff and labourſome at ſea, ſo as to endanger her maſts being rolled away, and the hull worked looſe and made leaky.

In order to help a ſhip's ſailing, that ſhe ſhould be lively and eaſy in her pitching and aſcending motions, it ſhould be contrived by the ſtowage, that the principal and weightieſt part of the cargo or materials ſhould lie as near the main body of the ſhip, and as far from the extreme ends, fore and aft, as things will admit of. For it ſhould be conſidered, that the roomy part of our ſhips lengthwiſe forms a ſweep or curve near four times as long as they are broad; therefore thoſe roomy parts at and above the water's edge, which are made by a full harping and a broad tranſom to ſupport the ſhip ſteady and keep her from plunging into the ſea, and alſo by the entrance and run of the ſhip having little or no bearing body under for the preſſure of the water to ſupport them, of courſe ſhould not be ſtowed with heavy goods or materials, but all the neceſſary vacancies, broken ſtowage, or light goods, ſhould be at theſe extreme ends fore and aft; and in proportion as they are kept lighter by the ſtowage, the ſhip will be more lively to fall and riſe eaſy in great ſeas; and this will contribute greatly to her working and ſailing, and to prevent her from ſtraining and hogging; for which reaſon it is a wrong practice to leave ſuch a large vacancy in the main hatchway, as is uſual, to coil and work the cables, which ought to be in the fore or after hatchway, that the principal weight may be more eaſily ſtowed in the main body of the ſhip, above the flatteſt and loweſt floorings, where the preſſure of the water acts the more to ſupport it.

Machine for meaſuring a Ship's *Way*. We have already deſcribed a variety of machines or inſtruments which have been propoſed for this purpoſe under the article Log. In this place, therefore, we ſhall confine ourſelves to the machine invented by Francis Hopkinſon, eſq. judge of the admiralty in Pennſylvania.—After having ſhown the fallacies to which the common log, and alſo that particular kind of inſtrument invented by M. Saumarez, are liable, he proceeds to deſcribe his own machine as follows:

This machine, in its moſt ſimple form, is repreſented by fig. 5. in Plate 11. wherein A B is a ſtrong rod of iron moveable on the fulcrum C. D is a thin circular palate of braſs riveted to the lower extremity of the rod. E a horizontal arm connected at one end with the top of the rod AB by a moveable joint F, and at the other end with the bottom of the index H, by a like moveable joint G. H is the index turning on its centre I, and travelling over the graduated arch K; and L is a ſtrong ſpring, bearing againſt the rod AB, and conſtantly counteracting the preſſure upon the palate D. The rod AB ſhould be applied cloſe to the cut-water or ſtem, and ſhould be of ſuch a length that the palate D may be no higher above the keel than is neceſſary to ſecure it from injury when the veſſel is aground, or ſails in ſhoal water. As the bow of the ſhip curves inward towards the keel M, the palate D will be thrown to a diſtance from the bottom of the veſſel, although the perpendicular rod to

which it is annexed lies close to the bow above; and therefore the palate will be more fairly acted upon. The arm E should enter the bow somewhere near the hawse-hole, and lead to any convenient place in the forecastle, where a smooth board or plate may be fixed, having the index H, and graduated arch K, upon it.

It is evident from the figure, that as the ship is urged forward by the wind, the palate D will be pressed upon by the resisting medium, with a greater or less force, according to the progressive motion of the ship; and this will operate upon the levers so as to immediately affect the index, making the least increase or diminution of the ship's way visible on the graduated arch; the spring L always counteracting the pressure upon the palate, and bringing back the index, or any relaxation of the force impressed.

This machine is advantageously placed at the bow of the ship, where the current first begins, and acts fairly upon the palate, in preference to the stern, where the tumultuous closing of the waters causes a wake, visible to a great distance. The palate D is sunk nearly as low as the keel, that it may not be influenced by the heaping up of the water and the dashing of the waves at and near the water line. The arch K is to ascertain how many knots or miles she would run in one hour at her then rate of sailing. But the graduations on this arch must be unequal; because the resistance of the spring L will increase as it becomes more bent, so that the index will travel over a greater space from one to five miles than from five to twelve. Lastly, the palate, rod, spring, and all the metallic parts of the instrument, should be covered with a strong varnish, to prevent rust from the corrosive quality of the salt water and sea air.

This machine may be considerably improved as follows: Let the rod or spear A B (fig. 5.) be a round rod of iron or steel, and instead of moving on the fulcrum or joint, as at C, let it pass through and turn freely in a socket, to which socket the moveable joint must be annexed, as represented in fig. 6. The rod must have a shoulder to bear on the upper edge of the socket, to prevent its slipping quite down. The rod must also pass through a like socket at F, fig. 5. The joint of the lower socket must be fixed to the bow of the ship, and the upper joint or socket must be connected with the horizontal arm E. On the top of the uppermost socket let there be a small circular plate, bearing the 32 points of the mariner's compass; and let the top of the rod A B come through the centre of this plate, so as to carry a small index upon it, as is represented in fig. 7. This small index must be fixed to the top of the rod on a square, so that, by turning the index round the plate, the rod may also turn in the sockets, and of course carry the palate D round with it; the little index always pointing in a direction with the face of the palate. The small compass plate should not be fastened to the top of the socket, but only fitted tightly on, that it may be moveable at pleasure. Suppose then the intended port to bear S. W. from the place of departure, the palate must be turned on the socket till the south-west point thereon looks directly to the ship's bow; so that the south-west and north-east line on the compass plate may be precisely parallel with the ship's keel, and in this position the plate must remain during the whole voyage. Suppose, then, the ship to be sailing in the direct course of her intended voyage, with her bowsprit pointing south-west. Let the little index be brought to the south-west point on the compass plate, and the palate D will necessarily present its broad face toward the port of destination; and this it must always be made to do, be the ship's course what it may. If, on account of unfavourable winds, the ship is obliged to deviate from her intended course, the little index must be moved so many points from the south-west line of the compass plate as the compass in the binnacle shall show that she deviates from her true course; so that, in whatever direction the ship shall sail, the palate D will always look full to the south west point of the horizon, or towards the port of destination, and consequently will present only an oblique surface to the resisting medium, more or less oblique as the ship deviates more or less from the true course of her voyage. As, therefore, the resistance of the water will operate less upon the palate in an oblique than in a direct position, in exact proportion to its obliquity, the index H will not show how many knots the vessel runs in her then course, but will indicate how many she gains in the direct line of her intended voyage.—Thus, in fig. 9. if the ship's course lies in the direction of the line A B, but she can sail by the wind no nearer than A C; suppose, then, her progressive motion such as to perform A C equal to five knots or miles in an hour, yet, the index H will only point to four knots on the graduated arch, because she gains no more than at that rate on the true line of her voyage, viz. from A to B. Thus will the difference between her real motion and that pointed out by the index be always in proportion to her deviation from her intended port, until she sails in a line at right angles therewith, as A D; in which case the palate would present only a thin sharp edge to the resisting medium, the pressure of which should not be sufficient to overcome the friction of the machine and the bearing of the spring L. So that at whatever rate the ship may sail on that line, yet the index will not be affected, showing that she gains nothing on her true course. In this case, and also when the vessel is not under way, the action of the spring L should cause the index to point at O, as represented by the dotted lines in fig. 5. and 8.

As the truth of this instrument must depend on the equal pressure of the resisting medium upon the palate D, according to the ship's velocity, and the proportionable action of the spring L, there should be a pin or screw at the joints C and F, so that the rod may be readily unshipped and taken in, in order to clean the palate from any foulness it may contract, which would greatly increase its operation on the index H, and thereby render the graduated arch false and uncertain.

Further, the spring L may be exposed too much to injury from the salt water, if fixed on the outside of the ship's bow. To remedy this, it may be brought under cover, by constructing the machine as represented by fig. 8. where A B is the rod, C the fulcrum or centre of its motion, D the palate, E the horizontal arm leading through a small hole into the forecastle; M is a strong chain fastened at one end to the arm E, and at the other to a rim or barrel on the wheel G, which by means of its teeth gives motion to the semicircle I and index H. The spring L is spiral, and enclosed in a box or barrel, like the main spring of a watch. A small chain is fixed to, and, passing round the barrel, is fastened by the other end to the fuzee W. This fuzee is connected by its teeth with the wheel G, and counteracts the motion of the palate D. N, N, are the two sockets through which the rod A B passes, and in which it is turned round by means of the little index R. S is the small compass plate, moveable on the top of the upper socket N. The plate S hath an upright rim round its edge, cut into teeth or notches, so that when the index R is a little raised up, in order to bring it round to any intended point, it may fall into one of these notches, and be detained there; otherwise the pressure of the water will force the palate D from its oblique position, and turn the rod and index round to the direction in which the ship shall be then sailing.—Should it be apprehended that the palate D, being placed so far forward, may affect the ship's steerage, or obstruct her rate of sailing, it should be considered that a very small plate will be sufficient to work the machine, as one of three or four inches in diameter would probably be sufficient, and yet not large enough to have any sensible effect on the helm or ship's way.

The greatest difficulty, perhaps, will be in graduating the arch K, (if the machine is constructed as in fig. 5.); the unequal divisions of which can only be ascertained by actual exper

riment on board of each ſhip reſpectively, inaſmuch as the accuracy of theſe graduations will depend on three circumſtances, viz. the poſition of the fulcrum C with reſpect to the length of the rod, the ſize of the palate D, and the ſtrength or bearing of the ſpring L. When theſe graduations, however, are once aſcertained for the machine on board of any one veſſel, they will not want any future alterations, provided the palate D be kept clean, and the ſpring L retains its elaſticity.

But the unequal diviſions of the graduated arch will be unneceſſary, if the machine is conſtructed as in fig. 8: for, as the chain goes round the barrel L, and then winds through the ſpiral channel of the fuzee W, the force of the main ſpring muſt operate equally, or nearly ſo, in all poſitions of the index, and conſequently the diviſions of the arch K may in ſuch caſe be equal.

After all, it is not expected that a ſhip's longitude can be determined to a mathematical certainty by this inſtrument. The irregular motions and impulſes to which a ſhip is continually expoſed, make ſuch an accuracy unattainable perhaps by any machinery. But if it ſhould be found, as we flatter ourſelves it will on fair experiment, that it anſwers the purpoſe much better than the common log, it may be conſidered as an acquiſition to the art of navigation.

It ſhould be obſerved, that in aſcertaining a ſhip's longitude by a time piece, this great inconvenience occurs, that a ſmall and trifling miſtake in the time makes a very great and dangerous error in the diſtance run: whereas the errors of this machine will operate no further than their real amount; which can never be great or dangerous, if corrected by the uſual obſervations made by mariners for correcting the common log.

A like machine, made in its ſimple form (as at fig. 5.), ſo conſtructed as to ſhip and unſhip, might occaſionally be applied alongſide about midſhips, in order to aſcertain the leeway; which, if rightly ſhown, will give the ſhip's preciſe longitude. As to ſea currents, this and all other machines hitherto invented muſt be ſubject to their influence: and proper allowances muſt be made according to the ſkill and knowledge of the navigator.

Laſtly, ſome diſcretion will be neceſſary in taking obſervations from the machine to be entered on the log-book: that is, the moſt favourable and equitable moment ſhould be choſen for the obſervation; not whilſt the ſhip is rapidly deſcending the declivity of a wave, or is ſuddenly checked by a ſtroke of the ſea, or is in the very act of plunging. In all caſes, periods may be found in which a ſhip proceeds with a true average velocity; to diſcover which, a little experience and attention will lead the ſkilful mariner.

SHIRAUZ. See Schiras.

SHIRE, is a Saxon word ſignifying a diviſion; but a county, *comitatus*, of the ſame import, is plainly derived from *comes*, "the count of the Franks;" that is, the earl or alderman (as the Saxons called him) of the ſhire, to whom the government of it was entruſted. This he uſually exerciſed by his deputy, ſtill called in Latin *vice-comes*, and in Engliſh the *ſheriff*, *ſhrieve* or *ſhire reeve*, ſignifying the "officer of the ſhire;" upon whom, in proceſs of time, the civil adminiſtration of it totally devolved. In ſome counties there is an intermediate diviſion between the ſhire and the hundred; as lathes in Kent and rapes in Suſſex, each of them containing about three or four hundreds apiece. Theſe had formerly their lathe-reeves and rape-reeves, acting in ſubordination to the ſhire-reeve. Where a county is divided into three of theſe intermediate juriſdictions, they are called *tri-things*, which were anciently governed by a trithing reeve. Theſe trithings ſtill ſubſiſt in the large county of York, where, by an eaſy corruption, they are denominated *ridings*; the north, the eaſt, and the weſt riding.

SHIRL, or Cockle, in mineralogy. See Cockle.

SHIRT, a looſe garment, commonly of linen, worn next the body.—Some doubt the propriety of changing the linen when a perſon is ſick. Clean linen promotes perſpiration; and it may be renewed as often as the patient pleaſes, whether the diſorder be of the acute or the chronical kind. Except during a criſis in fevers, whilſt the patient is in a ſweat, a change of linen, if well dried and warmed, may be daily uſed. Shirts were not worn by Jews, Greeks, or Romans, but their place was ſupplied by thin *tunicæ* of wool. The want of linen among the ancients made frequent waſhings and ablutions neceſſary.

SHIVER. See Schistus and Shale.

SHIVERS, in the ſea language, names given to the little rollers or round wheels of pulleys.

SHOAD, among miners, denotes a train of metalline ſtones, ſerving to direct them in the diſcovery of mines.

Shoad-*Stones*, a term uſed by the miners of Cornwall and other parts of this kingdom, to expreſs ſuch looſe maſſes of ſtone as are uſually found about the entrances into mines, ſometimes running in a ſtraight courſe from the load or vein of ore to the ſurface of the earth. Theſe are ſtones of the common kinds, appearing to have been pieces broken from the ſtrata or larger maſſes; but they uſually contain mundic, or marcaſitic matter, and more or leſs of the ore to be found in the mine. They appear to have been at ſome time rolled about in water, their corners being broken off, and their ſurface ſmoothed and rounded.

The antimony mines in Cornwall are always eaſily diſcovered by the ſhoad-ſtones, theſe uſually lying up to the ſurface, or very nearly ſo; and the matter of the ſtone being a white ſpar, or debaſed cryſtal, in which the native colour of the ore, which is a ſhining blueiſh black, eaſily diſcovers itſelf in ſtreaks and threads.

Shoad-ſtones are of ſo many kinds, and of ſuch various appearances, that it is not eaſy to deſcribe or know them: but the miners, to whom they are of greateſt uſe in the tracing or ſearching after new mines, diſtinguiſh them from other ſtones by their weight; for, if very ponderous, though they look ever ſo much like common ſtones, there is great reaſon to ſuſpect that they contain ſome metal. Another mark of them is their being ſpongy and porous; this is a ſign of eſpecial uſe in the tin-countries; for the tin ſhoad-ſtones are often ſo porous and ſpongy, that they reſemble large bodies thoroughly calcined. There are many other appearances of tin ſhoads, the very hardeſt and firmeſt ſtones often containing this metal.

When the miners, in tracing a ſhoad up hill, meet with ſuch odd ſtones and earths that they know not well what to make of them, they have recourſe to vanning, that is, they calcine and powder the ſtone, clay, or whatever elſe is ſuppoſed to contain the metal; and then waſhing it in an inſtrument, prepared for that purpoſe, and called a *vanning ſhovel*, they find the earthy matter waſhed away, and of the remainder, the ſtony or gravelly matter lies behind, and the metalline matter at the point of the ſhovel. If the perſon who performs this operation has any judgment, he eaſily diſcovers not only what the metal is that is contained in the ſhoad, but alſo will make a very probable gueſs at what quantity the mine is likely to yield of it in proportion to the ore.

SHOAL, in the ſea-language, denotes a place where the water is ſhallow; and likewiſe a great quantity of fiſhes, ſuch as a *ſhoal of herrings*.

SHOCK, in electricity. The effect of the exploſion of a charged body, that is, the diſcharge of its electricity on any other body, is called the *electric ſhock*.

SHOE, a covering for the foot, uſually of leather.

Shoes, among the Jews, were made of leather, linen, ruſh, or wood; thoſe of ſoldiers were ſometimes of braſs or iron. They were tied with thongs which paſſed under the ſoles of the feet. To put off their ſhoes was an act of veneration; it was alſo a ſign of mourning and humiliation: to bear one's ſhoes, or to untie the latchets of them, was conſidered as the meaneſt ſervice.

Among the Greeks ſhoes of various kinds were uſed. Sandals were worn by women of diſtinction. The Lacedemonians wore red ſhoes. The Grecian ſhoes generally reached to the middle of the leg. The Romans uſed two kinds of ſhoes; the *calceus*, which covered the whole foot ſomewhat like our ſhoes, and was tied above with latchets or ſtrings; and the *ſolea* or ſlipper, which covered only the ſole of the foot, and was faſtened with leathern thongs. The calceus was always worn along with the *toga* when a perſon went abroad: ſlippers were put on during a journey and at feaſts, but it was reckoned effeminate to appear in public with them. Black ſhoes were worn by the citizens of ordinary rank, and white ones by the women. Red ſhoes were ſometimes worn by the ladies, and purple ones by the coxcombs of the other ſex. Red ſhoes were put on by the chief magiſtrates of Rome on days of ceremony and triumphs. The ſhoes of ſenators, patricians, and their children, had a creſcent upon them which ſerved for a buckle; theſe were called *calcei lunati*. Slaves wore no ſhoes; hence they were called *cretoti* from their duſty feet. Phocion alſo and Cato Uticenſis went without ſhoes. The toes of the Roman ſhoes were turned up in the point; hence they were called *calcei roſtrati*, *repandi*, &c.

In the 9th and 10th centuries the greateſt princes of Europe wore wooden ſhoes, or the upper part of leather and the ſole of wood. In the reign of William Rufus, a great beau, Robert, ſurnamed *the horned*, uſed ſhoes with long ſharp points, ſtuffed with tow, and twiſted like a ram's horn. It is ſaid the clergy, being highly offended, declaimed againſt the long-pointed ſhoes with great vehemence. The points, however, continued to increaſe till, in the reign of Richard II. they were of ſo enormous a length that they were tied to the knees with chains ſometimes of gold, ſometimes of ſilver. The upper parts of theſe ſhoes in Chaucer's time were cut in imitation of a church window. The long-pointed ſhoes were called *crackowes*, and continued in faſhion for three centuries in ſpite of the bulls of popes, the decrees of councils, and the declamations of the clergy. At length the parliament of England interpoſed by an act A.D. 1463, prohibiting the uſe of ſhoes or boots with pikes exceeding two inches in length, and prohibiting all ſhoemakers from making ſhoes or boots with longer pikes under ſevere penalties. But even this was not ſufficient: it was neceſſary to denounce the dreadful ſentence of excommunication againſt all who wore ſhoes or boots with points longer than two inches. The preſent faſhion of ſhoes was introduced in 1633, but the buckle was not uſed till 1670.

In Norway they uſe ſhoes of a particular conſtruction, conſiſting of two pieces, and without heels; in which the upper leather fits cloſe to the foot, the ſole being joined to it by many plates or folds.

The ſhoes or ſlippers of the Japaneſe, as we are informed by Profeſſor Thunberg, are made of rice-ſtraw woven, but ſometimes for people of diſtinction of fine ſlips of ratan. The ſhoe conſiſts of a ſole, without upper leather or hind-piece; forwards it is croſſed by a ſtrap, of the thickneſs of one's finger, which is lined with linen; from the tip of the ſhoe to the ſtrap a cylindrical ſtring is carried, which paſſes betweeen the great and ſecond toe, and keeps the ſhoe faſt on the foot. As theſe ſhoes have no hind-piece, they make a noiſe, when people walk in them, like ſlippers. When the Japaneſe travel, their ſhoes are furniſhed with three ſtrings made of twiſted ſtraw, with which they are tied to the legs and feet, to prevent them from falling off. Some people carry one or more pairs of ſhoes with them on their journeys, in order to put on new when the old ones are worn out. When it rains, or the roads are very dirty, theſe ſhoes are ſoon wetted through, and one continually ſees a great number of worn out ſhoes lying on the roads, eſpecially near the brooks, where travellers have changed their ſhoes after waſhing their feet. Inſtead of theſe, in rainy or dirty weather they wore high wooden clogs, which underneath are hollowed out in the middle, and at top have a band acroſs like a ſtirrup, and a ſtring for the great toe; ſo that they can walk without ſoiling their feet. Some of them have their ſtraw ſhoes faſtened to theſe wooden clogs. The Japaneſe never enter their houſes with their ſhoes on; but leave them in the entry, or place them on the bench near the door, and thus are always barefooted in their houſes, ſo as not to dirty their neat mats. During the time that the Dutch live at Japan, when they are ſometimes under an obligation of paying viſits at the houſes of the Japaneſe, their own rooms at the factory being likewiſe covered with mats of this kind, they wear, inſtead of the uſual ſhoes, red, green, or black ſlippers, which on entering the houſe they pull off: however, they have ſtockings on, and ſhoes made of cotton ſtuff with buckles in them, which ſhoes are made at Japan, and can be waſhed whenever they are dirty. Some have them of black ſatin, in order to avoid waſhing them.

SHOE *of an Anchor*, a ſmall block of wood, convex on the back, and having a ſmall hole, ſufficient to contain the point of the anchor fluke, on the foreſide. It is uſed to prevent the anchor from tearing or wounding the planks on the ſhip's bow, when aſcending or deſcending; for which purpoſe the ſhoe ſlides up and down along the bow between the fluke of the anchor and the planks, as being preſſed cloſe to the latter by the weight of the former.

To SHOE *an Anchor*, is to cover the flukes with a broad triangular piece of plank, whoſe area or ſuperficies is much larger than that of the flukes. It is intended to give the anchor a ſtronger and ſurer hold of the bottom in very ſoft and oozy ground.

Horſe-SHOE. See FARRIERY.

SHOOTING, in the military art. See ARTILLERY, GUNNERY, and PROJECTILES.

SHOOTING, in ſportſmanſhip, the killing of game by the gun, with or without the help of dogs.

Under this article we ſhall lay down all the rules which are neceſſary to be obſerved in order to render one accompliſhed and ſucceſsful in the art of ſhooting.

The firſt thing which the ſportſman ought to attend to is the choice of his fowling-piece. Conveniency requires that the barrel be as light as poſſible, at the ſame time it ought to poſſeſs that degree of ſtrength which will make it not liable to burſt. Experience has proved, that a thin and light barrel, which is of equal thickneſs in every part of its circumference, is much leſs liable to burſt than one which is conſiderably thicker and heavier, but which, from being badly filed or bored, is of unequal ſtrength in different places.

It is alſo of importance to determine of what length the barrel ought to be, in order to acquire that range which the ſportſman has occaſion for. On this ſubject we have received the following information from an experienced ſportſman. We have, at different times, compared barrels of all the intermediate lengths between 28 and 40 inches, and of nearly the ſame caliber, that is to ſay, from 22 to 26; and theſe trials were made both by firing the pieces from the ſhoulder, and from a firm block, at an equal diſtance, and with equal weights of the ſame powder and of the ſame ſhot.

To avoid every poſſibility of error, the quires of paper at which we fired were fixed againſt planks inſtead of being placed againſt the wall. From theſe trials frequently repeated, we found that the ſhot pierced an equal number of ſheets, whether it was fired from a barrel of 28, 30, 32, 34, 36, 38, or 40, inches in length. Nay more, we have compared two barrels of the ſame caliber, but one of them 33, and the other 66 inches long, by repeatedly firing them in the ſame manner as the others, at different diſtances, from 45 to 100 paces, and the reſults have always been the ſame, *i. e.* the barrel of 33 inches drove its ſhot through as many ſheets of paper as that of 66 did. The concluſion from all this is, that the difference of 10 inches in the

length of the barrel, which ſeems to be more than is ever inſiſted upon among ſportſmen, produces no ſenſible difference in the range of the piece; and therefore, that every one may pleaſe himſelf in the length of his barrel, without either detriment or advantage to the range.

It may appear as an objection to this, that a duck-gun which is five or ſix feet long kills at a greater diſtance than a fowling-piece; but this is not owing to its length, but to its greater weight and thickneſs, which give it ſuch additional ſtrength, that the ſhot may be increaſed, and the charge of powder doubled, trebled, and even quadrupled. But a barrel of five or ſix feet length would be very inconvenient for fowling. Thoſe who conſult the appearanne of the piece, lightneſs, and the eaſe with which it is managed, will find that a barrel from 32 to 38 inches will anſwer beſt.

The next thing to be conſidered is, of what dimenſions the caliber or bore of a fowling-piece ought to be. This matter has been ſubjected to experiment, and it has been found, that a barrel of 22 or 24, which is the largeſt caliber uſually employed in fowling pieces, throws its ſhot as cloſely as one of the ſmalleſt caliber, viz. of 30 or 32.*

As to the length and form of the ſtock, it may be laid down as a principle, that a long ſtock is preferable to a ſhort one, and at the ſame time rather more bent than uſual; for a long ſtock ſits firmer to the ſhoulder than a ſhort one, and particularly ſo when the ſhooter is accuſtomed to place his left hand, which principally ſupports the piece, near to the entrance of the ramrod into the ſtock.

It is certain, however, that the ſtock may be ſo formed as to be better ſuited to one man than another. For a tall, long-armed man, the ſtock of a gun ſhould be longer than for one of a leſs ſtature and ſhorter arm. That a ſtraight ſtock is proper for him who has high ſhoulders and a ſhort neck; for, if it be much bent, it would be very difficult for him, eſpecially in the quick motion required in ſhooting at a flying or running object, to place the butt of the gun-ſtock firmly to the ſhoulder; the upper part alone would in general be fixed; which would not only raiſe the muzzle, and conſequently ſhoot high, but make the recoil much more ſenſibly felt, than if the whole end of the ſtock were firmly placed on his ſhoulder. Beſides, ſuppoſing the ſhooter to bring the butt home to his ſhoulder, he would ſcarcely be able to level his piece at the object. On the contrary, a man with low ſhoulders, and a long neck, requires a ſtock much bent; for, if it is ſtraight, he will, in the act of lowering his head to that place of the ſtock at which his cheek ſhould reſt in taking aim, feel a conſtraint which he never experiences when, by the effect of the proper degree of bent, the ſtock lends him ſome aſſiſtance, and, as it were, meets his aim half way.

Having now deſcribed the fowling-piece which has been found to anſwer beſt, it will next be proper to give ſome inſtructions for the choice of gunpowder, ſhot, and wadding.

The various kinds of gunpowder are well known; but, in the opinion of ſome experienced ſportſmen, Hervey's battle-powder is the beſt. Thoſe who wiſh to examine the ſtrength of powder, may determine it by drying ſome of it very well, and then trying how many ſheets of paper it will drive the ſhot through, at the diſtance of 10 or 12 yards. In this trial we ſhould be careful to employ the ſame ſized ſhot in each experiment, the quantity both of the ſhot and the powder being regulated by exact weight; otherwiſe we cannot, even in this experiment, arrive to any certainty in comparing the ſtrength of different powders, or of the ſame powder at different times.

Powder ought to be kept very dry, for every degree of moiſture injures it: and if conſiderable, the ſaltpetre is diſſolved, and the intimate combination of the ſeveral ingredients is entirely deſtroyed. It is obſerved, that after firing with damp powder the piece becomes very foul, which ſeems to ariſe from the diminution of the activity of the fire in the exploſion. Flaſks of copper or tin are much better for keeping powder in than thoſe made of leather, or than ſmall caſks. Their necks ought to be ſmall and well ſtopped with cork.

The *patent milled ſhot* is now very generally uſed, and is reckoned ſuperior to any other. The ſize of the ſhot muſt vary according to the particular ſpecies of game which is the object of the ſportſman's purſuit, as well as be adapted to the ſeaſon. In the firſt month of partridge ſhooting, N° 1. is moſt proper; for ſince at this time the birds ſpring near at hand, and we ſeldom fire at more than the diſtance of 40 paces, if the ſhooter takes his aim but tolerably well, it is almoſt impoſſible for a bird at this diſtance to eſcape in the circle which the ſhot forms.

As hares ſit cloſer, and are thinly covered with fur at this ſeaſon, they may eaſily be killed with this ſhot at 30 or 35 paces. N° 1. is equally proper for ſhooting ſnipes or quails About the beginning of October, when the partridges are ſtronger, N° 3. is the moſt proper ſhot to be uſed. Many ſportſmen uſe no other during the whole ſeaſon. The directions which have now been given refer only to the patent ſhot.

We ſhall now ſubjoin a table, which will ſhow at one view the number of pellets compoſing an ounce weight of each ſort of ſhot, the patent and the common, beginning with the ſmalleſt ſize.

Patent Shot.				Common Shot.			
N° 8.	1 ounce	-	620	N° 7.	1 ounce	-	350
7	id.	-	480	6	id.	-	260
× †	id.	-	300	5	id.	-	235
1	id.	-	220	4	id.	-	190
2	id.	-	180	3	id.	-	140
3	id.	-	157	2	id.	-	110
4	id.	-	105	1	id.	-	95
5	id.	-	83				

For a fowling-piece of a common caliber, which is from 24 to 30 balls to the pound weight, a dram and a quarter, or at moſt a dram and a half, of good powder; and an ounce, or an ounce and a quarter of ſhot, is ſufficient. But when ſhot of a larger ſize is uſed, ſuch as N° 5. the charge of ſhot may be increaſed one-fourth, for the purpoſe of counterbalancing in ſome degree what the ſize of the ſhot loſes in the number of pellets, and alſo to enable it to garniſh the more. For this purpoſe the ſportſman will find a meaſure marked with the proper gauges very convenient to him. An inſtrument of this nature has been made by an ingenious artiſt of London, Egg, of the Haymarket.

A conſequence of overloading with ſhot, is, the powder has not ſufficient ſtrength to throw it to its proper diſtance; for, if the object fired at be diſtant, one half of the pellets compoſing the charge, by their too great quantity and weight, will ſtrike againſt each other, and fall by the way; and thoſe which reach the mark will have ſmall force, and will produce but little or no effect.

The uſe of the *wadding* is to carry the ſhot in a body to a certain diſtance from the muzzle of the piece. It ought to be of ſoft and pliable materials. The beſt kind of wadding, in the opinion of an experienced fowler, is a piece of an old hat; but this cannot be obtained in ſufficient quantity. Next to it nothing is better than ſoft brown paper, which combines ſuppleneſs with conſiſtence, moulds itſelf to the barrel, and never falls to the ground within twelve or fifteen paces from the muzzle of the piece. Tow anſwers very well, and cork has been extolled for poſſeſſing

* In ſpeaking of the ſize of the caliber, we mean by 22 or 24, that ſo many balls exactly fitting it weigh juſt one pound; and every caliber is marked in the ſame way.

† The reader will obſerve, that the patent ſhot has no N° 6, the × being ſubſtituted in its place, and that the numbers do not follow each other in the order of progreſſion: the reaſon of this we cannot aſſign.

the peculiar virtue of increasing the range and closeness of the shot.

The wadding ought to be quite close in the barrel, but not rammed too hard; for, if it be rammed too close, or be of a rigid substance, the piece will recoil, and the shot will spread too much. On the other hand, if the wadding be very loose, or is composed of too soft materials, such as wool or cotton, the discharge will not possess proper force.

In loading a piece, the powder ought to be slightly rammed down by only pressing the ramrod two or three times on the wadding, and not by drawing up the ramrod and then returning it into the barrel with a jerk of the arm several times. For, when the powder is violently compressed, some of the grains must be bruised, which will prevent the explosion from being quick, and will spread the shot too wide. In pouring the powder into the barrel, the measure ought to be held so as that the powder may fall most readily to the bottom. That no grains may adhere to the sides of the barrel, the butt-end of the piece may be struck against the ground. The shot ought never to be rammed down with force; it is sufficient to strike the butt-end of the gun against the ground as before. Then the wadding is to be put down gently. A sportsman ought never to carry his gun under his arm with the muzzle inclined downwards, for this practice loosens the wadding and charge too much.

Immediately after the piece is fired it ought to be re-loaded; for, while the barrel is still warm, there is no danger of any moisture lodging in it to hinder the powder from falling to the bottom. As it is found that the coldness of the barrel, and perhaps the moisture condensed in it, diminishes the force of the powder in the first shot, it is proper to fire off a little powder before the piece is loaded. Some prime before loading, but this is not proper unless the touch-hole be very large. After every discharge the touch-hole ought to be pricked, or a small feather may be inserted to clear away any humidity or foulness that has been contracted.

The sportsman having loaded his piece, must next prepare to fire. For this purpose he ought to place his hand near the entrance of the ramrod, and at the same time grasp the barrel firmly. The muzzle should be a little elevated, for it is more usual to shoot low than high. This direction ought particularly to be attended to when the object is a little distant; because shot as well as ball only moves a certain distance point blank, when it begins to describe the curve of the parabola.

Practice soon teaches the sportsman the proper distance at which he should shoot. The distance at which he ought infallibly to kill any kind of game with patent shot, N° 3. provided the aim be well taken, is from 25 to 35 paces for the footed, and from 40 to 45 paces for the winged game. Beyond this distance even to 50 or 55 paces, both partridges and hares are sometimes killed; but in general the hares are only slightly wounded, and carry away the shot; and the partridges at that distance present so small a surface, that they frequently escape untouched between the spaces of the circle. Yet it does not follow that a partridge may not be killed with N° 3. patent shot at 60 and even 70 paces distance; but then these shots are very rare.

In shooting at a bird flying, or a hare running across, it is necessary to take aim before the object in proportion to its distance at the time of firing. If a partridge flies across at the distance of 30 or 35 paces, it will be sufficient to aim at the head, or at most but a small space before it. If it be 50, 60, or 70 paces distant, it is then requisite to aim at least half a foot before the head. The same practice ought to be observed in shooting at a hare, rabbit, or fox, when running in a cross direction; at the same time making due allowance for the distance and swiftness of the pace. Another thing to be attended to is, that the shooter ought not involuntarily to stop the motion of the arms at the moment of pulling the trigger; for the instant the hand stops in order to fire, however inconsiderable the time be, the bird gets beyond the line of aim, and the shot will miss it. A sportsman ought therefore to accustom his hand while he is taking aim to follow the object. When a hare runs in a straight line from the shooter, he should take his aim between the ears, otherwise he will run the hazard either of missing, or at least not of killing dead, or, as it is sometimes called, *clean*.

A fowling-piece should not be fired more than 20 or 25 times without being washed; a barrel when foul neither shoots so ready, nor carries the shot so far as when clean. The flint, pan, and hammer, should be well wiped after each shot; this contributes greatly to make the piece go off quick, but then it should be done with such expedition, that the barrel may be reloaded whilst warm, for the reasons we have before advanced. The flint should be frequently changed, without waiting until it misses fire, before a new one is put in. Fifteen or eighteen shots, therefore, should only be fired with the same flint; the expense is too trifling to be regarded, and by changing it thus often much vexation will be prevented.

A gun also should never be fired with the prime of the preceding day; it may happen that an old priming will sometimes go off well, but it will more frequently contract moisture and fuze in the firing; then the object will most probably be missed, and that because the piece was not fresh primed.

For the information of the young sportsman we shall add a few more general directions. In warm weather he ought to seek for game in plains and open grounds, and in cold weather he may search little hills exposed to the sun, along hedges, among heath, in stubbles, and in pastures where there is much furze and fern. The morning is the best time of the day, before the dew is exhaled, and before the game has been disturbed. The colour of the shooter's dress ought to be the same with that of the fields and trees; in summer it ought to be green, in winter a dark grey. He ought to hunt as much as possible with the wind, not only to prevent the game from perceiving the approach of him and his dog, but also to enable the dog to scent the game at a greater distance.

He should never be discouraged from hunting and ranging the same ground over and over again, especially in places covered with heath, brambles, high grass, or young coppice wood. A hare or rabbit will frequently suffer him to pass several times within a few yards of its form without getting up. He should be still more patient when he has marked partridges into such places; for it often happens, that after the birds have been sprung many times, they lie so dead that they will suffer him almost to tread upon them before they will rise. Pheasants, quails, and woodcocks do the same.

He ought to look carefully about him, never passing a bush or tuft of grass without examination; but he ought never to strike them with the muzzle of his gun, for it will loosen his wadding. He who patiently beats and ranges his ground over again, without being discouraged, will always kill the greatest quantity of game; and if he is shooting in company, he will find game where others have passed without discovering any.

When he has fired he should call in his dog, that he may not have the mortification to see game rise which he cannot shoot. When he has killed a bird, instead of being anxious about picking it up, he ought to follow the rest of the covey with his eye till he see them settle.

Three species of dogs are capable of receiving the proper instruction, and of being trained. These are the smooth pointer, the spaniel, and the rough pointer. The last is a dog with long curled hair, and seems to be a mixed breed of the water-dog and the spaniel. The smooth pointer is active and lively enough in his range, but in general is proper only for an open country.

The greatest part of these dogs are afraid of water, brambles, and thickets; but the spaniel and the rough pointer are easily

taught to take the water, even in cold weather, and to range the woods and rough places as well as the plain. Greater dependence may therefore be had on thefe two laft fpecies of dogs than on the fmooth pointer.

The education of a pointer may commence when he is only five or fix months old. The only leffons which he can be taught at this time are to *fetch* and *carry* any thing when defired; to come in when he runs far off, and to go behind when he returns; ufing, in the one cafe, the words *here, come in,* and in the other *back* or *behind.* It is alfo neceffary at this period to accuftom him to be tied up in the kennel or ftable; but he ought not at firft to be tied too long. He fhould be let loofe in the morning, and faftened again in the evening. When a dog is not early accuftomed to be chained, he difturbs every perfon in the neighbourhood by howling. It is alfo of importance that the perfon who is to train him fhould give him his food.

When the dog has attained the age of 10 or 12 months, he may be carried into the field to be regularly trained. At firft he may be allowed to follow his own inclination, and to run after every animal he fees. His indifcriminating eagernefs will foon abate, and he will purfue only partridges and hares. He will foon become tired of following partridges in vain, and will content himfelf after having flufhed them to follow them with his eyes. It will be more difficult to prevent him from following hares.

All young dogs are apt to *rake*; that is, to hunt with their nofes clofe to the ground, to follow birds rather by the track than by the wind. But partridges lie much better to dogs that *wind* them, than to thofe that follow them by the track. The dog that winds the fcent approaches the birds by degrees and without difturbing them; but they are immediately alarmed when they fee a dog tracing their footfteps. When you perceive that your dog is committing this fault, call to him in an angry tone *hold up:* he will then grow uneafy and agitated, going firft to the one fide and then to the other, until the wind brings him the fcent of the birds. After finding the *game* four or five times in this way, he will take the wind of himfelf, and hunt with his nofe high. If it be difficult to correct this fault, it will be neceffary to put the *puzzle peg* upon him. This is of very fimple conftruction, confifting only of a piece of oak or deal inch board, one foot in length, and an inch and a half in breadth, tapering a little to one end; at the broader end are two holes running longitudinally, through which the collar of the dog is put, and the whole is buckled round his neck; the piece of wood being projected beyond his nofe, is then faftened with a piece of leather thong to his under jaw. By this means the peg advancing feven or eight inches beyond his fnout, the dog is prevented from putting his nofe to the ground and raking.

As foon as the young dog knows his game you muft bring him under complete fubjection. If he is tractable, this will be eafy; but if he is ftubborn, it will be neceffary to ufe the *trafh cord,* which is a rope or cord of 20 or 25 fathoms in length faftened to his collar. If he refufe to come back when called upon, you muft check him fmartly with the cord, which will often bring him upon his haunches. But be fure you never call to him except when you are within reach of the cord. After repeating this feveral times he will not fail to come back when called; he ought then to be careffed, and a bit of bread fhould be given him. He ought now conftantly to be tied up, and never unchained, except when you give him his food, and even then only when he has done fomething to deferve it.

The next ftep will be to throw down a piece of bread on the ground, at the fame moment taking hold of the dog by the collar, calling out to him, "take heed,—foftly." After having held him in this manner for fome fpace of time, fay to him "feize—lay hold." If he is impatient to lay hold of the piece of bread before the fignal is given, correct him gently with a fmall whip. Repeat this leffon until he "takes heed" well, and no longer requires to be held faft to prevent him from laying hold of the bread. When he is well accuftomed to this manége, turn the bread with a ftick, holding it in the manner you do a fowling-piece, and having done fo, cry *feize.* Never fuffer the dog to eat either in the houfe or field without having firft made him take heed in this manner.

Then, in order to apply this leffon to the game, fry fmall pieces of bread in hogs lard, with the dung of partridge: take thefe in a linen bag into the fields, ftubbles, ploughed grounds, and paftures, and there put the pieces in feveral different places, marking the fpots with little cleft pickets of wood, which will be rendered more diftinguifhable by putting pieces of card in the nicks. This being done, caft off the dog and conduct him to thefe places, always hunting in the wind. After he has caught the fcent of the bread, if he approaches too near, and feems eager to fall upon it, cry to him in a menacing tone, "take heed;" and if he does not ftop immediately, correct him with the whip. He will foon comprehend what is required of him, and will ftand.

At the next leffon, take your gun charged only with powder, walk gently round the piece of bread once or twice, and fire inftead of crying *feize.* The next time of practifing this leffon, walk round the bread four or five times, but in a greater circle than before, and continue to do this until the dog is conquered of his impatience, and will ftand without moving until the fignal is given him. When he keeps his point well, and ftands fteady in this leffon, you may carry him to the birds; if he runs in upon them, or barks when they fpring up, you muft correct him; and if he continues to do fo, you muft return to the fried bread; but this is feldom neceffary.

When the dog has learned by this ufe of the bread to take heed, he may be carried to the fields with the trafh-cord dragging on the ground. When he fprings birds for the firft time, if he runs after them or barks, check him by calling out to him, *take heed.* If he point properly, carefs him; but you ought never to hunt without the cord until he point ftaunch.

If the dog runs after fheep, and it be difficult to cure him, couple him with a ram, and then whip the dog as long as you can follow him. His cries will at firft alarm the ram; he will run with all his fpeed, and drag the dog along with him; but he will at length take courage, turn upon the dog, and butt him feverely with his horns. When you think the dog is fufficiently chaftifed, untie him: he will never run at fheep again.

Having now given a few general inftructions concerning the beft method of training pointers, we fhall fubjoin a few obfervations refpecting the moft common fpecies of game, the partridge, pheafant, groufe, woodcock, fnipe, and wild duck.

Partridges pair in the fpring, and lay their eggs (generally from 15 to 20) during May and part of June. The young begin to fly about the end of June, and their plumage is complete in the beginning of October. The male has a confpicuous horfefhoe upon his breaft, an obtufe fpur on the hinder part of the leg, which diftinguifhes him from the female. He is alfo rather larger.

When a fportfman is fhooting in a country where the birds are thin, and he no longer choofes to range the field for the bare chance of meeting with them, the following method will fhow him where to find them on another day. In the evening, from fun-fet to night-fall, he fhould poft himfelf in a field, at the foot of a tree or a bufh, and there wait until the partridges begin to call or juck, which they always do at that time; not only for the purpofe of drawing together when feparated, but alfo when the birds compofing the covey are not difperfed. After calling in this manner for fome little fpace of time, the partridges will take to flight; then, if he mark the place where they alight, he may be affured they will lie there the whole night,

unlefs difturbed. Let him return to the fame poft the next morning by break of day, and there watch a while; being careful to keep his dog in a ftring, if he is not under perfect command.

As foon as the dawn begins to peep, the partridges will begin to call, and foon afterwards will perform the fame manœuvre as on the preceding evening; that is, after having called a while, they will take their flight, and will moft commonly fettle at a little diftance. There in a few minutes they will call again, and fometimes take a fecond flight, but that will be to no great diftance. Then, as foon as the fun is rifen, and the fportfman can fee to fhoot, he may caft off his dog and purfue them.

The *pheafant* is of the fize of a common dunghill cock, and lays its eggs generally in the woods, the number of which is 10 or 12.

Pheafants are accounted ftupid birds; for when they are furprifed they will frequently fquat down like a rabbit, fuppofing themfelves to be in fafety as foon as their heads are concealed; and in this way they will fometimes fuffer themfelves to be killed with a ftick. They love low and moift places, and haunt the edges of thofe pools which are found in woods, as well as the high grafs of marfhes that are near at hand; and above all, places where there are clumps of alders.

Groufe, or moor game, are found in Wales, in the northern counties of England, and in great abundance in Scotland. They chiefly inhabit thofe mountains and moors which are covered with heath, and feldom defcend to the low grounds. They fly in companies of four or five braces, and love to frequent moffy places, particularly in the middle of the day or when the weather is warm. In purfuing this game, when the pointer fets, and the fportfman perceives the birds running with their heads erect, he muft run after them as faft as he can, in the hope that he may get near enough to fhoot when they rife upon the wing; for he may be pretty certain they will not lie well that day. As thefe birds are apt to grow foon putrid, they ought to be drawn carefully the inftant they are fhot, and ftuffed with any heath, and if the feathers happen to be wetted they muft be wiped dry.

The *woodcock* is a bird of paffage; it commonly arrives about the end of October, and remains until the middle of March. Woodcocks are fatteft in December and January, but from the end of February they are lean. At their arrival they drop anywhere, but afterwards take up their refidence in copfes of nine or ten years growth. They feldom, however, ftay in one place longer than 12 or 15 days. During the day they remain in thofe parts of the woods where there are void fpaces or glades, picking up earth-worms and grubs from the fallen leaves. In the evening they go to drink and wafh their bills at pools and fprings, after which they repair to the open fields and meadows for the night. It is remarkable, that when a woodcock fprings from a wood to go into the open country, he always endeavours to find fome glade or opening, which he follows to the boundaries of the wood. At his return he purfues the fame path a good way, and then turns to the right or left oppofite to fome glade, in order to drop into a thick part of the wood, where he may be fheltered from the wind. He may therefore be watched with advantage in thefe narrow paffes and little alleys on the edges of woods which lead to a pool or fpring, or he may be watched in the dufk of the evening near the pools which he frequents.

The *fnipe* is a bird of paffage as well as the woodcock. This bird is fcarcely worth fhooting till the froft commences. In the month of November they begin to grow fat.. Snipes, like woodcocks, frequent fprings, bogs, and marfhy places, and generally fly againft the wind. The flant and crofs fhots are rather difficult, as the birds are fmall and fly very quickly. The fportfman ought to look for them in the direction of the wind; becaufe then they will fly towards him, and prefent a fairer mark.

The *wild duck* is alfo a bird of paffage, and arrives here in great flocks from the northern countries in the beginning of winter. Still, however, a great many remain in our marfhes and fens during the whole year, and breed.

The wild duck differs little in plumage from the tame duck, but is eafily diftinguifhed by its fize, which is lefs; by the neck, which is more flender; by the foot, which is fmaller; by the nails, which are more black; and above all, by the web of the foot, which is much finer and fofter to the touch.

In the fummer feafon, when it is known that a team of young ducks are in a particular piece of water, and juft beginning to fly, the fportfman is fure to find them early in the morning dabbling at the edges of the pool, and amongft the long grafs, and then he may get very near to them: it is ufual alfo to find them in thofe places at noon.

In the beginning of autumn almoft every pool is frequented by teams of wild ducks, which remain there during the day, concealed in the rufhes. If thefe pools are of fmall extent, two fhooters, by going one on each fide, making a noife and throwing ftones into the rufhes, will make them fly up; and they will in this way frequently get fhots, efpecially if the pool is not broad, and contracts at one end. But the fureft and moft fuccefsful way, is to launch a fmall boat or trow on the pool, and to traverfe the rufhes by the openings which are found; at the fame time making as little noife as poffible. In this manner the ducks will fuffer the fportfmen to come fufficiently near them to fhoot flying; and it often happens that the ducks, after having flown up, only make a circuit, return in a little time, and again alight upon the pool. Then the fportfmen endeavour a fecond time to come near them. If feveral fhooters are in company, they fhould divide; two fhould go in the boat, whilft the others fpread themfelves about the edge of the pool, in order to fhoot the ducks in their flight. In pools which will not admit a trow, water-fpaniels are abfolutely neceffary for this fport.

In winter they may be found on the margins of little pools; and when pools and rivers are frozen up, they muft be watched for in places where there are fprings and waters which do not freeze. The fport is then much more certain, becaufe the ducks are confined to thefe places in order to procure aquatic herbs, which are almoft their only food at this period.

SHOP-LIFTERS, are thofe that fteal goods privately out of fhops; which being to the value of 5s. though no perfon be in the fhop, is felony without the benefit of clergy by the 10 and 11 W. III. c. 23.

SHORE, a place wafhed by the fea, or by fome large river. Count Marfigli divides the fea-fhore into three portions: the firft of which is that tract of land which the fea juft reaches in ftorms and high tides, but which it never covers; the fecond part of the fhore is that which is covered in high tides and ftorms, but is dry at other times; and the third is the defcent from this, which is always covered with water. The *firft* part is only a continuation of the continent, and fuffers no alteration from the neighbourhood of the fea, except that it is rendered fit for the growth of fome plants, and wholly unfit for that of others, by the faline fteams and impregnations: and it is fcarcely to be conceived by any, but by thofe who have obferved it, how far on land the effects produced by the fea reach, fo as to make the earth proper for plants which will not grow without this influence; there being feveral plants frequently found on high hills and dry places, at three, four, and more miles from the fea, which yet would not grow unlefs in the neighbourhood of it, nor will ever be found elfewhere. The *fecond* part or portion of the fhore is much more affected by the fea than the former, being frequently wafhed and beaten by it. Its productions are rendered falt by the water, and it is covered with fand, or with the fragments of fhells in form of fand, and in fome places with a tartareous matter depofited from the water:

the colour of this whole extent of ground is usually dusky and dull, especially where there are rocks and stones, and these covered with a slimy matter. The *third* part of the shore is more affected by the sea than either of the others; and is covered with an uniform crust of the true nature of the bottom of the sea, except that plants and animals have their residence in it, and the decayed parts of these alter it a little.

SHORE (JANE), the celebrated concubine of the licentious king Edward IV. was the wife of Mr. Matthew Shore, a goldsmith in Lombard street, London. Kings are seldom unsuccessful in their amorous pursuits; therefore there was nothing wonderful in Mrs. Shore's removing from Lombard street to shine at court as the royal favourite. Historians represent her as extremely beautiful, remarkably cheerful, and of most uncommon generosity. The king, it is said, was no less captivated with her temper than with her person: she never made use of her influence over him to the prejudice of any person: and if ever she importuned him, it was in favour of the unfortunate. After the death of Edward, she attached herself to the lord Hastings; and when Richard III. cut off that nobleman as an obstacle to his ambitious schemes, Jane Shore was arrested as an accomplice, on the ridiculous accusation of witchcraft. This, however, terminated only in a public penance; excepting that Richard rifled her of all her little property: but whatever severity might have been exercised towards her, it appears that she was alive, though sufficiently wretched, under the reign of Henry VIII. when Sir Thomas More saw her poor, old, and shrivelled, without the least trace of her former beauty. Mr. Rowe, in his tragedy of Jane Shore, has adopted the popular story related in the old historical ballad, of her perishing by hunger in a ditch where Shoreditch now stands. But Stow assures us that street was so named before her time.

SHORL. See SCHORL.

SHORLING and MORLING, are words to distinguish fells of sheep; *shorling* being the fells after the fleeces are shorn off the sheep's back; and *morling*, the fells flayed off after they die or are killed. In some parts of England they understand by a *shorling*, a sheep whose face is shorn off; and by a *morling*, a sheep that dies.

SHORT (JAMES), an eminent optician, was born in Edinburgh on the 10th of June, O. S. in the year 1710. At ten years of age, having lost his father and mother, and being left in a state of indigence, he was received into Heriot's Hospital, where he soon displayed his mechanical genius in constructing for himself little chests, book-cases, and other conveniences, with such tools as fell in his way. At the age of twelve he was removed from the Hospital to the High School, where he showed a considerable taste for classical literature, and generally kept at the head of his forms. In the year 1726 he was entered into the university, where he passed through the usual course of education, and took his master's degree with great applause.

By his friends he was intended for the church; but after attending a course of theological lectures, his mind revolted from a profession which he thought little suited to his talents: and he devoted his whole time to mathematical and mechanical pursuits. He had been fortunate enough to have the celebrated M'Laurin for his preceptor; who having soon discovered the bent of his genius, and made a proper estimate of the extent of his capacity, encouraged him to prosecute those studies in which nature had qualified him to make the greatest figure. Under the eye of that eminent master, he began in 1732 to construct Gregorian telescopes; and, as the professor observed in a letter to Dr. Jurin, "by taking care of the figure of his specula, he was enabled to give them larger apertures, and to carry them to greater perfection, than had ever been done before him."

In the year 1736 Mr. Short was called to London, at the desire of queen Caroline, to give instructions in mathematics to William duke of Cumberland; and immediately on his appointment to that very honourable office he was elected a fellow of the royal society, and patronised by the earls of Morton and Macclesfield. In the year 1739 he accompanied the former of those noble lords to the Orkney Isles, where he was employed in adjusting the geography of that part of Scotland: and happy it was for him that he was so employed, as he might otherwise have been involved in a scuffle which took place between the retainers of Sir James Stewart of Barra and the attendants of the earl, in which some of the latter were dangerously wounded.

Mr. Short having returned to London, and finally established himself there in the line of his profession, was in 1743 employed by lord Thomas Spencer to make for him a reflector of twelve feet focus, for which he received 600 guineas. He made several other telescopes of the same focal distance with greater improvements and higher magnifiers; and in 1752 finished one for the king of Spain, for which, with its whole apparatus, he received 1200l. This was the noblest instrument of the kind that had then been constructed, and perhaps it has never yet been surpassed except by the astonishing reflectors of Herschel. See TELESCOPE.

Mr. Short was wont to visit the place of his nativity once every two or three years during his residence in London, and in 1766 he visited it for the last time. On the 15th of June 1768 he died, after a very short illness, at Newington Butts, near London, of a mortification in his bowels, and was buried on the 22d of the same month, having completed, within a few days, his fifty-eighth year. He left a fortune of about 20,000l. of which 15,000l. was bequeathed to two nephews, and the rest in legacies to his friends. In gratitude for the steady patronage of the earl of Morton, he left to his daughter the lady Mary Douglas, afterwards countess of Aboyne, 1000l. and the reversion of his fortune, should his nephews die without issue; but this reversionary legacy the lady, at the desire of her father, generously relinquished by a deed in favour of Mr. Short's brother Mr. Thomas Short and his children. Mr. Short's eminence as an artist is universally known, and we have often heard him spoken of by those who had known him from his youth, as a man of virtue and of very amiable manners.

SHORT-*Hand Writing*. See STENOGRAPHY.

SHORT-*jointed*, in the manege. A horse is said to be short-jointed that has a short pastern; when this joint, or the pastern, is too short, the horse is subject to have his fore legs from the knee to the cornet all in a straight line. Commonly your short-jointed horses do not manege so well as the long-jointed; but out of the manege the short-jointed are the best for travel or fatigue.

SHORT-*Sightedness*, a certain defect in vision, by which objects cannot be distinctly seen unless they are very near the eye. See OPTICS.

SHORTFORD, q. d. *fore-close*, an antient custom in the city of Exeter, when the lord of the fee cannot be answered rent due to him out of his tenement, and no distress can be levied for the same. The lord is then to come to the tenement, and there take a stone, or some other dead thing, off the tenement, and bring it before the mayor and bailiff, and thus he must do seven quarter days successively; and if on the seventh quarter day the lord is not satisfied of his rent and arrears, then the tenement shall be adjudged to the lord to hold the same a year and a day; and forthwith proclamation is to be made in the court, that if any man claims any title to the said tenement, he must appear within the year and day next following, and satisfy the lord of the said rent and arrears: but if no appearance be made, and the rent not paid, the lord comes again to the court, and prays that, according to the custom, the said tenement be adjudged to him in his demesne as of fee; which is done accordingly: so that the lord hath from thenceforth the said tenement, with the appurtenances to him and his heirs.

SHOT, a denomination given to all ſorts of balls for fire-arms; thoſe for cannon being of iron, and thoſe for guns, piſtols, &c. of lead. See SHOOTING.

Caſe SHOT formerly conſiſted of all kinds of old iron, nails, muſket-balls, ſtones, &c. uſed as above.

SHOT *of a Cable*, on ſhip-board, is the ſplicing of two cables together, that a ſhip may ride ſafe in deep waters and in great roads; for a ſhip will ride eaſier by one ſhot of a cable, than by three ſhort cables out ahead.

Grape SHOT. See GRAPE-*Shot*.

Patent milled SHOT is thus made: Sheets of lead, whoſe thickneſs correſponds with the ſize of the ſhot required, are cut into ſmall pieces, or cubes, of the form of a die. A great quantity of theſe little cubes are put into a large hollow iron cylinder, which is mounted horizontally and turned by a winch; when by their friction againſt one another and againſt the ſides of the cylinder, they are rendered perfectly round and very ſmooth. The other patent ſhot is caſt in moulds, in the ſame way as bullets are.

SHOT-*Flaggon*, a ſort of flaggon ſomewhat bigger than ordinary, which in ſome counties, particularly Derbyſhire, it is the cuſtom for the hoſt to ſerve his gueſts in, after they have drunk above a ſhilling.

Small SHOT, or that uſed for fowling, ſhould be well ſized, and of a moderate bigneſs: for, ſhould it be too great, then it flies thin and ſcatters too much; or if too ſmall, then it hath not weight and ſtrength to penetrate far, and the bird is apt to fly away with it. In order, therefore, to have it ſuitable to the occaſion, it not being always to be had in every place fit for the purpoſe, we ſhall ſet down the true method of making all ſorts and ſizes under the name of *mould-ſhot*. Its principal good properties are to be round and ſolid.

Take any quantity of lead you think fit, and melt it down in an iron veſſel; and as it melts keep it ſtirring with an iron ladle, ſkimming off all impurities whatſoever that may ariſe at the top: when it begins to look of a greeniſh colour, ſtrew on it as much auripigmentum or yellow orpiment, finely powdered, as will lie on a ſhilling, to every 12 or 14 pounds of lead; then ſtirring them together, the orpiment will flame. The ladle ſhould have a notch on one ſide of the brim, for more eaſily pouring out the lead; the ladle muſt remain in the melted lead, that its heat may be the ſame with that of the lead, to prevent inconveniences which otherwiſe might happen by its being either too hot or too cold: then, to try your lead, drop a little of it into water, and if the drops prove round, then the lead is of a proper heat; if otherwiſe, and the ſhot have tails, then add more orpiment to increaſe the heat; till it be found ſufficient.

Then take a plate of copper, about the bigneſs of a trencher, which muſt be made with a hollowneſs in the middle, about three inches compaſs, within which muſt be bored about 40 holes according to the ſize of the ſhot which you intend to caſt: the hollow bottom ſhould be thin; but the thicker the brim, the better it will retain the heat. Place this plate on a frame of iron, over a tub or veſſel of water, about four inches from the water, and ſpread burning coals on the plate, to keep the lead melted upon it: then take ſome lead and pour it gently on the coals on the plate, and it will make its way through the holes into the water, and form itſelf into ſhot; do thus till all your lead be run through the holes of the plate, taking care, by keeping your coals alive, that the lead do not cool, and ſo ſtop up the holes.

While you are caſting in this manner, another perſon with another ladle may catch ſome of the ſhot, placing the ladle four or five inches underneath the plate in the water, by which means you will ſee if they are defective, and rectify them. Your chief care is to keep the lead in a juſt degree of heat, that it be not ſo cold as to ſtop up the holes in your plate, nor ſo hot as to cauſe the ſhot to crack: to remedy the heat, you muſt refrain working till it is of a proper coolneſs; and to remedy the coolneſs of your lead and plate, you muſt blow your fire; obſerving, that the cooler your lead is, the larger will be your ſhot; as, the hotter it is, the ſmaller they will be.

After you have done caſting, take them out of the water, and dry them over the fire with a gentle heat, ſtirring them continually that they do not melt: when dry, you are to ſeparate the great ſhot from the ſmall, by the help of a ſieve made for that purpoſe, according to their ſeveral ſizes. But theſe who would have very large ſhot, make the lead trickle with a ſtick out of the ladle into the water, without the plate. If it ſtop on the plate, and yet the plate be not too cool, give but the plate a little knock, and it will run again; care muſt be had that none of your implements be greaſy, oily, or the like; and when the ſhot, being ſeparated, are found too large or too ſmall for your purpoſe, or otherwiſe imperfect, they will ſerve again at the next operation.

The ſizes of common ſhot for fowling are from No. 1 to 6, and ſmaller, which is called muſtard ſeed, or duſt ſhot; but No. 5 is ſmall enough for any ſhooting whatſoever. The No. 1 may be uſed for wild geeſe; the No. 2 for ducks, widgeons, and other water-fowl; the No. 3 for pheaſants, partridges after the firſt month, and all the fen-fowl; the No. 4 for partridges, woodcocks, &c.; and the No. 5 for ſnipes and all the ſmaller birds.

Tin-Caſe SHOT, in artillery, is formed by putting a great quantity of ſmall iron ſhot into a cylindrical tin-box called a canniſter, that juſt fits the bore of the gun. Leaden bullets are ſometimes uſed in the ſame manner; and it muſt be obſerved, that whatever number or ſizes of the ſhots are uſed, they muſt weigh with their caſes nearly as much as the ſhot of the piece.

SHOVEL (Sir CLOUDESLY), was born about the year 1650 of parents rather in the lower rank of life. He was put apprentice to a ſhoemaker; but diſliking this profeſſion, he abandoned it a few years after, and went to ſea. He was at firſt a cabin boy with Sir Chriſtopher Mynns; but applying to the ſtudy of navigation with indefatigable induſtry, his ſkill as a ſeaman ſoon raiſed him above that ſtation.

The corſairs of Tripoli having committed great outrages on the Engliſh in the Mediterranean, Sir John Narborough was ſent in 1674 to reduce them to reaſon. As he had received orders to try the effects of negotiation before he proceeded to hoſtilities, he ſent Mr. Shovel, who was at that time a lieutenant in his fleet, to demand ſatisfaction. The Dey treated him with a great deal of diſreſpect, and ſent him back without an anſwer. Sir John diſpatched him a ſecond time, with orders to remark particularly the ſituation of things on ſhore. The behaviour of the Dey was worſe than ever. Upon Mr. Shovel's return, he informed Sir John that it would be poſſible, notwithſtanding their fortifications, to burn all the ſhips in the harbour. The boats were accordingly manned, and the command of them given to Lieut. Shovel, who ſeized the guardſhip, and burnt four others, without loſing a man. This action ſo terrified the Tripolins, that they ſued for peace.—Sir John Narborough gave ſo favourable an account of this exploit, that Mr. Shovel was ſoon after made captain of the Sapphire, a fifth rate ſhip.

In the battle of Bantry-Bay, after the Revolution, he commanded the Edgar, and, for his gallant behaviour in that action, was ſoon after knighted by king William. Next year he was employed in tranſporting an army into Ireland; a ſervice which he performed with ſo much diligence and dexterity, that the king raiſed him to the rank of rear-admiral of the blue, and delivered his commiſſion with his own hands. Soon after he was made rear-admiral of the red, and ſhared the glory of the victory at La Hogue. In 1694, he bombarded Dunkirk. In 1703, he commanded the grand fleet in the Mediterranean, and did every

thing in his power to assist the protestants who were in arms in the Cevennes.

Soon after the battle off Malaga, he was presented by prince George to queen Ann, who received him graciously, and next year employed him as commander in chief.

In 1705 he commanded the fleet, together with the earls of Peterborough and Monmouth, which was sent into the Mediterranean; and it was owing to him chiefly that Barcelona was taken. After an unsuccessful attempt upon Toulon, he failed for Gibraltar, and from thence homeward with a part of the fleet. On the 22d of October, at night, his ship, with three others, was cast away on the rocks of Scilly. All on board perished. His body was found by some fishermen on the island of Scilly, who stripped it of a valuable ring, and afterwards buried it. Mr. Paxton, the purser of the Arundel, hearing of this, found out the fellows, and obliged them to discover where they had buried the body. He carried it on board his own ship to Portsmouth, from whence it was conveyed to London, and interred with great solemnity in Westminster Abbey. A monument was afterwards erected to his memory by the direction of the Queen. He married the widow of his patron, Sir John Narborough, by whom he left two daughters, co-heiresses.

SHOVELER, in ornithology, a species of ANAS.

SHOULDER-BLADE, a bone of the shoulder, of a triangular figure, covering the hind part of the ribs, called by anatomists the *scapula* and *omoplata*. See ANATOMY.

SHOUT, CLAMOUR, in antiquity, was frequently used on ecclesiastical, civil, and military occasions, as a sign of approbation, and sometimes of indignation.—Thus, as Cicero, in an assembly of the people, was exposing the arrogance of L. Antony, who had had the impudence to cause himself to be inscribed the patron of the Romans, the people on hearing this raised a shout to show their indignation. In the antient military discipline, shouts were used, 1. Upon occasion of the general's making a speech or harangue to the army from his tribunal. This they did in token of their approving what had been proposed. 2. Before an engagement, in order to encourage and spirit their own men, and fill the enemy with dread. This is a practice of great antiquity; besides which, it wants not the authority of reason to support it; for, as mankind are endowed with two senses, hearing and seeing, by which fear is raised in the mind, it may be proper to make use of the ear as well as the eye for that purpose. Shouts were also raised in the antient theatre, when what was acted pleased the spectators. It was usual for those present at the burning of the dead to raise a great shout, and call the dead person by his name before they set fire to the pile.

SHOWER, in meteorology, a cloud which is condensed into RAIN.

SHREWMOUSE. See SOREX.

SHREWSBURY, a borough in Shropshire, and the capital of that county, with a market on Wednesday, Thursday, and Saturday. It is seated on a peninsula formed by the Severn, over which are two bridges, and is surrounded by a wall, with three gates. Here was formerly a castle and abbey, both now in ruins. It contains five churches, is governed by a mayor, and sends two members to parliament. It is the chief mart for a coarse kind of woollen cloth, made in Montgomeryshire, called Welsh webs, and for all sorts of Welsh commodities, which are generally bought in a rough state at Welshpool, and finished here. It is also famous for its excellent brawn. In 1283, Edward I. held a parliament here, when the lords sat in the castle, and the commons in a barn. Another parliament was held here in 1397, by Richard II. Near this town, in 1403, was fought the battle between Henry IV. and Henry Percy, nicknamed Hotspur, in which the latter was defeated and slain. Shrewsbury is 18 miles E. of Welshpool, 36 W. of Litchfield, and 160 N. W. of London. W. lon. 2. 41. N. lat. 52. 43.

SHRIKE. See LANIUS.

SHRIMP, in ichthyology. See CANCER, No. 5 and 6.

SHRINE, in ecclesiastical history, a case or box to hold the relics of some saint.

SHROPSHIRE, or SALOP, a county of England, 50 miles long and 40 broad; bounded on the north by Cheshire and a detached part of Flintshire; on the east by Staffordshire, on the south-east by Worcestershire, on the south by Herefordshire, on the south-west by Radnorshire, and on the west by the counties of Montgomery and Denbigh. It lies partly in the diocese of Litchfield and Coventry, and partly in that of Hereford; contains 14 hundreds, 16 market-towns, and 170 parishes; and sends 12 members to parliament. The air is salubrious, and not very sharp, except on the hills. The soil is generally fruitful, especially in the north and east parts, which produce plenty of wheat and barley; but the south and west, being mountainous, are less fertile, yet yield sufficient pasture for sheep and cattle. This county abounds with lead, copper, iron, limestone, free-stone, pipe-clay, bitumen, and coal. The principal rivers are the Severn and the Tend. The capital is Shrewsbury.

SHROVE-TUESDAY, is the Tuesday after Quinquagesima Sunday, or the day immediately preceding the first of Lent; being so called from the Saxon word *shrive*, which signifies "to confess." Hence Shrove-Tuesday signifies Confession-Tuesday, on which day all the people in every parish throughout England (during the Romish times) were obliged to confess their sins, one by one, to their own parish priests, in their own parish churches; and, that this might be done the more regularly, the great bell in every parish was rung at ten o'clock, or perhaps sooner, that it might be heard by all, and that they might attend, according to the custom then in use; and though the Romish religion has now given way to the Protestant religion, the custom of ringing the great bell in our antient parish churches, at least in some of them, still remains, and obtains in and about London the name of Pancake bell; perhaps, because after the confession it was customary for the several persons to dine on pancakes or fritters. Most churches, indeed, have rejected that custom of ringing the bell on Shrove-Tuesday; but the usage of dining on pancakes or fritters, and such like provision, still continues.

SHROUDS (*scrud*, Sax.), a range of large ropes extending from the mast-heads to the right and left side of the ship, to support the masts, and enable them to carry sail, &c. The shrouds as well as the sails are denominated from the masts to which they belong. Thus they are the main, fore, and mizen shrouds; the main-top-mast, fore-top-mast, or mizen-top-mast shrouds; and the main-top-gallant, fore-top-gallant, or mizen-top-gallant shrouds. The number of shrouds by which a mast is sustained, as well as the size of rope of which they are formed, is always in proportion to the size of the mast and the weight of the sail it is intended to carry. Bowsprit shrouds are those which support the bowsprit. Bumkin shrouds are those which support the bumkins. Futtock shrouds are shrouds which connect the efforts of the topmast shrouds to the lower shrouds. Bentinck shrouds are additional shrouds to support the masts in heavy gales.—Preventer shrouds are similar to bentinck shrouds, and are used in bad weather to ease the lower rigging. See MAST and SAIL.

SHRUB, *frutex*, a little, low, dwarf tree, or a woody vegetable of a size less than a tree; and which, instead of one single stem, frequently from the same root puts forth several sets of stems. See PLANT and TREE. Such are privet, phillyrea, holly, box, honey-suckle, &c. Shrubs and trees put forth in autumn a kind of buttons, or gems, in the axis of the leaves; these buttons are as so many little ova, which, coming to expand by the warmth of the following spring, open into leaves

and flowers. By this, together with the height, fome diftinguifh fhrubs from *fuffrutices*, or under fhrubs, which are low bufhes, that do not put forth any of thefe buttons, as fage, thyme, &c.

The two hardieft fhrubs we are poffeffed of are the ivy and box; thefe ftand the feverity of our fharpeft winters unhurt, while other fhrubs perifh, and trees have their folid bodies fplit and torn to pieces. In the hard winter of the year 1683, thefe two fhrubs fuffered no injury any where; though the yews and hollies, which are generally fuppofed very hardy, were that winter in fome places killed, and in others ftripped of their leaves, and damaged in their bark. Furze-bufhes were found to be fomewhat hardier than thefe, but they fometimes perifhed, at leaft down to the root. The broom feemed to occupy the next ftep of hardinefs beyond thefe. This lived where the others died, and where even this died the juniper fhrubs were fometimes found unhurt. This laft is the only fhrub that approaches to the hardinefs of the box and ivy, but even it does not quite come up to them; for, while they fuffer nothing in whatever manner they are expofed, the juniper, though it bears cold well under the fhelter of other trees, yet cannot bear the viciffitudes of heat and cold; infomuch that fome juniper fhrubs were found half dead and half vigorous; that fide which faced the mid-day fun having perifhed by the fucceffive thawings and freezings of its fap; while that which was not expofed to the viciffitudes of heat had borne the cold perfectly well. Such fhrubs as are not hardy enough to defy the winter, but appear half dead in the fpring, may often be recovered by Mr. Evelyn's method of beating their branches with a flender hazel wand, to ftrike off the withered leaves and buds, and give a free paffage to the air to the internal parts. Where this fails, the method is to cut them down to the quick; and if no part of the trunk appears in a growing condition, they muft be taken off down to the level of the ground. Philofophical Tranfactions, No. 165.

SHUCKFORD (SAMUEL), curate of Shelthon, in Norfolk, prebendary of Canterbury, and chaplain in ordinary to the king, was a learned Englifhman. His manners were thofe of a philofopher, uncorrupted by the manners of the world. He wrote a hiftory of the world, facred and profane, to ferve as an introduction to Prideaux, in 3 vols. 8vo. It is heavily written, but difplays a great deal of erudition. His death, which happened in 1756, prevented him from carrying it down to the year 747 before Chrift, where Prideaux begins. He wrote alfo a treatife on the Creation and Fall of Man, to ferve as a fupplement to the preface to his hiftory.

SHUTTLE, in the manufactures, an inftrument ufed by the weavers, which guides the thread it contains, either of woollen, filk, flax, or other matter, fo as to make it form the woofs of ftuffs, cloths, linens, ribbands, &c. by throwing the fhuttle alternately from left to right, and from right to left, acrofs between the threads of the warp, which are ftretched out lengthwife on the loom. In the middle of the fhuttle is a kind of cavity, called the *eye* or *chamber* of the fhuttle, wherein is inclofed the fpoul, which is a part of the thread deftined for the woof, and this is wound on a little tube of paper, rufh, or other matter. The ribband weaver's fhuttle is very different from that of moft other weavers, though it ferves for the fame purpofe; it is of box, fix or feven inches long, one broad, and as much deep; fhod with iron at both ends, which terminate in points, and are a little crooked, the one towards the right, and the other towards the left, reprefenting the figure of an ∽ horizontally placed. See WEAVING.

SIALOGOGUES, medicines which promote the falivary difcharge.

SIAM, a kingdom of Afia, bounded on the north by China, on the eaft by Laos and Cambodia, on the fouth by the gulf of Siam, and on the weft by the bay of Bengal and Pegu. It is 550 miles in length, and 250 in breadth, though in fome places not above 50; and is divided into the Higher and Lower. It is a flat country, and in the rainy feafon is overflowed; for which reafon moft of the houfes are built on pillars, and have no communication for fome months but by boats. There are mines of gold, filver, tin, and copper, and plenty of pepper, rice, cotton, aloes, benjamin, and mufk. The tame cattle are beeves, buffaloes, and hogs; the woods abound with elephants, rhinocerofes, leopards, and tigers; befide which there are large crocodiles, and ferpents 20 feet long. The inhabitants, both men and women, go almoft naked; but the better fort wear rich garments. They are well fhaped, have large foreheads, little nofes, handfome mouths, plump lips, and black fparkling eyes. The men are of an olive colour, with little beards; but the women are of a ftraw complexion, and fome have their cheeks a little red. The king fhows himfelf but once a year to the common people. He is proprietor of all the lands in the country, and keeps a numerous army, among which are 1000 elephants. Though pagans, they have fome ideas of integrity and benevolence, for they think that doing good both to men and beafts is the principal part of their duty. Their temples and priefts are very numerous: the latter are diftinguifhed from the laity by an orange-coloured garment, and they keep their heads, beards, and eyebrows, clofe fhaved. They have fchools for the education of their children, and there is fcarce any among them but what can read and write.

SIBBALDIA, in botany: A genus of plants belonging to the clafs of pentandria, and to the order of pentagynia; and in the natural fyftem arranged under the 35th order, *Senticofæ*. The calyx is divided into ten fegments. The petals are five, and are inferted into the calyx. The ftyles are attached to the fide of the germens. The feeds are five. There are three fpecies belonging to this genus, the *procumbens*, *erecta*, and *altaica*.—The procumbens, or reclining fibbaldia, is a native of North Britain, having never been difcovered in the fouthern parts of the ifland. It grows on Ben-Lomond and Ben-Mor, within a mile of the fummit. It is diftinguifhed by a procumbent or trailing ftem; by three leaves growing on the top of a fmall footftalk, which are trifid at the extremity, and fomewhat hairy. The flowers are yellow, and bloffom in July or Auguft.

SIBENICO, or SEBENICO, the name of a city and province of Dalmatia. The province of Sibenico runs along the fea for more than 30 miles, reaches in fome places above 20 miles within land, and comprehends above 70 iflands. The city of Sibenico is fituated near the mouth of the river Cherca, in the Gulf of Venice, 35 miles north of Spalatto, and 25 fouth-eaft of Zara. E. lon. 16. 46. N. lat. 44. 17. It belongs to the Venetians. It is defended on one fide by a caftle, which held out againft repeated attacks of the Turks, and towards the fea by a fort.

SIBERIA, a country, comprehending the moft northern part of the Ruffian empire in Afia. It is bounded on the eaft by the Eaftern Ocean, on the fouth by Great Tartary, on the weft by Ruffia, and on the north by the Frozen Ocean. It extends 2000 miles from eaft to weft, and 750 from north to fouth. The fouth part is fertile, producing all the neceffaries of life; but the north part is extremely cold, almoft uncultivated, and thin of people. The principal riches of Siberia confift in fine fkins and furs. The inhabitants are of three forts, pagans, or the natives of the country, Mahometans, and Ruffians. The former dwell in forefts in the winter, and in the fummer on the banks of rivers. Their garments are the fkins of wild beafts, and their riches confift in bows, arrows, a knife, and a kettle. They make ufe of reindeer and dogs, inftead of horfes, to draw their fledges. They have feveral idols, which they are fometimes difpleafed with, and will either beat or burn them. They all live in wretched huts, which they remove from

place to place. Thofe in the fouthern parts are not much more polite; but they have horfes with which they go a-hunting, and their houfes, though poor, are not fhifted from place to place. Nor are the Mahometan Tartars, who dwell in thefe parts, fo ugly as in other places. The Ruffians fettled here are much the fame as in their native country. Through this vaft tract the Ruffian caravans travel every year, with their merchandife, to China. The principal rivers are the Oby, Lena, Irtyfh, Yenifei, and Okota. The weft part of Siberia is comprifed in the Ruffian governments of Tobolfk and Colyvan; the eaft part in the government of Irkutzk. Siberia is the place to which criminals, as well as perfons under the difpleafure of the court, are commonly banifhed from Ruffia. Tobolfk is the capital.

SIBTHORPIA, in botany: A genus of plants belonging to the clafs of didynamia, and to the order of angiofpermia; and in the natural fyftem claffed with thofe the order of which is doubtful. The calyx is fpreading, and divided into five parts, almoft to the bafe. The corolla is divided into five parts in the fame manner, which are rounded, equal, fpreading, and of the length of the calyx. The ftamina grow in pairs at a diftance from each other. The capfule is compreffed, orbicular, bilocular, the partition being tranfverfe. There are two fpecies, the *europæa* and *evolvulacea*. The *europæa*, or baftard money-wort, is a native of South Britain. The ftems of it are flender, and creeping. The leaves are fmall, round, and notched. The flowers grow under the wings of the leaves, are fmall, and of a pale red colour. It bloffoms from July to September, and is found in Cornwall on the banks of rivulets.

SIBYLS, in pagan antiquity, certain women faid to have been endowed with a prophetic fpirit, and to have delivered oracles, fhowing the fates and revolutions of kingdoms. Their number is unknown. Plato fpeaks of one, others of two, Pliny of three, Ælian of four, and Varro of ten; an opinion which is univerfally adopted by the learned. Thefe ten Sibyls generally refided in the following places: Perfia, Libya, Delphi, Cumæ in Italy, Erythræa, Samos, Cumæ in Æolia, Marpeffa on the Hellefpont, Ancyra in Phrygia, and Tiburtis. The moft celebrated of the Sibyls is that of Cumæ in Italy, whom fome have called by the different names of Amalthæa, Demiphile, Herophile, Daphne, Manto, Phemonoe, and Deiphobe. It is faid that Apollo became enamoured of her, and that, to make her fenfible of his paffion, he offered to give her whatever fhe fhould afk. The Sibyl demanded to live as many years as fhe had grains of fand in her hand; but unfortunately forgot to afk for the enjoyment of the health, vigour, and bloom, of which fhe was then in poffeffion. The god granted her requeft; but fhe refufed to gratify the paffion of her lover, though he offered her perpetual youth and beauty. Some time after fhe became old and decrepit, her form decayed, melancholy palenefs and haggard looks fucceeded to bloom and cheerfulnefs. She had already lived about 700 years when Æneas came to Italy, and, as fome have imagined, fhe had three centuries more to live before her years were as numerous as the grains of fand which fhe had in her hand. She gave Æneas inftructions how to find his father in the infernal regions, and even conducted him to the entrance of hell. It was ufual for the Sibyl to write her prophecies on leaves, which fhe placed at the entrance of her cave; and it required particular care in fuch as confulted her to take up thefe leaves before they were difperfed by the wind, as their meaning then became incomprehenfible. According to the moft authentic hiftorians of the Roman republic, one of the Sibyls came to the palace of Tarquin the Second, with nine volumes, which fhe offered to fell for a very high price. The monarch difregarded her, and fhe immediately difappeared, and foon after returned, when fhe had burned three of the volumes. She afked the fame price for the remaining fix books; and when Tarquin refufed to buy them, fhe burned three more, and ftill perfifted in demanding the fame fum of money for the three that were left. This extraordinary behaviour aftonifhed Tarquin; he bought the books, and the Sibyl inftantly vanifhed, and never after appeared to the world. Thefe books were preferved with great care by the monarch, and called the Sibylline verfes. A college of priefts was appointed to have the care of them; and fuch reverence did the Romans entertain for thefe prophetic books, that they were confulted with the greateft folemnity, and only when the ftate feemed to be in danger. When the capitol was burnt in the troubles of Sylla, the Sibylline verfes which were depofited there perifhed in the conflagration; and to repair the lofs which the republic feemed to have fuftained, commiffioners were immediately fent to different parts of Greece to collect whatever verfes could be found of the infpired writings of the Sibyls. The fate of thefe Sibylline verfes which were collected after the conflagration of the capitol is unknown. There are now many Sibylline verfes extant, but they are reckoned univerfally fpurious; and it is evident that they were compofed in the fecond century by fome of the followers of Chriftianity, who wifhed to convince the heathens of their error, by affifting the caufe of truth with the arms of pious artifice.

SICERA, a name given to any inebriating liquor by the Helleniftic Jews. St. Chryfoftom, Theodoret, and Theophilus of Antioch, who were Syrians, and who therefore ought to know the fignification and nature of "ficera," affure us, that it properly fignifies palm-wine. Pliny acknowledges, that the wine of the palm tree was very well known through all the eaft, and that it was made by taking a bufhel of the dates of the palm tree, and throwing them into three gallons of water; then fqueezing out the juice, it would intoxicate like wine. The wine of the palm tree is white: when it is drunk new, it has the tafte of the cocoa, and is as fweet as honey. When it is kept longer, it grows ftrong, and intoxicates. After long keeping, it becomes vinegar.

SICILIAN, in mufic, denotes a kind of gay fprightly air, or dance, probably invented in Sicily, fomewhat of the nature of an Englifh jig; ufually marked with the characters $\frac{6}{8}$, or $\frac{12}{8}$. It confifts of two ftrains; the firft of four, and the fecond of eight, bars or meafures.

SICILY, an ifland of the Mediterranean Sea, almoft in the form of a triangle, terminating in three points or capes: that which is neareft Italy is called Capo del Faro; that which regards the Morea, Capo Paffero; and the third, which points to Africa, Capo di Boco. Sicily is feparated from the kingdom of Naples by a narrow ftrait called the Faro; but as Meffina is feated on it, it is called the Faro di Meffina. The two kingdoms of Naples and Sicily are under the fame climate, and the productions are much the fame; but Sicily abounds much more in corn, particularly in the valleys of Noto and Mazara. The valley of Demona has more forefts and fruit trees than the two others. Sicily is 165 miles long and 112 broad, and divided into the valleys juft mentioned, called Val di Demona, Val di Noto, and Val di Mazara. In this ifland the antient practice of treading out corn from the ear is in ufe: and here is the celebrated volcano, called Mount Etna. See NAPLES.

SICINNIUS (DENTATUS), a tribune of the people, lived a little after the expulfion of the kings from Rome. He was in 120 battles and fkirmifhes, befides fingle combats, in all of which he came off conqueror. He ferved under nine generals, all of whom triumphed by his means. In thefe battles he received 45 wounds in the fore part of his body, and not one in his back. The fenate made him great prefents, and he was honoured with the name of the Roman Achilles.

SICYOS, in botany: A genus of plants belonging to the clafs of monœcia, and to the order of fyngenefia; and in the natural fyftem arranged under the 34th order, *Cucurbitaceæ*.—

The male flowers have their calyx quinquedentated, their corolla quinquepartite, and there are three filaments. The female flowers have their calyx and corolla similar; but their style is trifid, and their drupa monospermous. There are three species, the *angulata, laciniata*, and *garcini*, which are all foreign plants.

SIDA, *Yellow* or *Indian Mallow*, in botany: A genus of plants belonging to the class of monadelphia, and to the order of polyandria; and in the natural system ranging under the 37th order, *Columniferæ*. The calyx is simple and angulated; the style is divided into many parts; there are several capsules, each containing one seed. There are 27 species. 1. The Spinosa: 2. Angustifolia; 3. Alba; 4. Rhombifolia; 5. Alnifolia; 6. Ciliaris; 7. Retusa; 8. Triquetra; 9. Jamaicensis; 10. Carpinifolia; 11. Viscosa; 12. Cordifolia; 13. Umbellata; 14. Paniculata; 15. Atrosanguinea; 16. Periplocifolia; 17. Urens; 18. Arborea; 19. Occidentalis; 20. Americana; 21. Abutilon; 22. Mauritiana; 23. Asiatica; 24. Indica; 25. Crispa; 26. Cristata; 27. Ternata. The first 18 species have 15 capsules; the rest are multicapsular. They are all natives of warm climates; and most of them are found in the East or West Indies. The Chinese make cords of the *sida abutilon*. This plant loves water; and may be advantageously planted in marshes and ditches, where nothing else will grow. From experiments made by the Abbé Cavanilles, a Spaniard, which are inserted in the *Mem. de l'Acad. Royale*, it appears that the plants succeed best when sown in May, and they arrive at perfection in three months and a half. The maceration of the smaller stalks is finished in about 15 days; of the larger in a month. The strength and goodness of the thread appeared to be in proportion to the perfection of the vegetation, and to the distance the plant was kept at from other plants. The fibres lie in strata, of which there are sometimes six: they are not quite straight, but preserve an undulating direction, so as to form a network in their natural positions. Their smell resembles that of hemp; the fibres are whiter, but more dry and harsh than those of hemp. The harshness is owing to a greenish gluten which connects the fibres; and the white colour must always be obtained at the expense of having this kind of thread less supple; when of its natural hue, it is very soft and flexible. This description belongs chiefly to the sida; but it will also apply to the malva crispa, Peruviana, and Mauritiana. The malva crispa gave, however, the greatest quantity of fibres, and its gluten was most copious. The fibres of the sida abutilon, and the malva crispa, are the longest and the strongest; those of the Peruviana and Mauritiana are the shortest and weakest. The fibres of those plants which had lost their leaves are less strong, though of equal length with those which had preserved them.

SIDDEE, or Sedee: an Arabic title, by which the Abyssinians or Habashys are always distinguished in the courts of Hindostan; where, being in great repute for firmness and fidelity, they are generally employed as commanders of forts or in posts of great trust.

SIDEREAL year. See Astronomy.

SIDERIA, in natural history, the name of a genus of crystals, used to express those altered in their figure by particles of iron. These are of a rhomboidal figure, and composed only of six planes. Of this genus there are four known species. 1. A colourless, pellucid, and thin one; found in considerable quantities among the iron ores of the forest of Dean in Gloucestershire, and in several other places. 2. A dull, thick, and brown one; not uncommon in the same places with the former. And, 3. A black and very glossy kind, a fossil of great beauty: found in the same place with the others, as also in Leicestershire and Sussex.

SIDERITE, a substance discovered by Mr. Meyer, and by him supposed to be a new metal; but Messrs. Bergman and Kirwan have discovered that it is nothing else than a natural combination of the phosphoric acid with iron. Mr. Klaproth of Berlin also came to the same conclusion, without any communication with Mr. Meyer. It is extremely difficult to separate this acid from the metal; however, he found the artificial compound of phosphoric acid and iron to agree in its properties with the calx sideri alba obtained by Bergman and Meyer from the cold-short iron extracted from the swampy or marshy ores. The discovery of this substance, however, may be accounted an important affair in chemistry, as we are thus furnished with an immense quantity of phosphoric acid, which might be applied to useful purposes if it could be separated from the metal.

SIDERITIS, Ironwort, in botany: A genus of plants belonging to the class of didynamia, and to the order of gymnospermia; and in the natural system ranging under the 42d order, *Verticillatæ*. The stamina are within the tube of the corolla. There are two stigmas, one of which is cylindrical and concave; the other, which is lower, is membranous, shorter, and sheathing the other. The species are 13. 1. The Canariensis, or Canary ironwort, which is a native of Madeira and the Canary islands; 2. The Candicans, which is also a native of Madeira; 3. The Syriaca, a native of the Levant; 4. The Perfoliata, a native of the Levant; 5. The Montana, a native of Italy and Austria; 6. The Elegans; 7. The Romana, a native of Italy; 8. The Incana, a native of Spain; 9. The Hyssopifolia, a native of Italy and the Pyrenees; 10. The Scordioides, a native of the south of France; 11. The Hirsuta, which is indigenous in the south of Europe; 12. The Ciliata; 13. The Lanata.

SIDEROXYLON, Iron-wood, in botany: A genus of plants belonging to the class of pentandria, and to the order of monogynia; and in the natural system ranging under the 43d order, *Dumosæ*. The corolla is cut into 10 parts, the laciniæ or segments being incurvated alternately; the stigma is simple; the berry contains five seeds. There are 10 species: 1. Mite; 2. Inerme, smooth iron-wood; 3. Melanophleum, laurel-leaved iron-wood; 4. Fœtidissimum; 5. Cymosum—both natives of the Cape of Good Hope; 6. Sericeum, silky iron-wood, a native of New South Wales; 7. Tenax, silvery-leaved iron-wood, a native of Carolina; 8. Lycioides, willow-leaved iron-wood, a native of North America; 9. Spinosum, thorny iron-wood or argan, a native of Morocco; 10. Decandrum. The wood of these trees being very close and solid has given occasion for this name to be applied to them, it being so heavy as to sink in water. As they are natives of warm countries, they cannot be preserved in this country unless they are placed, the two former in a warm stove, the others in a green-house. They are propagated by seeds, when these can be procured from abroad.

SIDNEY (Sir Philip,) was born, as is supposed, at Penshurst in Kent in the year 1554: His father was sir Henry Sidney, an Irish gentleman, and his mother Mary the eldest daughter of John Dudley duke of Northumberland. He was sent when very young to Christ-church college at Oxford, but left the university at 17 to set out on his travels. After visiting France, Germany, Hungary, and Italy, he returned to England in 1575, and was next year sent by queen Elizabeth as her ambassador to Randolph emperor of Germany. On his return he visited don John of Austria, governor of the Netherlands, by whom he was received with great respect. In 1579, when queen Elizabeth seemed on the point of concluding her long projected marriage with the duke of Anjou, sir Philip wrote her a letter, in which he dissuaded her from the match with unusual elegance of expression, as well as force of reasoning. About this time a quarrel with the earl of Oxford occasioned his withdrawing from court: during which retirement he is supposed to have written his celebrated romance called *Arcadia*.

In 1585, after the queen's treaty with the United States, he was made governor of Flushing and master of the horse. Here he distinguished himself so much both by his courage and con-

duct, that his reputation roſe to the higheſt pitch. He was named, it is pretended, by the republic of Poland as one of the competitors for that crown, and might even have been elected had it not been for the interference of the queen. But his illuſtrious career was ſoon terminated; for in 1586 he was wounded at the battle of Zutphen, and carried to Arnheim, where he ſoon after died. His body was brought to London, and buried in St. Paul's cathedral. He is deſcribed by the writers of that age as the moſt perfect model of an accompliſhed gentleman that could be formed even by the wanton imagination of poetry or fiction. Virtuous conduct, polite converſation, heroic valour, and elegant erudition, all concurred to render him the ornament and delight of the Engliſh court: and as the credit which he enjoyed with the queen and the earl of Leiceſter was wholly employed in the encouragement of genius and literature, his praiſes have been tranſmitted with advantage to poſterity. No perſon was ſo low as not to become an object of his humanity. After the battle of Zutphen, while he was lying on the field mangled with wounds, a bottle of water was brought him to relieve his thirſt; but obſerving a ſoldier near him in a like miſerable condition, he ſaid, *This man's neceſſity is ſtill greater than mine*; and reſigned to him the bottle of water. Beſides his *Arcadia*, he wrote ſeveral ſmaller pieces both in proſe and verſe, which have been publiſhed.

Sidney (Algernon), was the ſecond ſon of Robert earl of Leiceſter, and of Dorothy eldeſt daughter of the earl of Northumberland. He was born about the year 1617. During the civil wars he took part againſt the king, and diſtinguiſhed himſelf as a colonel in the army of the parliament. He was afterwards appointed one of king Charles's judges, but declined appearing in that court. During the uſurpation of Cromwell, Sidney, who was a violent republican, retired to the country, and ſpent his time in writing thoſe diſcourſes on government which have been ſo deſervedly celebrated. After the death of the Protector, he again took part in the public tranſactions of his country, and was abroad on an embaſſy to Denmark when king Charles was reſtored. Upon this he retired to Hamburg, and afterwards to Francfort, where he reſided till 1677, when he returned to England and obtained from the king a pardon. It has been affirmed, but the ſtory deſerves no credit, that during his reſidence abroad king Charles hired ruffians to aſſaſſinate him. After his return he made repeated attempts to procure a ſeat in parliament, but all of them proved unſucceſsful. After the intention of the commons to ſeclude the duke of York from the throne had been defeated by the ſudden diſſolution of parliament, Sidney joined with eagerneſs the councils of Ruſſel, Eſſex, and Monmouth, who had reſolved to oppoſe the duke's ſucceſſion by force of arms. Frequent meetings were held at London; while, at the ſame time, a ſet of ſubordinate conſpirators, who were not, however, admitted into their confidence, met and embraced the moſt deſperate reſolutions. Keiling, one of theſe men, diſcovered the whole conſpiracy; and Algernon Sidney, together with his noble aſſociates, was immediately thrown into priſon, and no art was left unattempted in order to involve them in the guilt of the meaner conſpirators.

Howard, an abandoned nobleman, without a ſingle ſpark of virtue or honour, was the only witneſs againſt Sidney; but as the law required two, his diſcourſes on government, found unpubliſhed in his cloſet, were conſtrued into treaſon, and declared equivalent to another witneſs. It was vain for Sidney to plead that papers were no legal evidence; that it could not be proved they were written by him; and that, if they were, they contained nothing treaſonable. The defence was over-ruled; he was declared guilty, condemned, and executed! His attainder was reverſed in the firſt year of king William.

He was a man of extraordinary courage; ſteady even to obſtinacy; of a ſincere but rough and boiſterous temper. Though he profeſſed his belief in the Chriſtian religion, he was an enemy to an eſtabliſhed church, and even, according to Burnet, to every kind of public worſhip. In his principles he was a zealous republican: government was always his favourite ſtudy; and his eſſays on that ſubject are a proof of the progreſs which he made in it.

SIDON (anc. geog.), a city of Phœnicia in Aſia, famous in Scripture for its riches, ariſing from the extenſive commerce carried on by its inhabitants. Heavy judgments were denounced againſt the Sidonians on account of their wickedneſs, which were accompliſhed in the time of Ochus king of Perſia: for, that monarch having come againſt them with an army on account of their rebellion, the city was betrayed by its king; upon which the wretched inhabitants were ſeized with deſpair; they ſet fire to their houſes, and 40,000, with their wives and children, periſhed in the flames. This city is now called *Saide*, and, according to Mr. Bruce's account, not only its harbour is filled up with ſand, but the pavement of the antient city ſtood $7\frac{1}{2}$ feet lower than the ground on which the preſent city ſtands.

Sidon, or Sayd, a ſeaport of Paleſtine, antiently a place of great ſtrength and extenſive trade. It is ſtill of ſome note, has a good caſtle, and a well-frequented harbour, and is the reſidence of a Turkiſh baſhaw. It is 45 miles W. of Damaſcus. E. lon. 36. 5. N. lat. 33. 53.

SIDUS Georgium, in aſtronomy, a new primary planet, diſcovered by Dr. Herſchel in the year 1781. By moſt foreign, and even by ſome Britiſh philoſophers, it is known by the name of *Herſchel*, an honour which is due to the diſcoverer. As the other planets are diſtinguiſhed by marks or characters, the planet Herſchel is diſtinguiſhed by an H, the initial letter of the diſcoverer's name, and a croſs to ſhow that it is a Chriſtian planet. From many calculations of our beſt aſtronomers and mathematicians, ſays Dr. Herſchel, I have collected the following particulars, as moſt to be depended upon.

Place of the node - - -	$2^s\ 11^d\ 49'\ 30''$	
Inclination of the orbit - -	$43'\ 35''$	
Place of the perihelion - -	$172^d\ 13'\ 17''$	
Time of the perihelion paſſage -	Sep. 7. 1799.	
Eccentricity of the orbit	,82034	
Half the greater axis	19,07904	
Revolution - - -	83,3364	ſiderial years.

From my own obſervations on this planet's apparent diameter, which I have found cannot well be leſs than 4″, nor indeed much greater, we infer that its real diameter is to that of the earth as 4,454 to 1; and hence it appears to be of very conſiderable bulk, and, except Saturn and Jupiter, by far the largeſt of the remaining planets. Its light is of a blueiſh-white colour, and in brilliancy between that of the Moon and of Venus. With a teleſcope which magnifies about 300 times, it appears to have a very well defined viſible diſk; but with inſtruments of a ſmall power, it can hardly be diſtinguiſhed from a fixed ſtar of between the ſixth and ſeventh magnitude. In a very fine clear night, when the moon is abſent, it may alſo be diſcovered by the naked eye.

SIEGE, in the art of war, is to ſurround a fortified place with an army, and approach it by paſſages made in the ground, ſo as to be covered againſt the fire of the place.

SIEGEN, a town of Germany in Wetteravia, with a caſtle and the title of a principality, which it gives to a branch of the houſe of Naſſau. It is ſeated on a river of the ſame name, in E. lon. 8. 5. N. lat. 50. 53.

SIENNA, a large, antient, and celebrated city of Tuſcany in Italy; capital of the Sienneſe, with an archbiſhop's ſee, a famous univerſity, and a citadel. It is about four miles in circumference, and ſurrounded with an old wall. The metropolitan church is much eſteemed by travellers; and though it is a Gothic

ſtructure, the architecture is admirable. It is built with black and white marble, and the pavement is of Moſaic work. The town is adorned with a great number of palaces, fountains, and ſuperb churches, as alſo a magnificent hoſpital. The great area is round, and the houſes about it are of the ſame height, ſupported by piazzas, under which people may walk in hot or rainy weather; in the middle is a baſon, which can be filled with water at any time, to repreſent a ſea-fight with ſmall veſſels. The Italian language is taught here with ſuch purity, that a great many foreigners frequent it on that account. It is ſeated on three eminences, in a moſt fertile ſoil, in E. lon. 11. 11. N. lat. 43. 10.

SIENNESE, a duchy in Italy; bounded on the north by the Florentino, on the ſouth by the Mediterranean ſea and the duchy of Caſtro, on the eaſt by the Perugino and Orvietano, and on the weſt by the Florentino and the Tuſcan ſea; being about 55 miles in length, and as much in breadth. The ſoil is pretty fertile, eſpecially in mulberry trees, which feed a great number of ſilk-worms; and there are ſeveral mineral ſprings. Sienna is the capital town.

SIERRA LEONE, a country on the weſt coaſt of Africa, ſo named, according to ſome authors, by the Portugueſe, on account of its mountains on this coaſt abounding with lions. Some extend its limits from the Grain Coaſt on the ſouth-eaſt, to Cape Verga or Vega on the north-weſt; that is, between 7 and 10° N. lat. Others, however, confine the country between Cape Verga and Cape Tagrin. In the open and plain parts, on the banks of a river of the ſame name, the heat of the ſun, before any breeze ariſes, is almoſt intolerable; but as a refreſhing gale conſtantly ſprings up about noon, it renders the country ſupportable. The whole tract, on each ſide the river, is rich in rice and millet, which is the chief ſuſtenance of the inhabitants; and, upon the whole, it is one of the beſt countries on the coaſt.

Sierra Leone, a river of Africa, in a country of the ſame name. Its ſource is uncertain; but its mouth, in W. lon. 12. 30. N. lat. 8. 15. is nine miles wide. In 1791, an act of parliament was obtained, incorporating a company, called the Sierra Leone Company, for the purpoſe of cultivating Weſt India and other tropical productions on the banks of this river. The firſt ſettlers amounted to 200 white perſons, beſide a number of free blacks from Nova Scotia. The natives appeared to be extremely friendly, and a few, in 1792, had come to work for the colony. On the ſetting-in of the rains, about the latter end of May, the ſame year, a degree of ſickneſs and mortality prevailed, occaſioned chiefly by the inſufficiency of the temporary habitations, which could not be completed before the rains ſet in. Thirty-five white perſons (of whom fourteen were ſoldiers) and many of the blacks died of this ſickneſs. The next year, the ſetting-in of the rains was not productive of the ſame fatal effects. The coloniſts were in good health, were all put into poſſeſſion of ſmall lots of land, and a new town, on a regular and extended ſcale, was begun to be built. Beſide the Nova Scotia blacks, a large party of the natives were at work for the company, and the experiments in ſugar, cotton, &c. appeared to be promiſing. The native chiefs and people continued to be extremely friendly; and the company's ſchools were regularly attended by 300 children, among whom were ſome children of the natives. In Sept. 1794, a French ſquadron deſtroyed the ſettlement, and captured ſeveral of the company's ſhips; but from this diſaſter they have ſince recovered; and a factory was eſtabliſhed in the Rio Pongos, in 1795, which is likely to become the means of a lucrative trade.

SIERRA morena, mountains of Andaluſia in Spain.

SIEUR, a title of reſpect among the French, like that of *maſter* among us. It is much uſed by lawyers, as alſo by ſuperiors in their letters to inferiors.

SIFANTO, or Siphanto, an iſland of the Archipelago, to the weſt of Paros, to the north eaſt of Milo, and to the ſouth-weſt of Serphanto. The air is ſo good here, that many of the inhabitants live to the age of 120; and their water, fruits, wild fowl, and poultry, are excellent, but more eſpecially the grapes. It abounds with marble and granite, and is one of the moſt fertile and beſt cultivated of theſe iſlands. The inhabitants employ themſelves in cultivating olive-trees and capers; and they have very good ſilk. They trade in figs, onions, wax, honey, and ſtraw-hats; and may be about 8000 in all. E. lon. 25. 15. N. lat. 37. 9.

SI-FANS, or tou-fans, a people inhabiting the country on the weſt of China. Their country is only a continued ridge of mountains, incloſed by the rivers Hoang-ho on the north, Yalong on the weſt, and Yang-tſe-kiang on the eaſt, between the 30th and 35th degrees of north latitude.

The Si-fans are divided into two kinds of people; the one are called by the Chineſe *Black Si-fans*, the other *Yellow*; names which are given them from the different colours of their tents. The black are the moſt clowniſh and wretched; they live in ſmall bodies, and are governed by petty chiefs, who all depend upon a greater. The yellow Si-fans are ſubject to families, the oldeſt of which becomes a lama, and aſſumes the yellow dreſs. Theſe lama princes, who command in their reſpective diſtricts, have the power of trying cauſes, and puniſhing criminals; but their government is by no means burdenſome; provided certain honours are paid them, and they receive punctually the dues of the god Fo, which amount to very little, they moleſt none of their ſubjects. The greater part of the Si-fans live in tents; but ſome of them have houſes built of earth, and even brick. Their habitations are not contiguous; they form at moſt but ſome ſmall hamlets, conſiſting of five or ſix families. They feed a great number of flocks, and are in no want of any of the neceſſaries of life. The principal article of their trade is rhubarb, which their country produces in great abundance. Their horſes are ſmall; but they are well ſhaped, lively, and robuſt.

Theſe people are of a proud and independent ſpirit, and acknowledge with reluctance the ſuperiority of the Chineſe government, to which they have been ſubjected: when they are ſummoned by the mandarins they rarely appear; but the government, for political reaſons, winks at this contempt, and endeavours to keep theſe intractable ſubjects under by mildneſs and moderation: it would, beſides, be difficult to employ rigorous means in order to reduce them to perfect obedience; their wild and frightful mountains (the tops of which are always covered with ſnow, even in the month of July) would afford them places of ſhelter, from which they could never be driven by force. The cuſtoms of theſe mountaineers are totally different from thoſe of the Chineſe. It is, for example, an act of great politeneſs among them to preſent a white handkerchief of taffety or linen, when they accoſt any perſon whom they are deſirous of honouring. All their religion conſiſts in their adoration of the god Fo, to whom they have a ſingular attachment: their ſuperſtitious veneration extends even to his miniſters, on whom they have conſidered it as their duty to confer ſupreme power and the government of the nation.

SIGAULTIAN operation, a method of delivery in caſes of difficult labour, firſt practiſed by M. Sigault. It conſiſts in enlarging the dimenſions of the pelvis, in order to procure a ſafe paſſage to the child without injuring the mother. See Midwifery.

SIGESBECKIA, in botany: A genus of plants belonging to the claſs of ſyngeneſia, and to the order of polygamia ſuperflua: and in the natural ſyſtem ranging under the 49th order, *Compoſitæ*. The receptacle is paleaceous: the pappus is wanting; the exterior calyx is pentaphyllous, proper, and ſpreading;

the radius is halved. There are three ſpecies: 1. The *orientalis*, which is a native of India and China. 2. The *occidentalis*, which is a native of Virginia. 3. The *floſculoſa*, a native of Peru.

SIGETH, a town of Lower Hungary, and capital of a county of the ſame name. It is ſeated in a moraſs, and has a triple wall, with ditches full of water; and is defended by a citadel, being one of the ſtrongeſt places in Hungary. It now belongs to the houſe of Auſtria, and was retaken from the Turks in 1669, after it had been blocked up two years. In ſome maps it is called *Zigat*. E. lon. 18. 58. N. lat. 46. 17.

SIGHING, an effort of nature, by which the lungs are put into greater motion, and more dilated, ſo that the blood paſſes more freely, and in greater quantity, to the left auricle, and thence to the ventricle. Hence we learn, ſays Dr. Hales, how ſighing increaſes the force of the blood, and conſequently proportionably cheers and relieves nature, when oppreſſed by its too ſlow motion, which is the caſe of thoſe who are dejected and ſad.

SIGHT, or VISION. See ANATOMY and OPTICS.

Imperfection of Sight with regard to colours. Under the article COLOURS, is given an inſtance of a ſtrange deficiency of ſight in ſome people, who could not diſtinguiſh between the different colours. In the Phil. Tranſ. vol. lxviii. p. 611, we have an account of a gentleman who could not diſtinguiſh a claret colour from black. Theſe imperfections are totally unaccountable from any thing we yet know concerning the nature of this ſenſe.

Second SIGHT. See SECOND *Sight*.

SIGN, in general the mark or character of ſomething abſent or inviſible. See CHARACTER. Among phyſicians the term *ſign* denotes ſome appearance in the human body which ſerves to indicate or point out the condition of the patient with regard to health or diſeaſe.

SIGN, in algebra. See ALGEBRA.

SIGN, in aſtronomy, a conſtellation containing a 12th part of the zodiac. See ASTRONOMY.

SIGNALS, certain alarms or notices uſed to communicate intelligence to a diſtant obſerver. Signals are made by firing artillery, and diſplaying colours, lanterns, or fire-works; and theſe are combined by multiplication and repetition. Thus, like the words of a language, they become arbitrary expreſſions, to which we have previouſly annexed particular ideas: and hence they are the general ſources of intelligence throughout a naval armament, &c.

Signals ought to be diſtinct, with ſimplicity. They are ſimple when every inſtruction is expreſſed by a particular token, in order to avoid any miſtakes ariſing from the double purport of one ſignal. They are diſtinct when iſſued without precipitation, when ſufficient time is allowed to obſerve and obey them, and when they are expoſed in a conſpicuous place, ſo as to be readily perceived at a diſtance.

All ſignals may be reduced into three different kinds, viz. thoſe which are made by the ſound of particular inſtruments, as the trumpet, horn, or fife; to which may be added, ſtriking the bell or beating the drum. Thoſe which are made by diſplaying pendants, enſigns, and flags of different colours; or by lowering or altering the poſition of the ſails; and, finally, thoſe which are executed by rockets of different kinds; by firing cannon or ſmall arms; by artificial fire-works; and by lanthrens.

Firing of great guns will ſerve equally in the day or night, or in a fog, to make or confirm ſignals, or to raiſe the attention of the hearers to a future order. This method, however, is attended with ſome inconveniences, and ſhould not be uſed indiſcriminately. Too great a repetition of the cannon is apt to introduce miſtakes and confuſion, as well as to diſcover the track of the ſquadron. The report and flight of the rockets is liable to the ſame objection, when at a ſhort diſtance from the enemy.

It is then, by the combination of ſignals, previouſly known, that the admiral conveys orders to his fleet; every ſquadron, every diviſion, and every ſhip of which has its particular ſignal. The inſtruction may therefore occaſionally be given to the whole fleet, or to any of its ſquadrons; to any diviſion of thoſe ſquadrons, or to any ſhip of thoſe diviſions.

Hence the ſignal of command may at the ſame time be diſplayed for three diviſions, and for three ſhips of each diviſion; or for three ſhips in each ſquadron, and for only nine ſhips in the whole fleet. For, the general ſignal of the fleet being ſhown, if a particular pendant be alſo thrown out from ſome particular place on the ſame maſt with the general ſignal, it will communicate intelligence to nine ſhips that wear the ſame pendant.

The preparatory ſignal given by the admiral to the whole or any part of his fleet, is immediately anſwered by thoſe to whom it is directed; by ſhowing the ſame ſignal, to teſtify that they are ready to put his orders in execution. Having obſerved their anſwer, he will ſhow the ſignal which is to direct their operations: as, To chace, to form the line, to begin the engagement, to board, to double upon the enemy, to rally or return to action, to diſcontinue the fight, to retreat and ſave themſelves. The dexterity of working the ſhips in a fleet depends on the preciſe moment of executing theſe orders, and on the general harmony of their movements; a circumſtance which evinces the utility of a ſignal of preparation.

As the extent of the line of battle, and the fire and ſmoke of the action, or other circumſtances in navigation, will frequently prevent the admiral's ſignals from being ſeen throughout the fleet, they are always repeated by the officers next in command; by ſhips appointed to repeat ſignals; and, finally, by the ſhip or ſhips for which they are intended.

The ſhips that repeat the ſignals, beſides the chiefs of ſquadrons or diviſions, are uſually frigates lying to windward or to leeward of the line. They ſhould be extremely vigilant to obſerve and repeat the ſignals, whether they are to tranſmit the orders of the commander in chief, or his ſeconds, to any part of the fleet; or to report the fortunate or diſtreſsful ſituation of any part thereof. By this means all the ſhips from the van to the rear will, unleſs diſabled, be ready at a moment's warning to put the admiral's deſigns in execution.

To preſerve order in the repetition of ſignals, and to favour their communication, without embarraſſment, from the commander in chief to the ſhip for which they are calculated, the commanders of the ſquadrons repeat after the admiral; the chiefs of the diviſions, according to their order of the line, after the commanders of the ſquadrons; and the particular ſhips after the chiefs of the diviſions; and thoſe in return, after the particular ſhips, *vice verſa*, when the object is to convey any intelligence from the latter to the admiral.

Beſides the ſignals above mentioned, there are others for different ranks of officers; as for captains, lieutenants, maſters, &c. or for any of thoſe officers of a peculiar ſhip.

SIGNALS *by the Drum*, made uſe of, in the exerciſe of the army, inſtead of the word of command, viz.

SIGNALS.	*Operations.*
A ſhort roll, -	To caution.
A flam, -	To perform any diſtinct thing.
To arms, - -	To form the line or battalion.
The march, - -	To advance, except when intended for a ſalute.
The quick march, -	To advance quick.
The point of war, -	To march and charge.
The retreat, - -	To retreat.
Drum ceaſing, -	To halt.

Two short rolls, - -	To perform the flank-firing.
The dragoon march, -	To open the battalion.
The grenadier march, -	To form the column.
The troop, - -	To double divisions.
The long roll, - -	To form the square.
The grenadier march,	To reduce the square to the column.
The preparative, - -	To make ready and fire.
The general, - -	To cease firing.
Two long rolls, - -	To bring or lodge the colours.

SIGNATURE, a sign or mark impressed upon any thing, whether by nature or art. Such is the general signification of the word; but in the plural number it has been used in a particular sense, to denote those external marks by which physiognomists and other dabblers in the occult sciences pretend to discover the nature and internal qualities of every thing on which they are found. According to Lavater, every corporeal object is characterised by signatures peculiar to itself.

The doctrine of signatures, like alchemy and astrology, was very prevalent during the 15th and 16th centuries; and was considered as one of the occult sciences which conferred no small degree of honour on their respective professors. Some of these philosophers, as they thought fit to style themselves, maintained that plants, minerals, and animals, but particularly plants, had signatures impressed on them by the hand of nature, indicating to the adept the *therapeutic* uses to which they might be applied. Others, such as the mystic theosophists and chemists of that day, proceeded much further in absurdity, maintaining that every substance in nature had either *external* signatures, immediately discernible, or *internal* signatures, which, when brought into view by fire or menstrua, denoted its connection with some siderial or celestial archetype. Of the doctrine of signatures, as it relates merely to the therapeutic uses of plants and minerals, traces are to be found in the works of some of the greatest authors of antiquity; but the celestial signatures, we believe, were discovered only by the moonlight of the monkish ages. Pliny informs us that the marble called *ophites*, from its being spotted like a serpent, was discovered by those spots to be a sovereign remedy for the bite of that animal; and that the colour of the *hæmatites* or blood-stone intimated that it was fit to be employed to stop an hemorrhagy; but we do not recollect his attributing the virtues of these minerals to a siderial or celestial influence.

SIGNATURE, a signing of a person's name at the bottom of an act or deed written by his own hand.

SIGNATURE, in printing, is a letter put at the bottom of the first page at least, in each sheet, as a direction to the binder in folding, gathering, and collating them. The signatures consist of the capital letters of the alphabet, which change in every sheet: if there be more sheets than letters in the alphabet, to the capital letter is added a small one of the same sort, as A a, B b; which are repeated as often as necessary. In large volumes it is easy to distinguish the number of alphabets, after the first three or four, by placing a figure before the signature, as 5 B, 6 B, &c.

SIGNET, one of the king's seals, made use of in sealing his private letters, and all grants that pass by bill signed under his majesty's hand: it is always in the custody of the secretaries of state.

SIGNET, in Scots law. See LAW.

SILENE, CATCHFLY, or *Viscous Campion*, in botany: A genus of plants belonging to the class of *decandria*, and order of *trigynia*; and in the natural system arranged under the 22d order, *caryophyllei*. The calyx is ventricose; the petals are five in number, bifid and unguiculated, and crowned by a nectarium; the capsule is cylindrical, covered, and trilocular. There are 26 species, of which 7 are natives of Britain and Ireland. 1. *Anglica*, the small corn campion or catchfly. The stem is weak, hairy, and above a foot high; the leaves are oblong, and grow in pairs at the joints; the flowers are small, white, and entire; they stand on footstalks which issue from the alæ of the leaves; they are erect, alternate, single, and lateral. It grows in corn-fields, and flowers in June and July. 2. *Nutans*, Nottingham catchfly. The stem is about two feet high, and firm: the radical leaves are broad, obtuse, and grow in a tuft; those on the stem are narrow and acute: the flowers are white, and grow in lateral panicles; the petals are bifid and curled; the calyx is long, bellying a little, with ten longitudinal striæ. It grows in pastures, and flowers in June and July. 3. *Amœna*, sea-campion. The stem is two or three feet long, slender, procumbent, and branched alternately: the leaves are long and narrow: the flowers are white, and grow on opposite footstalks, three on each, in unilateral bunches: the calyx is hairy and purplish, and has ten angles. It grows on the south coast, and flowers in June and July. 4. *Conoidea*, greater corn catchfly, or campion. The leaves are narrow and soft; the calyx is conical, with 30 striæ; the flowers proceed from the divarications of the stem; the petals are entire. It grows in corn-fields, and flowers in June. 5. *Noctiflora*, night-flowering catchfly. The stem is about two feet high, and forked; the calyx has ten angles, is somewhat clammy, and oval, with longer teeth than the other species; the petals are of a reddish white. 6. *Armeria*, broad-leaved catchfly. The stem is about 18 inches high, and erect, with few branches; the leaves are smooth, sessile, and broad at the base; the flowers are terminal, in fastigiate bundles, small, and red. It may be seen on the banks of rivers, and is in flower in July and August. 7. *Acaulis*, moss campion. The radical leaves are spread on the ground like a tuft of moss; the stalks are about an inch long, and naked, bearing each a single purple flower. This last species grows on mountains, and has been found, in Wales and Scotland, within half a mile from their top. It is in flower in July.

SILESIA, a duchy of Germany, 274 miles long and 100 broad; bounded on the north by Brandenburg and Poland, on the south by Moravia and Hungary, on the east by Poland, and on the west by Lower Lusatia and Bohemia. The principal rivers are the Oder, Vistula, Neisse, Bober, Queis, Oppa, and Else. A long chain of mountains separates Silesia from Bohemia: the highest mountain, called Zotenberg, is in the principality of Schweidnitz, and is 104 miles in circumference. There are mines of gold and silver, but they are not worked; also some precious stones, but too much time is required to obtain them. There are also mines of lead, copper, and iron, and quarries of various stones, beside antimony, saltpetre, sulphur, alum, vitriol, quicksilver, &c. The principal manufacture is linen cloth; and there are also some woollen manufactures and glass-houses. In this country are a great number of cattle, large studs of horses, and plenty of game in the woods. It has but few lynxes and bears, and fewer wolves, because a ducat a head is given for every one that is killed. There are many lakes full of pike, carp, and other good fish; also plenty of bees, which produce much honey and wax. It affords wheat, barley, oats, millet, and turnips, sufficient for the use of the inhabitants; and in some places saffron is cultivated; but its wine is bad, and therefore is turned mostly into vinegar. Silesia is divided into the Upper and Lower. In the Upper, the inhabitants are generally Roman catholics, speaking the Polish language: in the Lower, they are almost all protestants, and speak their mother tongue. It is also divided into 17 small duchies, and seven free states, exclusive of the county of Glatz. The greatest part of this country was ceded to the king of Prussia, in 1742, by the treaty of Breslaw.

SILESIAN EARTH, in the materia medica, a fine astringent bole. It is very heavy, of a firm compact texture, and in colour of a brownish yellow. It breaks easily between the fingers, and does not stain the hands; is naturally of a smooth surface, is readily diffusible in water, and melts freely into a butter-like substance in the mouth. It leaves no grittiness between the teeth, and does not ferment with acid menstrua. It is found in

the perpendicular fiffures of rocks near the gold-mines at Strigonium in Hungary, and is fuppofed to be impregnated with the fulphur of that metal. It is a good aftringent, and better than moft of the boles in ufe.

SILEX. See Flint.

SILICEOUS earths. See Mineralogy.

SILICERNIUM, among the Romans, was a feaft of a private nature, provided for the dead fome time after the funeral. It confifted of beans, lettuces, bread, eggs, &c. Thefe were laid upon the tomb, and they foolifhly believed that the dead would come out for the repaft. What was left was generally burnt on the ftone. The word *filicernium* is derived from *filex* and *cœna*, i. e. "a fupper upon a ftone." Eating what had thus been provided for the dead, was efteemed a mark of the moft miferable poverty. A fimilar entertainment was made by the Greeks at the tombs of the deceafed; but it was ufual among them to treat the ghofts with the fragments from the feaft of the living. See Funeral and Inferiæ.

SILIUS ITALICUS (Caius), an antient Roman poet, and author of an epic poem, in feventeen books, which contains an account of the fecond Punic war, fo famous in hiftory for having decided the empire of the world in favour of the Romans. He was born in the reign of Tiberius, and is fuppofed to have derived the name of Italicus from the place of his birth; but whether he was born at Italica in Spain, or at Corfinium in Italy, which according to Strabo had the name of Italica given it during the focial war, is a point which cannot be known. When he came to Rome, he applied himfelf to the bar; and by a clofe imitation of Cicero fucceeded fo well, that he became a celebrated advocate and moft accomplifhed orator. His merit and character recommended him to the higeft offices in the republic, even to the confulfhip, of which he was poffeffed when Nero died. He is faid to have been aiding and affifting in accufing perfons of high rank and fortune whom that wicked emperor had devoted to deftruction: but he retrieved his character afterwards by a long and uniform courfe of virtuous behaviour. Hd held a principal place under the emperor Vitellius, which he executed fo well, that he preferved his credit with the public. Vefpafian fent him as proconful into Afia, where he behaved with unblemifhed reputation. After having thus fpent the beft part of his life in the fervice of his country, he bid adieu to public affairs, refolving to confecrate the remainder to a polite retirement and the Mufes. He had feveral fine villas in the country; one at Tufculum, celebrated for having been Cicero's; and a farm near Naples, faid to have been Virgil's, and at which was his tomb, which Silius often vifited. He fpent many years in thefe retirements; till at laft he was feized with an incurable ulcer, which afflicted him with infupportable pains, and drove him to put an end to his life by refraining from fuftenance. This was a common practice among the Romans, and, according to the principles of the Stoics, an act of bravery.

SILK, a very foft, fine, bright thread, the work of an infect called *bombyx*, or the filk worm.

As the filk worm is a native of China, the culture of filk in antient times was entirely confined to that country. We are told that the empreffes, furrounded by their women, fpent their leifure hours in hatching and rearing filk worms, and in weaving tiffues and filk veils. That this example was foon imitated by perfons of all ranks, we have reafon to conclude; for we are informed that the Chinefe, who were formerly clothed in fkins, in a fhort time after were dreffed in veftments of filk. Till the reign of Juftinian, the filk worm was unknown beyond the territories of China, but filk was introduced into Perfia long before that period. After the conqueft of the Perfian empire by Alexander the Great, this valuable commodity was brought into Greece, and thence conveyed to Rome. The firft of the Roman writers extant by whom filk is mentioned, are Virgil and Horace; but it is probable that neither of them knew from what country it was obtained, nor how it was produced. By fome of the antients it was fuppofed to be a fine down adhering to the leaves of certain trees or flowers. Others imagined it to be a delicate fpecies of wool or cotton; and even thofe who had learned that it was the work of an infect, fhow by their defcriptions that they had no diftinct idea of the manner in which it was formed. Among the Romans, filk was deemed a drefs too expenfive and too delicate for men, and was appropriated wholly to women of eminent rank and opulence. Elagabulus is faid to have been the firft man among the Romans who wore a garment of fine filk. Aurelian complained that a pound of filk was fold at Rome for 12 ounces of gold; and it is faid he refufed to give his wife permiffion to wear it on account of its exorbitant price.

For feveral centuries the Perfians fupplied the Roman empire with the filks of China. Caravans traverfed the whole latitude of Afia, in 243 days, from the Chinefe ocean to the fea-coaft of Syria, carrying this commodity. Sometimes it was conveyed to the ports of Guzerat and Malabar, and thence tranfported by fea to the Perfian Gulph. The Perfians, with the ufual rapacity of monopolifts, raifed the price of filk to fuch an exorbitant height, that Juftinian, eager not only to obtain a full and certain fupply of a commodity which was become of indifpenfable ufe, but folicitous to deliver the commerce of his fubjects from the exactions of his enemies, endeavoured, by means of his ally, the Chriftian monarch of Abyffinia, to wreft fome portion of the filk trade from the Perfians. In this attempt he failed; but when he leaft expected it, he, by an unforefeen event, attained, in fome meafure, the object which he had in view. Two Perfian monks having been employed as miffionaries in fome of the Chriftian churches, which were eftablifhed (as we are informed by Cofmas) in different parts of India, had penetrated into the country of the Seres, or China. There they obferved the labours of the filk worm, and became acquainted with all the arts of man in working up its productions into fuch a variety of elegant fabrics. The profpect of gain, or perhaps an indignant zeal, excited by feeing this lucrative branch of commerce engroffed by unbelieving nations, prompted them to repair to Conftantinople. There they explained to the emperor the origin of filk, as well as the various modes of preparing and manufacturing it, myfteries hitherto unknown, or very imperfectly underftood in Europe; and encouraged by his liberal promifes, they undertook to bring to the capital a fufficient number of thofe wonderful infects, to whofe labours man is fo much indebted. This they accomplifhed, by conveying the eggs of the filk worm in a hollow cane. They were hatched by the heat of a dunghill, fed with the leaves of a wild mulberry tree, and they multiplied and worked in the fame manner as in thofe climates where they firft became objects of human attention and care. Vaft numbers of thefe infects were foon reared in different parts of Greece, particularly in the Peloponnefus. Sicily afterwards undertook to breed filk worms with equal fuccefs, and was imitated, from time to time, in feveral towns of Italy. In all thefe places extenfive manufactures were eftablifhed and carried on with filk of domeftic production. The demand for filk from the eaft diminifhed of courfe, the fubjects of the Greek emperors were no longer obliged to have recourfe to the Perfians for a fupply of it, and a confiderable change took place in the nature of the commercial intercourfe between Europe and India.

As filk is the production of a worm, it will be firft neceffary to give a defcription of its nature and mode of manufacturing. But before we give any account of the moft approved methods of managing filk worms in Europe, it will be proper to prefent a fhort defcription of the methods practifed in China, the original country of the filk worm. Thefe are two: they either permit them to remain at liberty on mulberry trees, or keep them in rooms. As the fineft filk is produced by worms confined in rooms, and as the firft method is very fimple, it will fuffice to defcribe the fecond.

To begin with the eggs, which are laid on large fheets of

paper, to which they firmly adhere. The sheets are hung up on a beam of the room, with the eggs inward, and the windows are opened in the front to admit the wind; but no hempen ropes must ever come near the worms or their eggs. After some days the sheets are taken down, rolled up loosely with the eggs inward, and then hung up again, during the summer and autumn. At the end of December, or the beginning of January, the eggs are put into cold water, with a little salt dissolved in it. Two days after, they take them out, hang them up again, and when dry roll them a little tighter, and enclose each separately, standing on one end in an earthen vessel. Some put them into a ley made of mulberry tree ashes, and then lay them some moments in snow-water, or else hang them up three nights on a mulberry tree to receive the snow or rain, if not too violent. The time of hatching them is when the leaves of the mulberry trees begin to open, for they are hastened or impeded according to the different degrees of heat or cold to which they are exposed. When they are ready to come forth, the eggs swell, and become a little pointed.

The third day before they are hatched, the rolls of paper are taken out of the vessel, stretched out, and hung up with their backs toward the sun, till they receive a kindly warmth; and then being rolled up close, they are set upright in a vessel in a warm place. This is repeated the next day, and the eggs change to an ash gray. They then put two sheets together, and rolling them close tie the ends.

The third day, towards night, the sheets are unrolled and stretched on a fine mat, when the eggs appear blackish. They then roll three sheets together, and carry them into a pretty warm place, sheltered from the south wind. The next day the people taking out the rolls, and opening them, find them full of worms like small black ants.

The apartment chosen for silk worms is on a dry ground, in a pure air, and free from noise. The rooms are square, and very close, for the sake of warmth; the door faces the south, and is covered with a double mat, to keep out the cold; yet there should be a window on every side, that when it is thought necessary the air may have a free passage. In opening a window to let in a refreshing breeze, care must be taken to keep out the gnats and flies. The room must be furnished with nine or ten rows of frames, about nine inches one above the other. On these they place rush hurdles, upon which the worms are fed till they are ready to spin; and, to preserve a regular heat, stove fires are placed at the corners of the room, or else a warming pan is carried up and down it; but it must not have the least flame or smoke. Cow-dung dried in the sun is esteemed the most proper fuel.

The worms eat equally day and night. The Chinese give them on the first day forty-eight meals, that is, one every half-hour; the next thirty; the third day they have still less. As cloudy and rainy weather takes away their stomach, just before their repast a wisp of very dry straw, the flame of which must be all alike, is held over the worms to free them from the cold and moisture that benumbs them, or else the blinds are taken from the windows to let in the full day-light.

Eating so often hastens their growth, on which the chief profit of the silk worm depends. If they come to maturity in 23 or 25 days, a large sheet of paper covered with worms, which at their first coming from the eggs weigh little more than a drachm, will produce 25 ounces of silk; but if not till 28 days, they then yield only 20 ounces; and if they are a month or 40 days in growing, they then produce but ten.

They are kept extremely clean, and are often removed: and when they are pretty well grown, the worms belonging to one hurdle are divided into three, afterwards they are placed on six, and so on to the number of 20 or more; for, being full of humours, they must be kept at a due distance from each other. The critical moment for removing them is when they are of a bright yellow, and ready to spin; they must be surrounded with mats at a small distance, which must cover the top of the place to keep off the outward air; and because they love to work in the dark. However, after the third day's labour, the mats are taken away from one o'clock till three, but the rays of the sun must not shine upon them. They are at this time covered with the sheets of paper that were used on the hurdles.

The cocoons are completed in seven days, after which the worm is metamorphosed into a chrysalis; the cocoons are then gathered, and laid in heaps, having first set apart those designed for propagation upon a hurdle, in a cool airy place. The next care is to kill the moths in those cones which are not to be bored. The best way of doing this is to fill large earthen vessels with cones in layers of ten pounds each, throwing in four ounces of salt with every layer, and covering it with large dry leaves like those of the water-lily, and closely stopping the mouth of the vessels. But in laying the cones into the vessels, they separate the long, white, and glittering ones, which yield a very fine silk, from those that are thick, dark, and of the colour of the skin of an onion, which produce a coarser silk.

The silk worm is a species of caterpillar, which, like all others of the same class, undergoes a variety of changes, that, to persons who are not acquainted with objects of this kind, will appear to be not a little surprising.

It is produced from a yellowish coloured egg, about the size of a small pin head, which has been laid by a kind of grayish coloured moth, which the vulgar confound with the butterfly.

These eggs, in the temperature of this climate, if kept beyond the reach of the fire and sun shine, may be preserved during the whole of the winter and spring months without danger of hatching: and even in summer they may easily be prevented from hatching if they be kept in a cool place; but in warmer climates it is scarcely possible to preserve them from hatching, even for a few days, or from drying so much as to destroy them. Hence it is easy for a native of Britain to keep the eggs till the food on which the worm is to feed be ready for that purpose. When this food is in perfection, the eggs need only be exposed to the sun for a day or two, when they will be hatched with great facility.

When the animal is first protruded from the egg, it is a small black worm, which is active, and naturally ascends to the top of the heap in search of food. At this stage of his growth the silk worm requires to be fed with the youngest and most tender leaves. On these leaves, if good, he will feed very freely for about eight days, during which period he increases in size to about a quarter of an inch in length. He is then attacked with his first sickness, which consists in a kind of lethargic sleep for about three days continuance; during which time he refuses to eat, and changes his skin, preserving the same bulk. This sleep being over, he begins to eat again, during five days, at which term he is grown to the size of full half an inch in length; after which follows a second sickness in every respect like the former.

He then feeds for other five days; during which time he will have increased to about three quarters of an inch in length, when he is attacked with his third sickness. This being over, he begins to eat again, and continues to do so for five days more, when he is attacked by his fourth sickness, at which time he is arrived at his full growth. When he recovers this sickness, he feeds five days with a most voracious appetite; after which he disdains his food, becomes transparent, a little on the yellowish cast, and leaves his silky traces on the leaves where he passes. These signs denote that he is ready to begin his cocoon, and will eat no more.

Thus it appears that the whole duration of the life of the worm, in this state of its existence, in our climate, is usually

about 46 days; 28 of which days he takes food, and remains in his fick or torpid ftate 18; but it is to be obferved, that during warm weather the periods of ficknefs are fhortened, and in cold weather lengthened, above the terms here fpecified. In very hot climates it may be faid to live fafter, and fooner to attain maturity, than in thofe that are colder. Dr. Anderfon informs us, that at Madras the worm undergoes its whole evolutions in the fpace of 22 days. It appears, however, that it feeds fully as many days in India as in Europe, the difference being entirely occafioned by fhortening the period of ficknefs. The longeft ficknefs he had feen them experience there did not exceed two days; and during fummer it only lafts a few hours.

When the worm has attained its full growth, it fearches about for a convenient place for forming its cocoon, and mounts upon any branches or twigs that are put in its way for that purpofe. After about two days fpent in this manner, it fettles in its place, and forms the cocoon, by winding the filk which it draws from its bowels round itfelf into an oblong roundifh ball.

During this operation it gradually lofes the appearance of a worm; its length is much contracted, and its thicknefs augmented. By the time the web is finifhed, it is found to be transformed into an oblong roundifh ball, covered with a fmooth fhelly fkin, and appears to be perfectly dead. In this ftate of exiftence it is called an *aurelia*. Many animals in this ftate may be often feen fticking on the walls of out-houfes, fomewhat refembling a fmall bean.

In this ftate it remains for feveral days entirely motionlefs in the heart of the cocoon, after which it burfts like an egg hatching, and from that comes forth a heavy dull-looking moth with wings; but thefe wings it never ufes for flying; it only crawls flowly about in the place where it has been hatched. This creature forces its way through the filk covering which the worm had woven, goes immediately in queft of its mate, after which the female lays her eggs; and both male and female, without tafting food in this ftage of their exiftence, die in a very fhort time.

The filk worm, when at its full fize, is from an inch and a quarter to an inch and a half in length, and about half an inch in circumference. He is either of a milk or pearl colour, or blackifh; thefe laft are efteemed the beft. His body is divided into feven rings, to each of which are joined two very fhort feet. He has a fmall point like a thorn exactly above the anus. The fubftance which forms the filk is in his ftomach, which is very long, wound up, as it were, upon two fpindles, as fome fay, and furrounded with a gum, commonly yellowifh, fometimes white, but feldom greenifh. When the worm fpins his cocoon, he winds off a thread from each of his fpindles, and joins them afterwards by means of two hooks which are placed in his mouth, fo that the cocoon is formed of a double thread. Having opened a filk worm, you may take out the fpindles, which are folded up in three plaits; and, on ftretching them out, and drawing each extremity, you may extend them to near two ells in length. If you then fcrape the thread fo ftretched out with your nail, you fcrape off the gum, which is very like bees wax, and performs the fame office to the filk it covers as gold leaf does to the ingot of filver it furrounds, when drawn out by the wire drawer. This thread, which is extremely ftrong and even, is about the thicknefs of a middling pin.

Of filk worms, as of moft other animals, there is a confiderable variety of breeds, fome of which are much more hardy, and poffefs qualities confiderably different from others. This is a particular of much importance to be adverted to at the time of beginning to breed thefe creatures in any place; for it will make a great difference in the profit on the whole to the undertaker if he rears a good or a bad fort. This is a department in refpect to the œconomy of animals that has been in every cafe much lefs adverted to than it deferves; and in particular with regard to the filk worm it has been almoft entirely overlooked. A few eggs of the filk worm can be eafily tranfported by poft in a letter from any part of Europe to another, efpecially during the winter feafon. It would therefore be an eafy matter for any patriotic fociety, fuch as the Society of Arts in London, to obtain a fpecimen of the eggs from every country in which filk is now reared, to put thefe under the care of a perfon who could be depended upon, and who underftood the management of them, with orders to keep each kind diftinct from another, and advert to every particular that occurred in their management, fo as to make a fair eftimate of their refpective merits. By thefe means the beft might be felected, and thofe of inferior value rejected. Forty or fifty of each fort might be enough for the experiment; but it ought to be repeated feveral times before conclufions could be drawn from it that might be altogether relied upon; for it is well known that a variation of circumftances will make a change in the refult; and it is by no means certain that the fame particular would affect thofe of one breed exactly in the fame manner as it would do thofe of a different breed. One may be more hardy with regard to cold, another more delicate in refpect to food, and fo on. It is experience alone that can afcertain the circumftances here inquired for.

From the above-mentioned particulars, it is evident that the management of filk worms muft be very different in hot climates from what is required in thofe that are colder. At Madras, it appears from Dr. Anderfon's experiments that it is very difficult to prevent the eggs from hatching for a very few days, fo that many generations of them muft be propagated in one year. "In this hotteft feafon," fays he in a letter to Sir Jofeph Banks, dated July 6, 1791, "the fhorteft time I have been able to remark for the whole evolutions of the filk worm is 40 days; that is to fay, fix days an egg, 22 a worm, 11 a grub in the cocoon, and one a moth or butterfly." Fortunately, where the climate forces forward their production fo rapidly, nature hath been equally provident of food for their fubfiftence; for in thefe regions the mulberry continues to grow and pufh out leaves throughout the whole year.

Though the filk worm be a native of China, there is no doubt but it might eafily be propagated perhaps in moft parts of the temperate zones. The eggs of this infect, indeed, require a confiderable degree of warmth to hatch them, but they can alfo endure a fevere froft. No lefs than 5400 lbs. of filk was raifed in 1789, in the cold, fandy territories of Pruffia. In the province of Pekin, in China, where great quantities of filk are fabricated, the winter is much colder than even in Scotland. From the information of fome Ruffians who were fent thither to learn the Chinefe language, we find that Reaumur's thermometer was obferved from 10 to 15, and even 20 degrees below the freezing point. Nor is it difficult to rear the food of the filk worm in a temperate clime. The mulberry-tree is a hardy vegetable, which bears, without injury, the winters of Sweden, and even of Siberia. Of the feven fpecies of the mulberry (fee MORUS) enumerated by Linnæus, four of thefe (viz. the white, red, black, and Tartarian) there is every reafon to believe could be reared both in Britain and Ireland. The *white* grows in Sweden; the *red* is abundant round Quebec; the *black* delights in bleak fituations, expofed to wind on the fea fhore; and the *Tartarian* mulberry is reprefented as growing in the chilly regions of Siberia.

As to the fuperior qualities of the different fpecies, probably there is very little to be pointed out amongft the four juft mentioned with regard to nourifhment, except what may be drawn from the following fact: that if the firft three are laid down together, the filk worm will firft eat the white, then the red, and next the black, in the order of the tendernefs of the leaves. The Tartarian feems to hold as high a place in its

esteem as either the red or black; but all must yield to the white, which seems to be its natural food.

In Calabria the red mulberry is used; in Valencia the white; and in Granada, where excellent silk is produced, the mulberries are all black. The white seems to prosper very well in a moist stiff soil; the black agrees well with a dry, sandy, or gravelly soil; and the white is most luxuriant in a moist rich loam.

It may justly be asserted, that Britain possesses some advantages in the raising of raw silk which are not enjoyed by warmer countries. Even in the south of France, Mr. Arthur Young informs us, the mulberry leaves are often nipped by frost in the bud; but this is scarcely ever the case with us. It is well known that thunder and lightning are hurtful to the silk worm. Now our climate can boast that it is almost wholly exempted from those dreadful storms of thunder and lightning which prevail so much in hot climates. Nature has then furnished us with every thing requisite for the silk manufacture; it remains only for us to improve the advantages which we possess. Let mulberry trees be planted by proprietors of lands, and let a few persons of skill and attention devote their time to the raising of silk worms. This is an employment that will not interfere with any manufacture already established; on the contrary, it would afford a respectable, a lucrative, and agreeable employment to ladies, or to females in general, who have at present too few professions to which they can apply. The society instituted at London for the encouragenent of arts, manufactures, and commerce, much to their honour, have offered premiums to those who shall plant a certain number of mulberry trees.

The following method of raising mulberry trees from seed is practised in the south of France, and has been repeated with success in the East Indies by Dr. Anderson of Madras. "Take the ripe berries of the mulberry when it is full of juice and of seeds. Next take a rough horse hair line or rope, such as we dry linen on, and with a good handful of ripe mulberries run your hand along the line, bruising the berries and mashing them as much as possible as your hand runs along, so that the pulp and seeds of the berries may adhere in great abundance to the rope or hair line. Next dig a trench in the ground where you wish to plant them, much like what is practised in kitchen gardens in England for crops of various kinds. Next cut the rope or hair line into lengths according to the length of the trench you think fit to make, and plunge the line full of mashed berries into the trench, and then cover it over well with earth, always remembering afterwards to water it well, which is essential to the success. The seeds of the berries thus sown will grow, and soon shoot out young suckers, which will bear young leaves, the best food for the silk worm.

"The facility and rapidity with which young leaves may by this means be produced is evident, for as many rows of trenches may thus be filled as can be wished; and it can never be necessary to have mulberry trees higher than our raspberries, currants, or gooseberry bushes. Whenever they get beyond that, they lose their value; and if these trenches succeed, you may have a supply coming fresh up day after day, or any quantity you please." Thus abundance of these trees might be reared. But as mulberry trees are not yet found in abundance in this country, it were to be wished that some other food could be substituted in their place. Attempts have accordingly been made by those who have reared silk worms; and the experiments of Miss Rhodes and General Mordaunt have shown that it is very possible to support the silk worm upon lettuce.

It is even said that Dr. Lodovico Bellardi, a learned botanist of Turin, has found that the worms will feed on dried leaves of the mulberry tree. One would think that this dry nourishment would not be much relished by these insects; but repeated experiments made by our author, prove that they prefer it to any other, and eat it with the greatest avidity. The mulberry leaves must be gathered about the end of autumn, before the frosts commence, in dry weather, and at times when the heat is greatest. They must be dried afterwards in the sun, by spreading them upon large cloths, and laid up in a dry place after they have been reduced to powder. When it is necessary to give this powder to the worms, it should be gently moistened with a little water, and a thin coat of it must be placed around the young worms, which will immediately begin to feed upon it.

Silk worms may be kept in boxes or in shelves. When shelves are to be used, they may be constructed in the following manner: The shelves may be of wicker, ranged at the distance of a foot and a half, and fixed in the middle of the room: their breadth ought to be such, that any person can easily reach to the middle from either side. This is perhaps the simplest and cheapest apparatus for rearing silk worms; but there is another apparatus which may be recommended to those who are anxious to unite some degree of elegance with convenience. This apparatus is the invention of the Rev. George Swayne of Puckle-church, a gentleman who, greatly to his honour, has studied this subject much, in order to find out the way for promoting the culture of silk among the poor. This apparatus, with the description of it, we have borrowed from that valuable and patriotic work, the Transactions of the Society for encouraging Arts, Manufactures, and Commerce, vol. vii. p. 148. The apparatus consists of a wooden frame four feet two inches high, each side 16 inches and a half wide, divided into eight partitions by small pieces of wood which form grooves, into which the slides run, and are thus easily thrust into or drawn out of the frame. See pl. 13. The upper slide (*a*) in the model sent to the society by Mr. Swayne is of paper only, and designed to receive the worms as soon as hatched; the two next (*b*, *b*) are of catgut, the threads about one tenth of an inch distant from each other; these are for the insects when a little advanced in size: the five lower ones, marked *c*, *c*, *c*, *c*, *c*, are of wicker work; but, as Mr. Swayne afterwards found, netting may be substituted with advantage instead of wicker bottoms. Under each of these, as well as under those of catgut, are sliders made of paper, to prevent the dung of the worms from falling on those which are feeding below them.

The management of silk worms is next to be attended to. The proper time for hatching them is when the leaves of the mulberry are full grown, or nearly so; that as soon as these insects are capable of receiving food they may obtain it in abundance. To attempt to hatch them sooner would be hurtful, as the weather would not be sufficiently warm. Besides, as leaves are necessary to the life of a vegetable, if the young leaves of the mulberry-tree are cropped as soon as they are unfolded, the tree will be so much weakened as to be incapable of producing so many leaves as it would otherwise have done; and, if this practice be frequently repeated, will inevitably be destroyed.

When the proper season is arrived, the eggs may be hatched either by the heat of the sun, when it happens to be strong enough, or by placing them in a small room moderately heated by a stove or fire; and after being exposed for six or seven days to a gentle heat, the silk worm issues from the egg in the form of a small black hairy caterpillar. When Mr. Swayne's apparatus is used, the worms are to be kept on the drawers with paper bottoms till they are grown so large as not readily to creep through the gauze-bottomed drawers: they are then to be placed on those drawers, where they are to remain till their excrements are so large as not readily to fall through: when this is the case, they must be removed to the drawers with the wicker or netting bottoms, and fed thereon till they show symptoms of being about to spin. It is scarcely necessary to mention, that the paper slides beneath the gauze and wicker drawers are intended to receive the dung, which should be emptied as often as the worms are fed, at least once a-day; or to direct, that when the worms are fed, the slides are to be first drawn out a considerable way, and the drawers to rest upon them.

It has been already mentioned, that wet or damp food is exceedingly prejudicial to thefe infects. It produces contagious and fatal difeafes. To prevent the neceffity of giving them wet or damp food, attention ought to be paid to the weather, fo that when there is an immediate profpect of rain, a fufficient quantity of leaves may be gathered to ferve the worms two or three days. In this country, the leaves of the black or red mulberry tree may be preferved good for food, although kept four or five days, by the following method: When new gathered, lay them loofely in glazed earthen veffels, place thefe in a cold place, well aired, not expofed to drought.

The utmoft attention muft be paid to preferve the place where filk worms are kept as clean as poffible: the houfe or room muft be well ventilated, that no noxious vapours be accumulated. By fome experiments of M. Faujas de St. Fond, which are recorded in his hiftory of Languedoc, it appears that the filk worm is much injured by foul air. All decayed leaves muft be removed from them, as it is now well known that they emit bad air in great abundance.

Dr. Anderfon advifes thofe who have the management of filk worms to ftrew a thin ftratum of frefh flaked quicklime upon the flip board each time it is cleaned, immediately before it is put into its place. This would abforb the mephitic gas, for as foon as it is generated it would defcend upon the furface of the quicklime. Thus would the worms be kept continually in an atmofphere of pure air. Were the walls of the apartments to be frequently wafhed with quicklime and water, it would tend much to promote cleanlinefs at a fmall expenfe, and augment the healthinefs of the worms as well as that of the perfons who attend them.

When the filk worm refufes its food, and leaves filky traces on the leaves over which it paffes, it is a proof that it is ready to begin its cocoon. It is now neceffary to form a new receptacle, which is commonly done by pinning together papers in the fhape of inverted cones with broad bafes. "This method (fays Mr. Swayne), where there are many worms, is exceedingly tedious, waftes much paper, and ufes a large number of pins; befides, as the filk worm always weaves an outer covering or defenfive web before it begins the cocoon or oval ball, I apprehend that it caufes a needlefs wafte of filk in forming the broad web at the top. The method I make ufe of is, to roll a fmall piece of paper (an uncut octavo leaf, fuch as that of an old magazine, is fufficient for three), round my fore finger, and to give it a twift at the bottom; which is done with the utmoft expedition, and gives no occafion for the ufe of pins. Thefe rolled paper-cafes being likewife of a form more nearly refembling that of a cocoon, with a much narrower opening on the top than the others, takes away the neceffity of wafting much filk in the outer web, and confequently leaves more to be employed in forming the ball. The filk is readily taken out of thefe cafes by untwifting the bottom; and if this be done with moderate care, and the papers are preferved, they will ferve feveral times for the like purpofe."

Others advife, that when the filk worms are preparing to fpin, little bufhes of heath, broom, or twigs, fhould be ftuck upright near the fhelf or box in which they are inclofed: the worms mount thefe, and attach their web to them.

When the worms are ready to mount, in order to fpin, if the weather be hot, attended with thunder, you will fee them in a languifhing condition; your care muft then be to revive them, which is effected thus: Take a few eggs and onions, and fry them in a pan with fome ftale hog's lard, the ranker the better, and make pan-cake; which done, carry it fmoking hot into the room where they are kept, and go round the chamber with it. You will be furprifed to fee how the fmell revives them, excites thofe to eat who have not done feeding, and makes the others that are ready to fpin climb up the twigs.

In about ten or twelve days, they may be diftinguifhed into the good and bad. The good cocoons may be known by thefe marks: they are little, ftrong, and firm; have a fine grain, both ends are round, and they are free from fpots. Among the good cocoons alfo may be arranged thofe which are called *calcined* cocoons, in which the worm, in confequence of ficknefs, is petrified or reduced to a fine powder. Thefe cocoons produce more filk than others, and are fold in Piedmont at half as much again. They may be diftinguifhed by the noife which the worm makes when the cocoon is fhaken. Of the bad cocoons there are fix fpecies: 1. The *pointed cocoons*, one extremity of which ends in a point; the filk which covers the point is weak, and foon breaks or tears. 2. The *cocalons*, which are bigger, but the contexture is weak. 3. The *dupions*, or double cocoons, which have been formed by the joint labour of two and fometimes of three worms. 4. The *foufflons*, which have a loofe contexture, fometimes fo loofe that they are tranfparent. 5. The *perforated cocoons*, which have a hole at one end. 6. The *bad choquette*, which is compofed of defective cocoons, fpotted or rotten. Befides thefe there is the *good choquette*, which does not properly belong to either of thefe two claffes: it is formed of thofe cocoons in which the worm dies before the filk is brought to perfection. The worms adhere to one fide of the cocoon, and therefore when the cocoon is fhaken will not rattle: the filk is as fine, but is not of fo bright a colour, nor is fo ftrong and nervous, as that which is obtained from good cocoons.

The cocoons which are kept for breeding are called *royal* cocoons. For felecting and preferving thefe, we have been favoured with fome valuable inftructions by Mr. Wright of Paifley, which we fhall prefent to our readers.—The largeft and beft cocoons ought to be kept for breed, about an equal number of males and females; the cocoons that contain the former are fharper pointed at the ends than thofe that contain the latter. Although it fhould happen that there are more females than males, little inconvenience or ill confequences can arife from it, as one male will ferve two or three females, if the time of their coming out of the cocoons anfwer. About 12 or 15 days after they begin to fpin, the cocoons for breed may be laid on fheets of white paper; about this time the moth opens for itfelf a paffage through the end of its cocoon, and iffues out. When the female has laid her eggs, which on an average may amount to 250, they are fpread upon fheets of paper, and hung up to dry in fome place where they may not be expofed to the heat of the fun: after being dried they muft be kept in a cool well-aired place, where neither vapours nor moifture can reach them. That they may be preferved from external accidents, as infects of different kinds will deftroy them, and mice are their enemy in all the ftages of their exiftence, they fhould be kept in ftone pots or glafs bottles with their mouths ftopped, and there remain until brought out next feafon to be hatched.

The cocoons from which the filk is to be immediately wound muft be expofed to the heat of an oven, in order to kill the chryfalis or aurelia, which would otherwife eat its way through the cocoon, and render it ufelefs. The following directions are given for managing this procefs by one of the firft filk manufacturers in Italy.

Put the cocoons into long fhallow bafkets, and fill them up within an inch of the top. Then cover them with paper, and put a wrapper over that. Thefe bafkets are to be difpofed in an oven, whofe heat is as near as can be that of an oven from which the bread is juft drawn after being baked. After remaining therein near an hour, draw them out; and to fee whether all the worms are dead, draw out a dupion from the middle of the bafket and open it: if the worm be dead, you may conclude all the reft are fo; becaufe the contexture of the dupion being ftronger than that of the other cocoons, it is confequently lefs eafy to be penetrated by the heat. You muft obferve to take it from the middle of the bafket, becaufe in that part the heat is leaft perceptible. After you have drawn the bafkets from the oven, you

muſt firſt cover each of them with a woollen blanket or rug, leaving the wrapper beſides, and then pile them above one another. If the baking has ſucceeded, your woollen cover will be all over wet with a kind of dew, the thickneſs of your little finger. If there be leſs, it is a ſign the cocoons have been too much or too little baked. If too much baked, the worm, being over-dried, cannot tranſpire a humour he no longer contains, and your cocoon is then burnt. If not enough baked, the worm has not been ſufficiently penetrated by the heat to diſtil the liquor he contains, and in that caſe is not dead.

You muſt let your baſket ſtand thus covered five or ſix hours if poſſible, in order to keep in the heat, as this makes an end of ſtifling thoſe worms which might have avoided the firſt impreſſion of the fire. You are likewiſe to take great care to let your cocoons ſtand in the oven the time that is neceſſary; for, if they do not ſtand long enough, your worms are only ſtunned for a time, and will afterwards be revived. If, on the other hand, you leave them too long in the oven, you burn them: many inſtances of theſe two caſes are frequently to be met with. It is a good ſign when you ſee ſome of the butterflies ſpring out from the cocoons which have been baked, becauſe you may be certain they are not burnt. For, if you would kill them all to the laſt worm, you would burn many cocoons which might be more expoſed to the heat than that particular worm.

The next operation is the winding of the ſilk. Before you begin to wind, you muſt prepare your cocoons as follows:

1. In ſtripping them of the waſte ſilk that ſurrounds them, and which ſerved to faſten them to the twigs. This burr is proper to ſtuff quilts, or other ſuch uſes; you may likewiſe ſpin it to make ſtockings, but they will be coarſe and ordinary.

2. You muſt ſort your cocoons, ſeparating them into different claſſes in order to wind them apart. Theſe claſſes are, the good white cocoons; the good cocoons of all the other colours; the dupions; the cocalons, among which are included the weak cocoons; the good choquette; and, laſtly, the bad choquette. In ſorting the cocoons, you will always find ſome perforated cocoons amongſt them, whoſe worm is already born; thoſe you muſt ſet apart for fleuret. You will likewiſe find ſome ſoufflons, but very few; for which reaſon you may put them among the bad choquette, and they run up into waſte.

The good cocoons, as well white as yellow, are the eaſieſt to wind; thoſe which require the greateſt care and pains are the cocalons; you muſt wind them in cooler water than the others, and if you take care to give them to a good windſter, you will have as good ſilk from them as the reſt. You muſt likewiſe have careful windſters for the dupions and choquettes. Theſe two ſpecies require hotter water than the common cocoons.

The good cocoons are to be wound in the following manner: Firſt, chooſe an open convenient place for your filature, the longer the better, if you intend to have many furnaces and coppers. The building ſhould be high and open on one ſide, and walled on the other, as well to ſcreen you from the cold winds and receive the ſun, as to give a free paſſage to the ſteam of your baſons or coppers.

Theſe coppers or baſons are to be diſpoſed (when the building will admit of it) in a row on each ſide of the filature, as being the moſt convenient method of placing them, for by that means in walking up and down you ſee what every one is about. And theſe baſons ſhould be two and two together, with a chimney between every couple.

Having prepared your reels (which are turned by hands, and require a quick eye), and your fires being alight, one under every baſon, your windſter muſt ſtay till the water is as hot as it can be without boiling. When every thing is ready, you throw into your baſons two or three handfuls of cocoons, which you gently bruſh over with a wiſk about ſix inches long, cut ſtumpy like a broom worn out: by theſe means the threads of the cocoons ſtick to the wiſk. You muſt diſengage theſe threads from the wiſk, and purge them by drawing theſe ends with your fingers till they come off entirely clean. This operation is called *la Battue*.

When the threads are quite clear, you muſt paſs four of them (if you will wind fine ſilk) through each of the holes in a thin iron bar that is placed horizontally at the edge of your baſon; afterwards you twiſt the two ends (which conſiſt of four cocoons each) twenty or twenty-five times, that the four ends in each thread may the better join together in croſſing each other, and that your ſilk may be plump, which otherwiſe would be flat.

Your windſter muſt always have a bowl of cold water by her, to dip her fingers in, and to ſprinkle very often the ſaid bar, that the heat may not burn the thread.

Your threads, when thus twiſted, go upon two iron hooks called rampins, which are placed higher, and from thence they go upon the reel. At one end of the axis of the reel is a cog-wheel, which catching in the teeth of the poſt-rampin, moves it from the right to the left, and conſequently the thread that is upon it; ſo that your ſilk is wound on the reel croſsways, and your threads form two hanks of about four fingers broad.

As often as the cocoons you wind are done, or break or diminiſh only, you muſt join freſh ones to keep up the number requiſite, or the proportion; becauſe, as the cocoons wind off, the thread being finer, you muſt join two cocoons half wound to replace a new one: Thus you may wind three new ones and two half wound, and your ſilk is from four to five cocoons.

When you would join a freſh thread, you muſt lay one end on your finger, which you throw lightly on the other threads that are winding, and it joins them immediately, and continues to go up with the reſt. You muſt not wind off your cocoons too bare or to the laſt, becauſe when they are near at an end, the *bairré*, that is, the huſk, joins in with the other threads, and makes the ſilk foul and gouty.

When you have finiſhed your firſt parcel, you muſt clean your baſons, taking out all the ſtripped worms, as well as the cocoons, on which there is a little ſilk, which you firſt open and take out the worm, and then throw them into a baſket by you, into which you likewiſe caſt the looſe ſilk that comes off in making the battue.

You then proceed as before with other two or three handfuls of cocoons; you make a new battue; you purge them, and continue to wind the ſame number of cocoons or their equivalent, and ſo to the end.

As was already mentioned, the windſter muſt always have a bowl of cold water by her, to ſprinkle the bar, to cool her fingers every time ſhe dips them in the hot water, and to pour into her baſon when neceſſary, that is, when her water begins to boil. You muſt be very careful to twiſt your threads a ſufficient number of times, about 25, otherwiſe your ſilk remains flat, inſtead of being round and full; beſides, when the ſilk is not well croſſed, it never can be clean, becauſe a gout or nub that comes from a cocoon will paſs through a ſmall number of theſe twiſts, though a greater will ſtop it. Your thread then breaks, and you paſs what foulneſs there may be in the middle of your reel between the two hanks, which ſerves for a head-band to tie them.

You muſt obſerve that your water be juſt in a proper degree of heat. When it is too hot, the thread is dead, and has no body; when it is too cold, the ends which form the thread do not join well, and form a harſh ill-qualified ſilk.

You muſt change the water in your baſon four times a-day for your dupions and choquette, and twice only for good cocoons when you wind fine ſilk; but if you wind coarſe ſilk, it is neceſſary to change it three or four times. For, if you were not to change the water, the ſilk would not be ſo bright and gloſſy, becauſe the worms contained in the cocoons foul it very conſiderably. You muſt endeavour as much as poſſible to wind with clear water; for, if there are too many worms in it, your ſilk is covered with a kind of duſt which attracts the moth, and deſtroys your ſilk.

You may wind your ſilk of what ſize you pleaſe, from one cocoon to 1000; but it is difficult to wind more than 30 in a thread. The nicety, and that in which conſiſts the greateſt difficulty, is to wind even; becauſe as the cocoon winds off the end is finer, and you muſt then join other cocoons to keep up the ſame ſize. This difficulty of keeping the ſilk always even is ſo great, that (excepting a thread of two cocoons, which we call ſuch) we do not ſay a ſilk of three, of four, or of ſix cocoons; but a ſilk of three to four, of four to five, of ſix to ſeven cocoons. If you proceed to a coarſer ſilk, you cannot calculate ſo nicely as to one cocoon more or leſs. We ſay, for example, from 12 to 15, from 15 to 20, and ſo on.

What number of worms are neceſſary to produce a certain quantity of ſilk has not been aſcertained. And as different perſons who wiſhed to determine this point have had different reſults, the truth ſeems to be, that from various circumſtances the ſame number of worms may produce more ſilk at one time than at another. It is related in the ſecond volume of the Tranſactions of the Society for encouraging Arts, &c. that Mrs. Williams obtained nearly an ounce and a half of ſilk from 244 cocoons. Mr. Swayne from 50 cocoons procured 100 grains. Miſs Rhodes obtained from 250 of the largeſt cocoons, three quarters of an ounce and a dram. From a paper in the ſecond volume of the American Tranſactions, which we have before referred to in the courſe of this article, we are informed that 150 ounces of good cocoons yield about 11 ounces of ſilk from five to ſix cocoons: if you wind coarſer, ſomething more. But what appears aſtoniſhing, Mr. Salvatore Bertezen, an Italian, to whom the Society for encouraging Arts, &c. adjudged their gold medal, raiſed five pounds of excellent ſilk from 12,000 worms.

The cocoons produce a thread of very unequal length; you may meet with ſome that yield 1200 ells, whilſt others will ſcarcely afford 200 ells. In general, you may calculate the production of a cocoon from 500 to 600 ells in length.

As there is every reaſon to hope that the ſilk manufacture will ſoon be carried on with ardour in this country, and to a great extent, we are happy to learn that the ſilk loom has been much improved lately by Mr. Sholl of Bethnall-Green. It appears from the evidence of ſeveral gentlemen converſant in that branch of ſilk weaving to which this loom is particularly adapted, that the advantages of this conſtruction are, the gaining light, a power of ſhortening the porry occaſionally, ſo as to ſuit any kind of work, being more portable, and having the gibbet firmly fixed, together with the diminution of price; which, compared with the old loom, is as five pounds, the price of a loom on the old conſtruction, to three pounds ten ſhillings, the price of one of thoſe contrived by Mr. Sholl; and that, as the proportion of light work is to ſtrong work as nine to one, this ſort of loom promiſes to be of very conſiderable advantage, particularly in making modes, or other black work.

For a repreſentation of this loom, ſee Plate 13. A, A, The ſills; B, B, The breaſt-roll poſts: C, The cut tree; D, D, The uprights; E, The burdown; F, The batton; G, The reeds; H, The Harneſs, I, The breaſt roll; K, The cheeſe; L, The gibbet; M, The treddles; N, The tumblers; O, Short countermeſhes; P, Long-counter-meſhes; Q, The porry; R, R, Cane-roll poſts; S, The cane-roll; T, The weight bar and weight; U, U, Counter-weights; W, The breaking rod; X, X, Croſs-rods.

Silk-worm. See Silk.

SILPHA, Carrion-beetle, in natural hiſtory; a genus of animals belonging to the claſs of *inſectæ*, and to the order of *coleopteræ*. The antennæ are clavated; the clava are perfoliated; the elytra marginated; the head is prominent; and the thorax marginated. There are 94 ſpecies, of which ſeven only are natives of Britain and Ireland. 1. The *v ſpillo*. The margin of the thorax broad. The ſhells abbreviated, black, with two yellow belts. The thighs of the hind legs large, with a ſpine near their origin. Length near one inch. It infeſts dead bodies. 2. The *lipuſtulata*, is black; the antennæ are long and ſmall, and there are two red ſpots on the middle of each ſhell. The length is one third of an inch. 3. The *puſtulata*, is black and oblong: there are four brown ſpots on the ſhells: the length is one-fifth of an inch. It lives on trees. 4. The *quadripunctata*. The head, antennæ, and legs black. Margin of the thorax and ſhells are of a pale yellow, with four black ſpots. The length half an inch. It is found in Caen wood, near Hampſtead. 5. The *ſabuloſa*, is black; the antennæ are ſhort and globular; there are five ſtriæ on each ſhell. The ſhells and wings are ſhort. There are five joints on the two firſt feet, four on the reſt. It lives in ſand. 6. The *aquatica*, is brown, with a green bronze tinge. There are four ribs on the thorax. On each ſhell there are 10 ſtriæ. The length is one-fifth of an inch. 7. The *pulicaria*, is black and oblong; the ſhells are abbreviated; the abdomen is rounded at the extremity; the thorax and ſhells are ſcarce marginated; the length is one line. It is found frequently running on flowers.

SILPHIUM, in botany; A genus of plants belonging to the claſs of ſyngeneſia, and to the order of polygamia neceſſaria; and in the natural ſyſtem arranged under the 49th order, *compoſitæ*. The receptacle is paleaceous; the pappus has a two-horned margin, and the calyx is ſquarroſe. There are eight ſpecies; the laciniatum, terebinthinum, perfoliatum, connatum, aſteriſcum, trifoliatum, ſoldaginoides, and trilobatum. The firſt ſix of theſe are natives of North America.

SILVER, one of the perfect metals, and the whiteſt and moſt brilliant among them all, is of the ſpecific gravity, according to Bergman, of 10.552; but according to Kirwan, of 11.095. Its ductility is not greatly inferior to that of gold, as a grain of ſilver leaf meaſures ſomewhat more than 51 ſquare inches; and the ſilver wire uſed for aſtronomical purpoſes meaſures only the 750th part of an inch in diameter; which is no more than half the thickneſs of the hair of the human head. It is harder and more elaſtic than lead, tin, or gold; but leſs ſo than copper, platina, or iron: like other metals it grows hard by hammering, but is eaſily reduced to its former ſtate by annealing. It is more deſtructible than gold, and is particularly acted upon by ſulphureous vapours; hence its ſurface tarniſhes in the air, and aſſumes a dark brown colour.

" It has been thought (ſays Mr. Fourcroy) that ſilver is indeſtructible by the combined action of heat and air. It is certain, that this metal kept in fuſion, without contact of air, does not appear to be ſenſibly altered; yet Junker had affirmed, that by treating it a long time in the reverberatory furnace, in the manner of Iſaac Hollandus, ſilver was changed into a vitreous calx. This experiment has been confirmed by Macquer. That learned chemiſt expoſed ſilver 20 times ſucceſſively in a porcelain crucible to the fire of the furnace at Seves; and at the 20th fuſion he obtained a vitriform matter of an olive green, which appeared to be a true glaſs of ſilver. This metal, when heated in the focus of a burning-glaſs, has always exhibited a white pulverulent matter on its ſurface, and a greeniſh vitreous covering on the ſupport it reſted upon. Theſe two facts remove all doubt reſpecting the alteration of ſilver: though it is much more difficult to calcine than other metallic matters, yet it is capable of being converted after a long time into a white calx, which, treated in a violent fire, affords an olive-coloured glaſs. It may be poſſible perhaps to obtain a calx of ſilver by heating this metal when reduced into very fine laminæ, or into leaves, for a very long time in a matraſs, as is done with mercury."

Magellan informs us, that by melting in a due proportion with gold or ſteel, ſilver becomes greeniſh or blueiſh; ſo that it is capable of producing the white, yellow, red, green, blue, and olive colours, more or leſs conſpicuouſly according to the various circumſtances of heat and proportions of the mixture. Though he makes mention of the vitrifications by Macquer already taken

notice of, he denies that it can be calcined by heat alone. "Silver (says he) is so fixed by itself in the fire, that, after being kept a whole month in fusion, it had only lost one 60th part of its weight, which might be on account of some alloy. It is therefore incapable of being calcined by mere heat; and the calx of silver, which can only be made by means of its solution in acids, is reducible to its metallic form without the addition of any oxigenous substance. But when silver is exposed to the violent heat of the solar rays collected by a powerful lens, a kind of smoke is seen surrounding it, which proves at last to be the minute particles of the metal raised and dispersed by heat, as is evident if a thin plate of gold be exposed to it; for then the particles of silver are seen upon the gold in the same manner as those of gold are seen upon silver in a similar experiment."

By slow cooling after it has been melted, silver crystallizes into quadrangular pyramids. M. Baumé observes, that, in cooling, it assumes a symmetrical form, observable on the surface by small fibres resembling the feathers of a pen. M. Fourcroy observes, that the fine button obtained by cupellation often presents on its surface five or six sides arranged amongst each other like a pavement; but the crystallization in tetrahedral pyramids has not been observed particularly excepting by Messrs. Tillet and Monges. It has been supposed that silver melts with a smaller degree of heat than copper; but the late improved thermometer of Mr. Wedgewood shows that this is a mistake; silver requiring 130° of Fahrenheit more than copper to bring it into fusion. It is found in the earth,

1. *Native*, generally of the fineness of 16 carats; and of this there are several varieties. 1. Thin plated or leaved. 2. Capillary silver, of fine or coarse fibres or arborescent, from Potosi in America and Kunsberg in Norway. 3. A kind is also met with resembling coarse linen in the surface, which in Saxony is called *knit cobalt*. Abundance of this kind is to be met with in Potosi, but more rarely in Saxony and Norway. 4. Sometimes native silver is met with in a crystalline or regularly figured state with shining surfaces. This is found at Kunsberg, but is very scarce. There appears likewise a kind of crystallization on the thin plates of native silver, their surfaces being full of minute pyramidal crystals. Most of the American silver is of the native kind; so is that at Kunsberg in Norway. It is not, however, met with native so commonly in other European mines. A very small quantity of it is found in the mines of Salberg in Westmanland, and of Lofasen in Dalarne, and several other places in Sweden. It has been found in pretty large lumps in clay mixed with nickel, partly decayed or withered; in which situation it formed the compound called the *stercus anserinum*, or goose dung ore. 5. A piece of native silver in coal is shown in the mineralogical academy at Freyberg; and Lahman, quoted by Le Camus, speaks also of a similar silver ore found in a mine of pit-coal. The capillary silver, according to the observations of Henckel and Romé de Lisle, seems to have been produced by a decomposition of red silver ore; and Wallerius affirms, that if sulphur is mixed in a gentle heat with silver, the latter takes a capillary form. 6. Native silver is likewise sometimes found in the form of spider's webs, and for that reason called by the Spaniards *arane*. 7. It is met with in branches formed by octaedrons inserted into one another. Some of these show the mark of a leaf of fern or of a tree; others are cubes or single octaedrons, whose angles are truncated, though these last are but rare. 8. It is often found dispersed through sand and ochre, as well as in gray limestone in Lower Austria, and in a greenish clay near Schemnitz, or mixed with ochre, clay, and calciform nickel. It is generally alloyed with copper, sometimes with gold, iron, or regulus of antimony; and sometimes it contains even five per cent. of arsenic. That found near Kunsberg contains so much gold, that the colour of it is yellow.

Wallerius distinguishes seven species of native silver; viz. 1. In irregular masses and lumps, at Kunsberg in Norway and other places, in a bed of clay. 2. In a granular and jagged form in America and Norway. 3. Arborescent, in the places already mentioned. 4. In thin leaves, between the fissures of stones, in Norway and Germany. 5. In a capillary form, in the places already mentioned, including the cobweb silver of the Spaniards already mentioned. 6. Crystallized. 7. Superficial. Mr. Daubenton enumerates eight varieties of native white silver, of different forms, most of which have been already enumerated. The materials in which this metal is most commonly found in its native state are baro-selenite, limestone selenite, quartz, chert, flint, serpentine, gneiss, agate, mica, calcareous spar, pyrites, schistus, clay, &c. Sometimes it is met with in large masses, of the weight of 60 pounds or more, in or near the veins of most metallic ores, particularly in Peru and in various parts of Europe, of a white, brown, or yellowish colour. In Norway and at Alsace it is found in the form of solitary cubes and octahedral lumps, of 50 and 60 pounds weight.

2. *Native silver alloyed with other metals*. 1. With gold, as in Norway, where it contains so much as to appear of a yellow colour. 2. With copper. 3. With gold and copper. 4. Amalgamated with mercury, as in the mines of Salberg. M. Romé de Lisle mentions a native amalgam of silver and mercury found at Muschel Landsberg in the duchy of Deux Ponts, in a ferruginous matrix, mixed with cinnabar, and crystallized in a hexagonal form, and of a large size. It was before the French revolution preserved in the king's cabinet at Paris. 5. With iron. According to Bergman, this ore contains two per cent. of iron; but Mongez informs us, that it often does not exceed one per cent. 6 With lead. "Silver (says Mr. Magellan) is always contained in lead, though the quantity is generally insufficient to defray the expense of separating it. In the reign of Edward I. of England, however, near 1600 pounds weight of silver were obtained, in the course of three years, from a lead mine in Devonshire, which had been discovered about the year 900. The lead mines in Cardiganshire have at different periods afforded great quantities of silver; so that Sir Hugh Middleton is said to have cleared from them 2000l. in a month. The same mines in the year 1745 yielded 80 ounces of silver out of every ton of lead. The lead in only one of the smelting-houses at Holywell in Flintshire produced no less than 37521 ounces, or $3126\frac{3}{4}$ pounds of silver from the year 1754 to 1756, and from 1774 to 1776. There are some lead ores in England, which, though very poor in that metal, contain between 300 and 400 ounces of silver in a ton of lead; and it is commonly observed, that the poorest lead ores are the richest in silver; so that a large quantity of silver is probably thrown away in England by not having the poorest sort of lead ores properly essayed." 7. Mr. Monnet found silver united with arsenic among the ores which came from Guadanal canal in Spain, and an ore of the same kind is furnished by the Samson mine near Andreaberg in the Hartz: but Mr. Mongez very properly remarks, that these ores must be distinguished from such as have the arsenic in the form of an acid; for in this case they are properly mineralized by it, whilst there can only be a mixture of native silver, or some of its calces with arsenic in its reguline form. 8. Bergman mentions silver in a state of union with antimony. The ore yields some smoke when roasted, but has not the garlic smell observable in the arsenical ores. 9. The white silver ore, found in the mines near Freyberg, has the metal united to the regulus of arsenic and iron, the three metallic ingredients being nearly in equal proportions. All the extraneous matters with which the silver is united are sometimes in exceedingly small proportion, but not to be neglected where they exceed the hundredth part of the whole mass. 10. A particular kind of stony silver ores is mentioned by Wallerius under the title of *lapis deæ*, and which contain the following varieties, viz. the calcareous silver ore at Annaberg in Austria, when the metal is mixed with an alkaline

limeftone; the fpathofe ore, either white, variegated, or yellowifh, found at Schemnitz in Hungary; the quartzofe white ore in a powdery form, mixed with ferruginous fcoria, found at Potofi in America; the dark and variegated quartzofe filver ores, with many other fubdivifions diftinguifhed from one another by little elfe than their colour.

Silver is found mineralized by various fubftances; as

1. With fulphur in the glaffy or vitreous filver ore; though this name feems rather to belong to the minera argenti cornea or horn filver ore, to be afterwards taken notice of more particularly. It is ductile, and of the fame colour with lead, but quickly becomes very black by expofure to the air; though fometimes it is gray or black even when firft broken. It is found either in large lumps, or inhering in quartz, gypfum, gneifs, pyrites, &c. Its fpecific gravity, according to Kirwan, is 7,200. A hundred parts of it contain from 72 to 77 of filver, and it is rarely contaminated with any other metal.

Profeffor Brunnich fays that it contains 180 merks of filver in the hundred weight. The medium between the glafs ore and the red gilder ore is called *rofch-gewœchs* in Hungary, and *brittle glafs ore* in Saxony. It is black, and affords a powder of the fame colour when pounded. In the mines of Himmelfurft near Freyberg, it is faid to have held 140 merks, but thefe pieces are very fcarce at prefent; and indeed the Hungarian glafs ores in general are now very fcarce, as Profeffor Brunnich informs us, though they are now and then found in the wind-fhafts, which are frequently covered with a thin membrane, or rather cruft, of the colour of pyrites. Mr. Magellan fays that this ore is nothing elfe but native filver penetrated by fulphur; for, on being expofed to a flow heat, the latter flies off, and the filver fhoots into filaments. There are nine varieties of it. 1. Like *black lead*, or plumbago, the moft common kind of any. 2. Bruckman mentions a kind *brown* on the outfide and greenifh within. 3. The *yellow ore* has its colour from fome arfenic contained in it, which forms an orpiment with the fulphur. 4. It is alfo found of a *greenifh*, and 5. *bluci/h* colour; the latter is friable, like the fcoria of metals, and is called at Freyberg *fchlarekenerz*, or the ore of fcoria. 6. It is found alfo in the *arborefcent*. 7. *Lamellated*. 8. *Cryftallized* into octaedral or hexaedral prifms, and into ten pyramids with ten fides. 9. Laftly, it is found *fuperficial*, or covering the ftones or maffes of other ores.

2. The pyrites argenteus of Henckel contains filver and iron mineralized with arfenic. There are three varieties of it. 1. Hard, white, and fhining ore, of a compact, lamellar, or fibrous texture. The brighteft kind has leaft filver, only giving 6 or 8 ounces per quintal, and the richeft about ten per cent. It is found in Germany and Spain. It contains no fulphur. 2. Of a yellowifh white colour, and ftriated texture refembling bifmuth, but much harder. It is found in Spain, and yields about 60 per cent. of filver. 3. In another kind the quantity of arfenic is fo great, that it would fcarcely deferve the name of filver ore if the arfenic were not very eafily diffipated. It is foft and eafily cut; has a brilliant metallic appearance, and confifts of conchoidal laminæ. A quintal contains only from four to fix ounces of filver, but it is eafily reduced by evaporating the arfenic, after which the filver is left behind flightly contaminated with iron.

3. The red or ruby filver ore, the *rothgulden* of the Germans, has the metal combined with fulphur and arfenic. It is a heavy fhining fubftance, fometimes tranfparent, and fometimes opaque; the colour generally crimfon, though fometimes gray or blackifh. It is found in fhapelefs maffes, or cryftallized in pyramids or polygons, fometimes dendritical or plated, or with radiated incruftations. It is found in quartz, flint, fpar, pyrites, fparry iron ore, lead ore, cobalt ore, jafper, baro-felenite, gneifs, &c. When radiated or ftriated, it is called *rothgulden bluth*. It cracks in the fire, and detonates with nitre. Its fpecific gravity is from 5,400 to 5,684. Bergman informs us, that this kind contains, in the hundred, 60, fometimes 70, pounds of filver, 27 of arfenic, and 13 of fulphur. The darkeft coloured ores are the richeft, the yellow kinds much poorer; but the moft yellow do not belong to this fpecies, being in fact an orpiment with 6 or 7 per cent. of filver. This laft kind is brought chiefly from Potofi in America, and is called *rofi-cler* by the Spaniards.

4. The *fchuartz gulden*, or *filver mulm*, contains the metal mineralized by fulphur and a fmall quantity of arfenic and iron. It is of a black footy colour, and was fuppofed by Cronftedt to contain a good quantity of copper, to which its colour was owing; but later experiments have evinced, that there is no copper at all in it. It is either of a folid or brittle confiftence, and of a glaffy appearance when broken, or of a loofer texture, and footy or deep black colour; or it is found like mofs, or thin leaves, lying on the furface of other filver ores, or thofe of lead and cobalt, or in clays, ponderous fpar, gneifs, &c. It contains from 25 to 60 per cent. of filver.

5. The *minera argenti alba*, the *Weiffgulden ore* of the Germans, is a heavy, foft, opaque fubftance, fine grained or fcaly, bright and fhining in its fractures, of a whitifh, fteely, or lead colour; fometimes cryftallized in pyramidical or cylindrical forms, but often in amorphous grains, or refembling mofs, or in the form of thin laminæ incrufting other bodies, found in quartz, fpar, fhelftein, pyrites, blend, lead-ore, cobalt-ore, fparry-iron ore, fluors, &c. It is very fufible. Its fpecific gravity is from 5 to 5,300. Its proportion of filver from 10 to 30 per cent. It is found, though not commonly, in Saxony, Hungary, the Hartz, and St. Marie aux Mines.

6. The *weifertz*, or white filver ore, is an arfenical pyrites, containing filver. It is met with in the Saxon mines fo exactly refembling the common arfenical pyrites, that it cannot be diftinguifhed from it by infpection. Cronftedt fuppofes that the filver it contains may exift in a capillary form; but Profeffor Brunnich thinks this is not altogether the cafe. It is very fcarce, but met with near Freyberg. There is likewife a brown *mulm* having the appearance of rags, met with in the crevices and upon the lumps of cubic lead ore in a mine near Claufthal and other places, which contains a great quantity of filver. It is of a whitifh fhining colour; hard, granulated, and folid, fometimes ftriking fire with fteel. It difcovers a mixture of arfenic, by emitting a garlic fmell when heated.

7. The *lebererts* of the Germans has the metal combined with fulphurated antimony. It is of a dark gray and fomewhat brownifh colour. A variety of a blackifh blue colour is found in the form of capillary cryftals, and called *federertz* or plumofe filver ore. It is met with in Saxony, and contains fometimes a mark or half a pound, fometimes only two, three, or four ounces, and fometimes only a mere trifle of filver, per cent. There is another filver ore, alfo called *lebererts* by the Germans, which contains arfenic and regulus of antimony. This ore is fometimes alfo found of a dark gray colour; for the moft part amorphous, but fometimes cryftallized into pyramids. It appears red when fcraped, and contains from one to five per cent. of filver. The greateft part of this ore is copper, and the next arfenic. According to Bergman, the copper amounts to 24 per cent. It is found in Tranfylvania; and a kind was lately difcovered in Spain, of a hard folid confiftence, and of a grayifh blue colour.

8. The *goofe dung* ores contain filver mineralized with fulphur in combination with iron, arfenic, and cobalt. It looks like the *weifsgulden*, excepting that the cobalt, by its decompofition, gives it a rofy appearance. There are two varieties; one of a dull tarnifhed furface and ferruginous look; the other has a fhining appearance like the *lebererts*. It contains from 10 to 40 or 50 per cent. of filver. The arfenic is in an acid ftate, and united to the cobalt.

9. The *dal fab'ertz* contains ſilver mineralized with ſulphurated copper and antimony, and reſembles the dark-coloured *weiſsgulden*, giving a red powd r when rubbed. It is found either ſolid or cryſtallized, and is met with in the province of Dal, where it is melted by a very difficult proceſs, calculated to preſerve the different metals it contains. There is another kind which has arſenic united to the reſt of the ingredients. It is only the gray copper ore impregnated with ſilver, of which it contains from one to twelve per cent. the quantity of copper being from 12 to 24 per cent. and the remainder conſiſting either of ſulphur or arſenic, with a little iron. It is the moſt common of all ſilver ores; and M. Monnet remarks, that where copper is united to arſenic, ſilver is always to be found. A variety has been found at Schemnitz, containing a portion of gold alſo.

10. The *pechebl nde* is an ore of zinc containing ſilver, and is met with in the Saxon and Hungarian mines among the rich gold and ſilver ores. It is either of a metallic changeable colour or black. Of theſe there were formerly two varieties, viz. either in the form of fine ſcales or in balls, but the latter is now entirely unknown. A black blend is found in Bohemia, which is very heavy, with the ſurface ſomewhat elevated like ſome kinds of hæmatites, but no ſilver has yet been extracted from it.

11. The *bleyglanz*, potters ore, or galena, contains ſilver mineralized with ſulphurated lead. It is alſo called *pyritous ſilver*, and is of a brown colour, yielding but a very ſmall portion of metal. It is met with at Kunſberg in Norway. When the ſilver is combined with ſulphurated lead and antimony, the ore is called *ſtriperz*.

12. The *marcaſite* containing ſilver has the metal united with ſulphurated iron. There are great varieties of this ore holding different proportions of the metal; ſome produce only half an ounce of ſilver per cent. A liver-coloured marcaſite is found at Kunſberg in Norway, containing from three to three ounces and a half of ſilver per cent.

13. Silver is found mineralized with ſulphurated and arſenical cobalt; the ſtone ſometimes containing *dendrites*. Theſe kinds keep well in water, but generally decay in the air, and loſe the ſilver they contain. It is found at Morgenſtern near Freyberg and Annaberg.

14. The *butter-milk ore* contains ſilver mineralized by ſulphur, with regulus of antimony and barytes. It is found in the form of thin particles or granular ſpar. Wallerius ſays that it is ſoft like mud, and feels like butter. He ſuſpects it to be produced from other ſilver ores waſhed away by running waters. Bomare adds, that the miners look upon it as a certain ſign of other ores in the neighbourhood, though ſome are perſuaded that it is only an unripened ſilver ore, which would ſoon become perfect.

15. The *combuſtible* ſilver ore is a black brittle ſubſtance, leaving about ſix per cent. of ſilver in its aſhes. It is in fact a perfect coal in which ſilver is found.

16. The *hornertz*, or horn ſilver ore, in which the ſilver is united with the muriatic acid, is the ſcarceſt of all the ſilver ores. It is ſometimes found in ſnowy cubical cryſtals, but is met with of many different colours. Its principal characteriſtic is to change to a violaceous browniſh colour when expoſed to the ſunbeams, as happens alſo to the artificial luna cornea. It is frequently cryſtallized in a cubic form, though not always of a white colour. Sometimes it reſembles an earth eaſily fuſible without ſmoke. There is a black kind, friable, and eaſily reducible to powder; the other is in ſome degree malleable, may be cut with a knife, and takes a ſort of poliſh when rubbed. The vitreous ſilver ore, which is ſometimes mixed with the horn ſilver, is ſoluble in nitrous acid; and this affords a method of ſeparating them, the horn ſilver ore being inſoluble in that menſtruum. When the horn ſilver is free from iron, it generally contains 70 per cent. of ſilver at leaſt; but theſe ores moſtly contain ſome portion of iron, a ſmall part of which is even united to the marine acid. This kind of ore was firſt analyſed by Mr. Woulfe, who diſcovered the preſence of the vitriolic acid in it.

17. Another kind of horn ſilver ore is mentioned by Mr. Bergman, in which the metal is mineralized by the vitriolic and marine acids, along with ſome ſulphur. He doubts, however, whether the mineralization be perfect in this caſe, as the ſalt and ſulphur do not admit of any other than a mechanical union. But ſince iron is often found in theſe ores, a marcaſite may thus be ſometimes formed.

18. The *ſilver gooſe dung ore* is of a greeniſh colour, with a mixture of yellow and red. Some think it is a mixture of red ſilver ore and calx of nickel.

19. The *foliaceous* ſilver ore. The colour of this ore is *mort-doré*. Some imagine it to be a native ſilver ore; others that it is a mixture of galena, ochre, and ſilver. It is ſometimes found in the mountain cork, and is ſo light that it will ſwim upon water. It contains but one ounce of ſilver per quintal.

Theſe are all the varieties hitherto obſerved in which ſilver is met with in the earth. though it may perhaps occur in various other forms. It would be worth while to examine whether, in thoſe countries where gold and ſilver are found in large quantities, the precious metals may not be contained in ſome proportion in the moſt common ores, more eſpecially when the particles of gold and ſilver have not been able to extricate themſelves in ſuch a manner as to lie ſeparate in fiſſures, veins, or hollow places of the mine. A mineralization of ſilver with alkali is ſaid to have been lately met with at Annaberg in Auſtria; but the account of it as yet can ſcarcely be depended upon. Profeſſor Brunnich ſays, that the ſilver contained in the limeſtone at that place appears to be native when the ſtone is poliſhed.

The pureſt ſilver is that which is extracted from luna cornea, and is the only kind that ought to be truſted in the nice operations of chemiſtry, The proceſs, however, is very tedious, and preſents a very unexpected phenomenon, as this metal, though one of the moſt fixed, is nevertheleſs volatilized in the operation in ſuch a manner that it exhales through the pores of the crucible; and ſmall globules of ſilver are afterwards found in the cover, and even in the ſupport of the crucible. According to Cramer, this loſs may be prevented by ſmearing the crucible with black ſoap, and mixing with the luna cornea half its weight of oil or tallow, which laſt muſt alſo be added by little and little during the operation.

M. Magellan takes notice of a remarkable appearance obſervable in diſſolving ſilver in the nitrous acid. He obſerves, that this acid is its ſpecific menſtruum, attacking it even when cold with conſiderable effervesſcence, growing hot, and emitting a conſiderable quantity of orange coloured fumes, which diminiſh in proportion as the ſaturation advances. The metal appears of a pale brown colour in the conflict, and the ſolution becomes quite black. This laſt appearance, however, is owing to a thin, black, fuliginous ſubſtance, like ſmut, which is at once formed into a cruſt on the ſurface of the thin plates of ſilver in the firſt attack of the acid upon them. This is a very ſingular phenomenon, and hitherto unaccounted for, theſe black cruſts being comminuted into ſmaller and ſmaller particles by the action of the acid; and, when the effervesſcence is over, they are ſeen diſtinctly to fall to the bottom of the veſſel, and to form a black ſediment, leaving the liquid ſolution quite tranſparent, but of a blue colour inclining to green.—This colour might be attributed to ſome ſmall mixture of copper, though the ſilver uſed in the experiment was of the purer kind. The chemiſts of Dijon ſay, that the nitrous ſolution of ſilver looks of a fine blue colour, if the acid be pure and well concentrated; but if it has any mixture of vitriolic or marine, a precipitation of vitriolated ſilver or luna cornea takes place. Afterwards the ſolution becomes as colourleſs as water, but gives a laſting black tinge to animal

fubftances. This folution is of great ufe in chemiftry, ferving to form the lunar cauftic, to purify the common aquafortis from a mixture of the vitriolic and marine acids, and is a very nice teft of the exiftence of thefe acids in mineral waters.

Silver does not combine with earths, even by the moft violent heat, though Mr. Fourcroy fuppofes that its calx might give an olive green to glafs. Mr. Magellan informs us, that its calx, precipitated by volatile alkali, gives a yellow colour to glafs, and that he has feen it ftained in this manner fo high as almoft to appear of a red colour. It unites with moft metals, even with iron. The nature of this alloy has been but little inquired into, though Fourcroy is of opinion that it may probably be of the greateft utility in the arts. It combines in all proportions with copper, by which it is not deprived of its ductility, but renders it harder and more fonorous; by which means it is often ufed in bells. It is otherwife highly ufeful, on account of its indeftructibility by fire and air, and its extreme ductility. Its fine colour renders it extremely proper for ornamental purpofes, and it is applied like gold on the furface of different bodies, and even on copper. It likewife enters the texture of rich filks; but its moft confiderable ufe is that of being employed as money of an inferior value to gold. In this cafe it is alloyed with one-twelfth part of copper. It is likewife often employed in making houfehold utenfils of all kinds, though its great price renders it lefs common than it would otherwife be for this purpofe. For plate, it is ufually alloyed with one twenty-fourth of copper, which gives it a greater degree of hardnefs and coherence, without rendering it in the leaft noxious.

Silver has alfo been ufed in medicine; but its extreme caufticity, when diffolved in the nitrous acid, and its inactivity otherwife, have brought it into difufe. The cryftals of filver have been recommended, in very fmall quantity, in dropfical cafes; but they are by no means fuperior, or even equal in efficacy, to much fafer medicines. The folution of filver, under the name of *Greek water*, has been ufed for the purpofe of dyeing hair of a dark colour; and the fame folution evaporated to a confiftence, and fufed, forms the lunar cauftic of the fhops.

Shell SILVER, is prepared of the fhreds of filver leaf, or of the leaves themfelves, for the ufe of painters, after the fame manner as fhell gold. See *Shell* GOLD.

SILVERING, the covering of any thing with filver. It is ufual to filver metals, wood, paper, &c. which is performed either with fire, oil, or fize. Metal-gilders filver by the fire; painter-gilders all the other ways. See GILDING. To filver copper or brafs: 1. Cleanfe the metal with aquafortis, by wafhing it lightly, and immediately throwing it into pure water; or by heating it red-hot, and fcouring it with falt and tartar and pure water with a fmall wire brufh. 2. Diffolve fome filver in aquafortis, in a broad-bottomed glafs-veffel, or of glazed earth; then evaporate away the aquafortis over a chaffing-difh of coals. 3. Put five or fix times its quantity of water, or as much as will be neceffary to diffolve it perfectly, on the remaining dry calx; evaporate this water with the like heat; then put more frefh water, and evaporate again; and, if need be, the third time, making the fire towards the latter end fo ftrong as to leave the calx perfectly dry, which, if your filver is good, will be of a pure white. 4. Take of this calx, common falt, cryftal of tartar, of each a like quantity or bulk, and, mixing well the whole compofition, put the metal into pure water, and take of the faid powder with your wet fingers, and rub it well on, till you find every little cavity of the metal fufficiently filvered over. 5. If you would have it richly done, you muft rub on more of the powder; and in the laft place wafh the filvered metal in pure water, and rub it hard with a dry cloth.

SILVERING *of Glaffes*. See FOLIATING *of Looking-glaffes*.

SILURIS, in ichthyology, a genus belonging to the order of pifces abdominales. The head is naked; the mouth fet round with hairy filaments; the bronchiæ have from 4 to 14 rays; the ray of the pectoral fins, or the firft dorfal one, is prickly, and dentated backwards. There are 21 fpecies, moft of them natives of the Indian and American feas. Mr. Haffelquift mentions one called the *clarias* by Linnæus, and *fcheilan* by the Arabians. If it pricks one with the bone of the breaft fin, it is dangerous; and our author faw the cook of a Swedifh merchant fhip die of the poifon communicated by the prick of one of thefe fifh. See ELECTRICITY.

SIMEON *of* DURHAM, the cotemporary of William of Malmfbury, took great pains in collecting the monuments of our hiftory, efpecially in the north of England, after they had been fcattered by the Danes. From thefe he compofed a hiftory of the kings of England, from A. D. 616 to 1130; with fome fmaller hiftorical pieces. Simeon both ftudied and taught the fciences, and particularly the mathematics, at Oxford; and became precentor of the church at Durham, where he died, probably foon after the conclufion of his hiftory, which was continued by John, prior of Hexham, to A. D. 1156.

SIMIA, the MONKEY, a genus of quadrupeds belonging to the clafs of mammalia, and order of primates, in the Linnæan fyftem, but by Mr. Pennant arranged under the digitated quadrupeds. According to the Linnæan fyftem, the characteriftics of this genus are thefe: There are four clofe fet fore-teeth on each jaw; fingle tufks on each fide in both jaws, which are longer than the reft, and fomewhat remote from them. The grinders are obtufe, and the feet are formed like hands. Mr. Pennant gives the following generic defcription of the fimia: There are four cutting teeth in each jaw, and two canine. Each of the feet are formed like hands, generally with flat nails, and, except in one inftance, have four fingers and a thumb. There are eye-brows both above and below.

They are a numerous race; but almoft all confined to the torrid zone. They fill the woods of Africa from Senegal to the Cape, and from thence to Æthiopia. They are found in all parts of India, and its iflands; in Cochin-China, in the fouth of China, and in Japan; (and one is met with in Arabia;) and they fwarm in the forefts of South America, from the ifthmus of Darien as far as Paraguay. They are lively, agile, full of frolic, chatter, and grimace. From the ftructure of their members, they have many actions in common with the human kind. Moft of them are fierce and untameable; fome are of a milder nature, and will fhow a degree of attachment; but in general they are endowed with mifchievous intellects; and are filthy, obfcene, lafcivious, and thieving. They inhabit the woods, and live on trees; feeding on fruits, leaves, and infects. In general, they are gregarious, going in vaft companies; but the different fpecies never mix with each other, always keeping apart and in different quarters. They leap with vaft activity from tree to tree, even when loaded with their young, which cling to them. They are the prey of leopards and others of the feline race; and of ferpents, which purfue them to the fummits of the trees, and fwallow them entire. They are not carnivorous, but for mifchief's fake will rob the nefts of birds of the eggs and young. In the countries where they moft abound, the fagacity of the feathered tribe is more marvelloufly fhown in their contrivances to fix the neft beyond the reach of thefe invaders.

The fimiæ being more numerous in their fpecies than any other animals, and differing greatly in their appearances, it feemed neceffary to methodize and fubdivide the genus. Accordingly Mr. Ray firft diftributed them into three claffes. 1. *Simiæ*, Apes, fuch as wanted tails. 2. *Cercopitheci*, Monkeys, fuch as had tails. 3. *Papiones*, Baboons, thofe with fhort tails; to diftinguifh them from the common monkeys, which have very long ones.

The principal marks by which the fpecies of this genus are diftinguifhable from each other, are derived, 1ft, from the tail,

which is either long, ſhort, or altogether wanting, or is ſtraight, or prehenſile; 2dly, from the buttocks, which are naked, and furniſhed with calloſities, or are covered with hair; 3dly, from the nails, which are flat and rounded like thoſe of man, or ſharp pointed like the claws of beaſts in general; 4thly, from the preſence or abſence of a beard on the chin; and, 5thly, from the cheeks being provided with, or wanting, pouches in their under parts. For greater convenience, the ſpecies of this genus, which are very numerous, are arranged under five ſubordinate diviſions, conſidered as diſtinct genera by ſome authors, and not without reaſon. Three of theſe ſubdiviſions were adopted by Linnæus; but Dr. Gmelin, following Buffon, has added other two taken from the third diviſion of his great precurſor. Theſe ſubdiviſions are the *ſimiæ*, *papiones*, *cercopitheci*, *ſapaji*, and *ſagoini*.

I. The Simiæ, or Apes. (See pl. 14.) They have no tails. The viſage is flat; the teeth, hands, fingers, feet, toes, and nails, reſemble thoſe of man, and they walk naturally erect. This diviſion includes the ſimiæ, or apes properly ſo called, which are not found in America.

1. The *chimpanzee*, the ſimia troglodytes of Linnæus, common in the mountains of Sierra Leone, reſembles man more than the orang-outang. This animal was firſt brought to Europe in 1738, when it was exhibited as a ſhow in London. The following deſcription of one that was kept ſome months at the colony of Sierra Leone is given by Wadſtrom, in his Eſſay on Colonization, (Part ii. p. 272). He was nearly two feet high; but the full ſtature is nearly five feet. He was covered with black hair, long and thick on the back, but ſhort and thin on the breaſt and belly. His face was bare; his hands and his head reſembled thoſe of an old black man, except that the hair on his head was ſtraight. He ate, drank, ſlept, and ſat at table, like a human being. At firſt he crept on all fours, on the outſide of his hands; but when grown larger he endeavoured to go erect, ſupporting himſelf by a ſtick. He was melancholy, but always good-natured.

2. The *ſatyrus*, orang-outang, or great ape, has a flat face, and a deformed reſemblance of the human; ears like thoſe of a man; the hair on the head longer than on the body. The body and limbs are covered with reddiſh and ſhaggy hair; longeſt on the back, thinneſt on the fore parts. The face and paws are ſwarthy; the buttocks covered with hair. They inhabit the interior parts of Africa, the Iſles of Sumatra, Borneo, and Java. Are ſolitary, and live in the moſt deſert places. They grow to the height of ſix feet; have prodigious ſtrength, and will overpower the ſtrongeſt man. The old ones are ſhot with arrows, the young alone can be taken alive. They live entirely on fruits and nuts. They will attack and kill the negroes who wander in the woods; will drive away the elephants, and beat them with their fiſts or pieces of wood; and will throw ſtones at people that offend them. They ſleep in trees; and make a ſort of ſhelter from the inclemency of the weather. They are of a grave appearance and melancholy diſpoſition, and even when young not inclined to frolic. They go erect, and are vaſtly ſwift and agile. Theſe accounts are chiefly taken from Andrew Battel, an Engliſh ſailor, who was taken priſoner in 1589, and lived many years in the inner parts of Congo; his narrative is plain, and ſeems very authentic. It is preſerved in Purchas's collection. Froger informs us, "that thoſe along the banks of the river Ganges are larger and more miſchievous than in any part of Africa: the negroes dread them, and cannot travel alone in the country without running the hazard of being attacked by theſe animals, who often preſent them with a ſtick, and force them to fight. I have heard the Portugueſe ſay, that they have often ſeen them hoiſt up young girls, about ſeven or eight years old, into trees, and that they could not be wreſted from them without a great deal of difficulty. The moſt part of the negroes imagine them to be a foreign nation come to inhabit their country, and that they do not ſpeak for fear of being compelled to work." When taken young, they are capable of being tamed, and taught to perform many menial offices. Francis Pyrard relates, that in the province of Sierra Leone there is a ſpecies ſo ſtrong limbed, and ſo induſtrious, that, when properly trained and fed, they work like ſervants; that they generally walk on the two hind feet; that they pound any ſubſtances in a mortar; that they go to bring water from the river in ſmall pitchers, which they carry full on their heads. But when they arrive at the door, if the pitchers are not ſoon taken off, they allow them to fall; and when they perceive the pitchers overturned and broken, they weep and lament." Father Jarric, quoted by Nieremberg, ſays the ſame thing, nearly in the ſame terms. With regard to the education of theſe animals, the teſtimony of Shoutten accords with that of Pyrard. "They are taken (he remarks) with ſnares, taught to walk on their hind feet, and to uſe their fore feet as hands in performing different operations, as rinſing glaſſes, carrying drink round to the company, turning a ſpit, &c." "I ſaw at Java (ſays Guat) a very extraordinary ape. It was a female. She was very tall, and often walked erect on her hind feet. On theſe occaſions, ſhe concealed with her hands the parts which diſtinguiſh the ſex. Except the eye-brows, there was no hair on her face, which pretty much reſembled the groteſque female faces I ſaw among the Hottentots at the Cape. She made her bed very neatly every day, lay upon her ſide, and covered herſelf with the bed-clothes. When her head ached, ſhe bound it up with a handkerchief; and it was amuſing to ſee her thus hooded in her bed. I could relate many other little articles which appeared to me extremely ſingular. But I admired them not ſo much as the multitude; becauſe, as I knew the deſign of bringing her to Europe to be exhibited as a ſhow, I was inclined to think that ſhe had been taught many of theſe monkey tricks, which the people conſidered as being natural to the animal.—She died in our ſhip, about the latitude of the Cape of Good Hope. The figure of this ape had a very great reſemblance to that of man, &c." Gmelli Carreri tells us, that he ſaw one of theſe apes, which cried like an infant, walked upon its hind feet, and carried a mat under its arm to lie down and ſleep upon.

An orang-outang which Buffon ſaw is deſcribed by him as mild, affectionate, and good-natured. His air was melancholy, his gait grave, his movements meaſured, his diſpoſitions gentle, and very different from thoſe of other apes. He had neither the impatience of the Barbary ape, the malicioufneſs of the baboon, nor the extravagance of the monkeys. "It may be alleged, (ſays our author,) that he had the benefit of inſtruction; but the other apes which I ſhall compare with him were educated in the ſame manner. Signs and words were alone ſufficient to make our orang-outang act; but the baboon required a cudgel, and the other apes a whip; for none of them would obey without blows. I have ſeen this animal preſent his hand to conduct the people who came to viſit him, and walk as gravely along with them as if he had formed a part of the company. I have ſeen him ſit down at table, unfold his towel, wipe his lips, uſe a ſpoon or a fork to carry the victuals to his mouth, pour his liquor into a glaſs, and make it touch that of the perſon who drank along with him. When invited to take tea, he brought a cup and a ſaucer, placed them on the table, put in ſugar, poured out the tea, and allowed it to cool before he drank it. All theſe actions he performed without any other inſtigation than the ſigns or verbal orders of his maſter, and often of his own accord. He did no injury to any perſon: he even approached company with circumſpection, and preſented himſelf as if he wanted to be careſſed. He was very fond of dainties, which every body gave him: And as his breaſt was

diſeaſed, and he was afflicted with a teaſing cough, this quantity of ſweetmeats undoubtedly contributed to ſhorten his life. He lived one ſummer in Paris, and died in London the following winter. He ate almoſt every thing; but preferred ripe and dried fruits to all other kinds of food. He drank a little wine; but ſpontaneouſly left it for milk, tea, or other mild liquors." This was only two feet four inches high, and was a young one. There is great poſſibility that theſe animals may vary in ſize and in colour, ſome being covered with black, others with reddiſh hairs.—They are not the ſatyrs of the antients; which had tails, and were a ſpecies of monkey. Linnæus's *homo nocturnus*, an animal of this kind, is unneceſſarily ſeparated from his *ſimia ſatyrus*.

To enable the reader to form a judgement of this animal, which has ſo great a reſemblance to man, it may not be unacceptable to refer to Buffon for the differences and conformities which make him approach or recede from the human ſpecies.

3. *Pongo*, or *Jocko*, are conſidered as one ſpecies by Pennant and Gmelin. It inhabits the iſland of Java, and the interior parts of Guinea. Has no pouches within his cheeks, no tail, and no calloſities on the buttocks; which laſt are plump and fleſhy. All the teeth are ſimilar to thoſe of man. The face is flat, naked, and tawny; the ears, hands, feet, breaſt, and belly, are likewiſe naked; the hair of the head deſcends on both temples in the form of treſſes; the hair on the back and loins is in ſmall quantities. It is five or ſix feet high, and walks always erect on the two hind feet. It has not been aſcertained whether the females, of this ſpecies or variety, are ſubject to periodical diſcharges; but analogy renders this almoſt unqueſtionable. This animal is by Dr. Gmelin conſidered only as a variety of the orang-outang.

4. The *great gibbon*, long-armed ape, or ſimia lar, with a flat ſwarthy face ſurrounded with gray hairs; hair on the body black and rough; buttocks bare; nails on the hands flat; on the feet long; arms of a moſt diſproportioned length, reaching quite to the ground when the animal is erect, its natural poſture; of a hideous deformity.—Inhabits India, Malacca, and the Molucca Iſles; a mild and gentle animal; grows to the height of four feet. The great black ape of Mangſi, a province in China, ſeems to be of this kind.

5. The *leſſer gibbon*, or ſimia lar minor, but is much leſs, being only about a foot and a half high; the body and face are of a brown colour, reſembles the former. The ſimia lar argentea is probably a variety of this ſpecies.

6. The pigmy, or *ſimia ſilvanus*, has no tail; the buttocks are naked; the head roundiſh, and the arms ſhorter than the body. It inhabits Africa; and is not uncommon in our exhibitions of animals; is very tractable and good-natured, and was moſt probably the pigmy of the antients. It abounds in Æthiopia, one ſeat of that imaginary nation; was believed to dwell near the fountains of the Nile, whence it deſcended annually to make war on the cranes, *i. e.* to ſteal their eggs, which the birds may be ſuppoſed naturally to defend; whence the fiction of their combats.

7. The *magot*, *ſimia inuus*, or Barbary ape, has a long face, not unlike that of a dog; canine teeth, long and ſtrong; ears like the human; nails flat; buttocks bare; colour of the upper part of the body a dirty greeniſh brown; belly, of a dull pale yellow; grows to above the length of four feet.—They inhabit many parts of India, Arabia, and all parts of Africa except Egypt, where none of this genus are found. A few are found on the hill of Gibraltar, which breed there; probably from a pair that had eſcaped from the town, as they are not found in any other part of Spain.—They are very ill-natured, miſchievous, and fierce; agreeing with the character of the antient cynocephali. They are a very common kind in exhibitions. By force of diſcipline they are made to play ſome tricks; otherwiſe they are more dull and ſullen than the reſt of this genus. They aſſemble in great troops in the open fields in India, and will attack women going to market, and take their proviſions from them. The females carry the young in their arms, and will leap from tree to tree with them. Apes were worſhipped in India, and had magnificent temples erected to them. When the Portugueſe plundered one in Ceylon, they found in a little golden caſket the tooth of an ape; a relic held by the natives in ſuch veneration, that they offered 700,000 ducats to redeem it, but in vain; for it was burnt by the viceroy, to ſtop the progreſs of idolatry.

II. Papiones, or Baboons (ſee pl. 15). Theſe have ſhort tails, a long face; a broad high muzzle; longiſh dog-like tuſks, or canine teeth; and naked calloſities on the buttocks. They are only found in the old world, and are the papiones and Κυνοκεφαλα of the antients.

8. The *maimon*, ſimia papio nemeſtrina, or pig-tailed baboon, with a pointed face, which is naked, of a ſwarthy redneſs; two ſharp canine teeth; ears like the human; hair on the limbs and body brown inclining to aſh-colour, paleſt on the belly: fingers black; nails long and flat; thumbs on the hind feet very long, connected to the neareſt toe by a broad membrane; tail four inches long, ſlender, exactly like a pig's, and almoſt naked; the bare ſpaces on the rump red, and but ſmall: length, from head to tail, 22 inches. Inhabits the iſles of Sumatra and Japan; is very docile. In Japan it is taught ſeveral tricks, and carried about the country by mountebanks. Kempfer was informed by one of theſe people, that the baboon he had was 102 years old.

9. The great baboon, or *ſimia papio ſphinx*, with hazel irides; ears ſmall and naked, face canine, and very thick; middle of the face and forehead naked, and of a bright vermilion colour; tip of the noſe of the ſame, and ending truncated like that of a hog; ſides of the noſe broadly ribbed, and of a fine violet hue; the opening of the mouth very ſmall; cheeks, throat, and goat-like beard yellow; hair on the forehead very long, turns back, is black, and forms a kind of pointed creſt. Head, arms, and legs, covered with ſhort hair, yellow and black intermixed; the breaſt with long whitiſh yellow hairs; the ſhoulders with long brown hair. Nails flat; feet and hands black; tail four inches long, and very hairy; buttocks bare, red, and filthy; but the ſpace about them is of a moſt elegant purple colour, which reaches to the inſide of the upper part of the thighs.

This was deſcribed by Mr. Pennant from a ſtuffed ſpecimen in Sir Aſhton Lever's muſeum. In Auguſt 1779, a live animal of this ſpecies was ſhown at Edinburgh, and in October following at Cheſter, where being ſeen by Mr. Pennant, that inquiſitive naturaliſt has deſcribed it in his Hiſtory of Quadrupeds. "It differed little (he obſerves) in colour from the above, being in general much darker. Eyes much ſunk in the head, and ſmall. On the internal ſide of each ear was a white line, pointing upwards. The hair on the forehead turned up like a toupee.—Feet black; in other reſpects reſembled the former. In this I had an opportunity of examining the teeth. The cutting teeth were like thoſe of the reſt of the genus; but, in the upper and lower jaw, were two canine, or rather tuſks, near three inches long, and exceedingly ſharp and pointed. This animal was five feet high, of a moſt tremendous ſtrength in all its parts; was exceſſively fierce, libidinous, and ſtrong."

Mr. Schreber ſays, that this ſpecies lives on ſucculent fruits, and on nuts; is very fond of eggs, and will put eight at once into its pouches, and, taking them out one by one, break them at the end, and ſwallow the yolk and white; rejects all fleſh-meat, unleſs it be dreſſed; would drink quantities of wine or brandy; was leſs agile than other baboons; very cleanly; for it would immediately fling its excrements out of its hut. That

which was shown at Chester was particularly fond of cheese. Its voice was a kind of roar, not unlike that of a lion, but low and somewhat inward. It went upon all fours, and never stood on its hind legs, unless forced by the keeper; but would frequently sit on its rump in a crouching manner, and drop its arms before the belly. Inhabits the hotter parts of Africa.

10. The little baboon, or *simia papio apedia*, has a roundish head, with a projecting muzzle, and roundish naked ears; the hair on the body is yellow, tipt with black; the face is brown, and almost naked, having only a few scattered hairs; the nails are all compressed and oblong, except on the thumbs and great toes, the nails of which resemble man; the tail is very short, being hardly an inch long; the body is about the size of a cat. It is uncertain, says Gmelin, if this animal should be considered as a distinct species, or only as a variety of the simia sciurea.

11. The mantegar, or *simia papio mormon*, commonly called the *tufted ape*, but it is improperly named an *ape*, as it has a tail. It is described in the abridgment of the Philosophical Transactions, N° 290. It had a nose and head fourteen inches in length; the nose of a deep red, face blue, both naked; black eyebrows; ears like the human; on the top of the head a long upright tuft of hair; on the chin another; two long tusks in the upper jaw; fore feet exactly resembling hands, and the nails on the fingers flat; the fore part of the body and the inside of the legs and arms naked; the outside covered with mottled brown and olive hair. Length, from the nose to the rump, three feet two inches. It was very fierce and salacious; went on all fours, but would sit up on its rump, and support itself with a stick: in this attitude it would hold a cup in its hand, and drink out of it. Its food was fruits.

12. The mandril, *simia papio maimon*, or ribbed-nose baboon, has a short tail, and a thin beard on the chin; the cheeks are blue and striped, and the buttocks are naked. This species of baboon is found on the Gold Coast, and in the other southern provinces of Africa, where he is called *boggo* by the negroes, and *mandril* by the Europeans. Next to the orang-outang, he is the largest of all the apes or baboons. Smith relates, that he had a present of a female mandril, which was only six months old, and that it was as large as an adult baboon. He adds, that these mandrils walk always on two feet; that they weep and groan like men; that they have a violent passion for women, which they never fail to gratify when they find a woman at a distance from relief. We have given figures both of the male and female, which may be easily distinguished by their size and appearance.

13. The wood baboon, or *simia papio sylvatica*, with a long, dog-like face, covered with a small glossy black skin; hands and feet naked, and black like the face; hair on all parts long, elegantly mottled with black and tawny; nails white; about three feet high when erect; tail not three inches, and very hairy on the upper top. Inhabits Guinea, where it is called by the English the *man of the wood*.

14. The brown baboon, or *simia papio platypygos*, with pointed ears; face of a dirty white; nose large and broad; hairs round the face short and straight: colour of the upper part of the body brown; of the under, ash colour; tail about four inches long; taper, and almost bare of hair; beneath is quite naked. The animal which Mr. Pennant called the *new baboon*, in the first edition, seems by the taperness of the tail, and general form, to be of this kind.

15. The hoggish baboon, or *simia papio porcaria*, has a short tail, and coloured buttocks; the head is like that of a hog, with a naked snout; the body is of an olive brown colour; the nails are sharp and compressed. Inhabits Africa, and is about three feet and a half high when standing erect. This, in all probability, is the same animal with the hog-faced ape, adopted from Pennant.

III. Monkeys, Cercopitheci, have long tails, which are not prehensile; the under parts of their cheeks are furnished with pouches, in which they can keep their victuals; the partition between the nostrils is thin, and the apertures are, like those of man, placed in the under part of the nose; the buttocks are naked, and provided with callosities. These animals, which are never found native in America, are the cercopitheci, and Κυβοι, of the antients. See pl. 16.

16. The *Tartarin*, dog-faced baboon of Pennant, and cercopithecus hamadryas of Gmelin, with a long, thick, and strong nose, covered with a smooth red skin; ears pointed, and hid in the hair: head great, and flat; hair on the head, and fore part of the body as far as the waist, very long and shaggy; gray and olive-brinded; the sides of the head very full; the hair on the limbs and hind part of the body very short; limbs strong and thick; hands and feet dusky; the nails on the fore feet flat; those on the hind like a dog's; buttocks very bare, and covered with a skin of a bloody colour; tail scarce the length of the body, and carried generally erect. They inhabit the hottest parts of Africa and Asia; where they keep in vast troops, and are very fierce and dangerous. They rob gardens. They will run up trees when passengers go by, shake the boughs at them with great fury, and chatter very loud. They are excessively impudent, indecent, lascivious; most detestable animals in their manners, as well as appearance. They range the woods in hundreds, which obliges the owners of the coffee plantations to be continually on their guard against their depredations. One of them was shown in London some years ago: it came from Mokha, in the province of Yeman, in Arabia Felix, in the Persian gulph, and was above five feet high. It was very fierce and untameable; so strong as easily to master its keeper, a stout young man. Its inclinations to women appeared in the most violent manner. A footman, who brought a girl to see it, in order to tease the animal, kissed and hugged her: the beast, enraged at being so tantalized, caught hold of a quart pewter pot, which he threw with such force and so sure an aim, that, had not the man's hat and wig softened the blow, his skull must have been fractured: but he fortunately escaped with a common broken head.

17. The white bearded black wanderu, the *simia silenus* of Linnæus, the ouanderou of Buffon, and lion-tailed baboon of Pennant, the cercopithecus silenus albibarbatus of Gmelin, has a dog-like face, is naked, and of a dusky colour; a very large and full white or hoary beard; large canine teeth; body covered with black hair; belly of a light colour; tail terminated with a tuft of hair like that of a lion. Its bulk that of a middling sized dog. It inhabits the East Indies, and the hotter parts of Africa.

18. The purple-faced monkey, or *cercopithecus silenus purpuratus*, with a great triangular white beard, short and pointed at the bottom, and on each side of the ears, extending a winged fashion far beyond them; face and hands purple, body black. Inhabit Ceylon. They are very harmless; live in the woods, and feed on leaves and buds of trees; and, when taken, soon become tame.

19. Malbrouk, or *cercopithecus faunus*, has a long tail, and is bearded; the tail is bushy at the extremity. It is a native of Bengal. This species has cheek-pouches, and callosities on the buttocks; the tail is nearly as long as the body and head; and it is a mistake of Clusius that it terminates in a tuft; the face is of a cinereous gray colour, with a large muzzle, and large eyes, which have flesh-coloured eyelids, and a gray band cross the forehead in the place of eyebrows; the ears are large, thin, and flesh-coloured; the upper parts of the body are of a uniform yellowish brown colour, and the lower of a yellowish

gray: it walks on all fours, and is about a foot and a half from the muzzle to the extremity of the tail. The females menftruate.

20. Macaque, or *cercopithecus cynomologus*, the hare-lipped monkey of Pennant, has no beard; the noftrils are thick and divided; the tail is long and arched; and the buttocks are naked. He has cheek-pouches, and callofities on the buttocks. His tail is from 18 to 20 inches long. His head is large, his muzzle very thick, and his face naked, livid, and wrinkled. His ears are covered with hair. His body is fhort and fquat, and his limbs thick and fhort. The hair on the fuperior parts of his body is of a greenifh afh-colour, and of a yellowifh gray on the breaft and belly. He has a fmall creft of hair on the top of the head. He walks on four and fometimes on two feet. The length of his body, comprehending that of the head, is about 18 or 20 inches.

21. The dog-headed monkey, or *cercopithecus cynocephalus*, has no beard, and is of a yellow colour; the muzzle is long; the tail long and ftraight, and the buttocks naked. It is a native of Africa.

22. The fpotted monkey, or *cercopithecus Diana*, with a long white beard: colour of the upper parts of the body reddifh, as if they had been finged, marked with white fpecks; the belly and chin whitifh; tail very long; is a fpecies of a middle fize. It inhabits Guinea and Congo, according to Marcgrave; the Congefe call it *exquima*. M. de Buffon denies it to be of that country; but from the circumftance of the curl in its tail, in Marcgrave's figure, and the defcription of fome voyagers, he fuppofes it to be a native of South America. Linnæus defcribes his S. Diana fomewhat differently: he fays it is of the fize of a large cat; black, fpotted with white; hind part of the back ferruginous; face black; from the top of the nofe is a white line paffing over each eye to the ears, in an arched form; beard pointed, black above, white beneath, placed on a fattifh excrefcence; breaft and throat white; from the rump, crofs the thighs, a white line; tail long, ftraight, and black; ears and feet of the fame colour; canine teeth, large.

23. The green monkey, or *cercopithecus fabæus*, has a black and flattifh face; the fide of it bounded by long white hairs, falling backwards, and almoft covering the ears, which are black, and like the human; head, limbs, and whole upper part of the body and tail covered with foft hair, of a yellowifh green colour at their ends, cinereous at their roots; under fide of the body and tail, and inner fide of the limbs, of a filvery colour: tail very long and flender; fize of a fmall cat; inhabit different parts of Africa; keep in great flocks, and live in the woods; are fcarce difcernible when among the leaves, except by their breaking the boughs with their gambols, in which they are very agile and filent; even when fhot at, do not make the leaft noife, but will unite in company, knit their brows, and gnafh their teeth, as if they meant to attack the enemy; are very common in the Cape de Verd iflands.

24. The muftache, or *cercopithecus cephus*, has a beard on the cheeks: the crown of the head is yellowifh; the feet are black, and the tip of the tail is of an afh colour. Its tail is much longer than the body and head, being 19 or 20 inches in length. The female menftruates.

25. The mangabey, *cercopithecus æthiops*, or white eyed monkey, has a long, black, naked, and dog-like face; the upper eye-lids of a pure white, ears black, and like the human; no canine teeth; hairs on the fides of the face beneath the cheeks longer than the reft; tail long; colour of the whole body tawny and black; flat nails on the thumbs and fore fingers; blunt claws on the others; hands and feet black. Shown in London fome years ago; place uncertain; that defcribed by M. de Buffon came from Madagafcar; was very good-natured; went on all-fours.

26. The egret, or *cercopithecus aygula*, has a long face, and an upright fharp-pointed tuft of hair on the top of the head. The hair on the forehead is black; the tuft, and the upper part of the body, light-gray; the belly white; the eyebrows are large; the beard very fmall. Size of a fmall cat. They inhabit Java. They fawn on men, on their own fpecies, and embrace each other. They play with dogs, if they have none of their own fpecies with them. If they fee a monkey of another kind, they greet him with a thoufand grimaces. When a number of them fleep, they put their heads together. They make a continual noife during night.

27. The rillow, *cercopithecus finicus*, or Chinefe bonnet, has a long fmooth nofe, of a whitifh colour; hair on the crown of the head long, lying flat, and parted like that of a man; colour, a pale cinereous brown. Inhabit Ceylon. They keep in great troops; and rob gardens of their fruit, and fields of their corn; to prevent which, the natives are obliged to watch the whole day; yet thefe animals are fo bold, that, when driven from one end of the field, they will immediately enter at the other, and carry off with them as much as their mouth and arms can hold. Bofman, fpeaking of the thefts of the monkeys of Guinea, fays, that they will take in each paw one or two ftalks of millet, as many under their arms, and two or three in their mouth; and, thus laden, hop away on their hind legs; but, if purfued, they fling away all, except what is in their mouths, that it may not impede their flight. They are very nice in the choice of the millet; examine every ftalk; and if they do not like it, fling it away; fo that this delicacy does more harm to the fields than their thievery.

28. The tawny monkey, or *cercopithecus fulvus*, has long tufks in the lower jaw; the vifage is long and flefh coloured, with flefh coloured ears, and a flattifh nofe. Inhabits India. This is a very ill natured animal, about the fize of a cat; it was lately in the poffeffion of Mr. Brook, an animal merchant and exhibitor in London. The upper parts of the body are covered with a pale tawny-coloured fur, which is afh coloured at the roots; the hinder part of the back is orange coloured, the legs afh coloured, the belly white, and the tail fhorter than the body.

29. King monkey, full-bottom monkey, or *cercopithecus regalis*, has no thumb on the hands; the head, cheeks, throat, and fhoulders, are covered with long, flowing, coarfe hairs. Inhabits the forefts of Sierra Leone in Guinea, where it is called *bey*, or *king monkey*. It is above three feet high when erect; the head is fmall, with a fhort, black, naked face; and the head, cheeks, throat, neck, and fhoulders, are covered with long, coarfe, flowing hairs, of a dirty yellowifh colour, mixed with black, and refembling a full-bottomed wig; the body, arms, and legs, are covered with fhort hairs of a fine gloffy black colour; the hands are naked, and have no thumbs; the feet have five very long flender toes, which are armed with narrow pointed claws; the tail is very long, and is covered with fnow white hairs, having a tuft at the end; the body and limbs are very flender; its fkin is held in high eftimation by the negroes for making pouches and gun cafes.

IV. Sapajous, Sapaji, have prehenfive tails, and no cheek pouches. (See pl. 17.) Thefe animals have long tails, which, at the extremity, is generally deprived of hair on the under fide, and covered with a fmooth fkin; this part they can fold, extend, curl up, and unfold at pleafure: by which they are enabled to hang upon branches, or to lay hold of any thing which is beyond the reach of their hands, ufing the extremity of the tail like a finger or hand; the partition between the noftrils is very thick, and the apertures are fituated on the fides of the nofe; the buttocks are clothed with hair, and have no callofities; the females of this fubgenus do not menftruate; and this race of

animals is only to be found in America. This subdivision of the genus is made with great propriety by Dr. Gmelin, in imitation of the Count de Buffon.

30. The guariba, *sapajus Beelzebub*, or the preacher monkey, has black shining eyes, short round ears, and a round beard under the chin and throat; the hairs on the body are of a shining black, long, yet lie so close on each other, that the animal appears quite smooth; the feet and end of the tail are brown; the tail very long, and always twisted at the end. Size of a fox. Inhabit the woods of Brazil and Guiana in vast numbers, and make a most dreadful howling. Sometimes one mounts on a higher branch, the rest seat themselves beneath: the first begins as if it was to harangue, and sets up so loud and sharp a howl as may be heard a vast way, and a person at a distance would think that a hundred joined in the cry; after a certain space, he gives a signal with his hand, when the whole assembly joins in chorus; but on another signal is silent, and the orator finishes his address*. Their clamour is the most disagreeable and tremendous that can be conceived, owing to a hollow and hard bone placed in the throat, which the English call the *throttle-bone*. These monkeys are very fierce, untameable, and bite dreadfully. There is a variety of a ferruginous or reddish bay colour, which the Indians call the *king of the monkeys*. It is large, and as noisy as the former. The natives eat this species, as well as several other sorts of monkeys, but are particularly fond of this. Europeans will also eat it, especially in those parts of America where food is scarce. When it is scalded in order to get off the hair, it looks very white, and has a resemblance shocking to humanity, that of a child of two or three years old when crying †.

31. The quato, *sapajus paniscus*, or four-fingered monkey, has a long flat face, of a swarthy flesh colour: the eyes are sunk in the head; ears like the human; limbs of a great length, and uncommonly slender; the hair is black, long, and rough. There are only four fingers on the hands, being quite destitute of a thumb; five toes on the feet. The tail is long, and naked below, near the end. The body is slender; about a foot and a half long; the tail near two feet, and so prehensile as to serve every purpose of a hand. They inhabit the neighbourhood of Carthagena, Guiana, Brazil, and Peru; associate in vast herds, and are scarce ever seen on the ground. Dampier describes their gambols in a lively manner: "There was (says he) a great company dancing from tree to tree over my head, chattering, and making a terrible noise and a great many grim faces and antic gestures; some broke down dry sticks and flung them at me; others scattered their urine and dung about my ears; at last, one bigger than the rest came to a small limb just over my head, and, leaping directly at me, made me leap back; but the monkey caught hold of the bough with the tip of its tail, and there continued swinging to and fro, making mouths at me. The females, with their young ones, are much troubled to leap after the males; for they have commonly two: one she carries under her arm, the other sits on her back, and claps its two fore paws about her neck; are very sullen when taken; and very hard to be got when shot, for they will cling with their tail or feet to a bough as long as any life remains. When I have shot at one, and broke a leg or arm, I have pitied the poor creature to see it look at and handle the broken limb, and turn it from side to side." They are the most active of monkeys, and quite enliven the forests of America. In order to pass from top to top of lofty trees, whose branches are too distant for a leap, they will form a chain, by hanging down, linked to each other by their tails, and swinging in that manner till the lowest catches hold of a bough of the next tree, and draws up the rest; and sometimes they pass rivers by the same expedient. They are sometimes brought to Europe; but are very tender, and seldom live long in our climate.

32. The sai, *sapajus capucinus*, or weeper, with a round and flat face, of a reddish brown colour, very deformed; the hair on the head and upper part of the body black, tinged with brown; beneath and on the limbs tinged with red; tail black, and much longer than the head and body; the young excessively deformed; their hair very long, and thinly dispersed. In the British Museum are specimens of old and young. M. de Buffon has a variety with a white throat. Inhabits Surinam and Brazil: appears as if it was always weeping; of a melancholy disposition; but very full of imitating what it sees done. These probably are the monkeys Dampier saw in the Bay of All Saints, which he says are very ugly, and smell strongly of musk. They keep in large companies, and make a great chattering, especially in stormy weather; reside much on a species of tree which bears a podded fruit, which they feed on.

33. *Sapajus fatuellus*, or horned sapajou, has two tufts of hair on the head, resembling little horns; is beardless. Inhabits South America. The face, sides, belly, and fore parts of the thighs are brown; the top of the head, middle of the back, tail, legs, and posterior parts of the thighs, are black; the nails are long and rather blunt; the tail is prehensile and twisted spirally. Perhaps of the same species with the simia apella or capuchin (*Gm.*). This, in all probability, is one of the factitious species, purposely deformed, by exhibitors of wild beasts, to impose on the public.

34. Saimiri, *sapajus sciureus*, or orange monkey, has no beard; the hinder part of the head is prominent; and the nails on the four toes of the hind paws are narrow and pointed. It inhabits South America, and is the most beautiful of all the sapajous; its movements are graceful, its size small, its colour a brilliant yellow, its visage round, with large vivacious eyes, surrounded by flesh-coloured rings; it has hardly any forehead; the nose is elevated at the base, and flattened at the point; the mouth is small, the face flat and naked, and the ears are garnished with hair, and a little pointed; the tail is only half prehensile; it stands with ease on two feet, but commonly walks on all four.

V. Sagoins, Sagoini. (See pl. 17.) These have long tails, which are proportionally longer than those of the sapajous, straight, flaccid, entirely covered with hair, and not prehensile; that is, incapable of laying hold of any object; the cheeks have no pouches; and the buttocks, which are covered with hair, have no callosities; the partition between the nostrils is very thick, and the apertures are placed on the sides of the nose. The females do not menstruate. This race of animals is only found in America.

35. The saki, *sagoinus pithecia*, or fox tailed monkey, with a swarthy face, covered with short white down: forehead and sides of the face with whitish, and pretty long hair; body with long dusky brown hairs, white or yellowish at their tips; hair on the tail very long and bushy; sometimes black, sometimes reddish; belly and lower part of the limbs a reddish white; length from nose to tail near a foot and a half; tail longer, and like that of

* A singular account, yet related by Marcgrave and several other writers. Marcgrave is a writer of the first authority, and a most able naturalist, long resident in the Brazils, and speaks from his own knowledge.

† *Ulloa's Voy.* i. 113. *Des Marchais*, iii. 311. says, they are excellent eating, and that a *soupe aux singes* will be found as good as any other, as soon as you have conquered the aversion to the *bouilli* of their heads, which look very like those of little children.

a fox; hands and feet black, with claws inſtead of nails. Inhabits Guiana.

36. The fanglin, *ſagoinus iacchus*, or ſtriated monkey, with a very round head; about the ears two very long full tufts of white hairs ſtanding out on each ſide; irides reddiſh; face a ſwarthy fleſh colour, ears like the human, head black, body aſh coloured, reddiſh, and duſky; the laſt forms ſtriated bars croſs the body; tail full of hair, annulated with aſh colour and black; body ſeven inches long; tail near eleven; hands and feet covered with ſhort hairs; fingers like thoſe of a ſquirrel; nails, or rather claws, ſharp. Inhabits Brazil; feeds on vegetables; will alſo eat fiſh; makes a weak noiſe; very reſtleſs; often brought over to Europe.

37. Pinche, *ſagoinus œdipus*, or red-tailed monkey, is beardleſs; has a flowing head of hair, which hangs down on each ſide; a red tail and ſharp claws. It has neither cheek-pouches nor calloſities on the buttocks. His tail is not prehenſile, and is more than twice the length of the head and body. The partition of the noſtrils is thick, and the apertures are placed at a ſide. The face, throat, and ears are black; on the head are long white hairs; the muzzle is broad, and the face round; the hair on the body is pretty long, of a yellowiſh brown or reddiſh colour till near the tail, where it becomes orange; on the breaſt, belly, hands, and feet, it is white, and ſhorter than on the body. The tail, from the origin to one-half of its length, is a vivid red, then browniſh red, and toward the point it is black. He is about nine inches in length, and walks on four feet. The females are not ſubject to the menſtrual evacuation.

38. The marikina, *ſagoinus roſalius*, or ſilky monkey, is beardleſs; has a very hairy head; the circumference of the face and the feet are red; and the claws are ſharp and narrow. It inhabits South America. A briſk animal, leſs impatient of cold than the reſt of this race; the body is of a yellowiſh white colour; the nails on the thumbs and great toes are rounded; the ears are naked, but are hidden beneath the fur; it has a round head, and a brown face, which is ſurrounded with a kind of mane of a bright red colour: the hair on the body and tail is long, ſilky, and of a pale but vivid yellow colour, almoſt white, with a conſiderable tuft at the extremity of the tail. It walks on four feet, and is eight or nine inches in length, from the muzzle to the rump; and the tail is above 13 inches long.—This ſpecies has the ſame manners and vivacity with the other ſagoins, but is more robuſt in conſtitution, as an individual lived five or ſix years in Paris, being kept in a warm room during winter.

39. The mico, *ſagoinus argenteus*, or fair monkey, with a ſmall round head; face and ears of the moſt lively vermilion colour; body covered with moſt beautiful long hairs of a bright and ſilvery whiteneſs, of matchleſs elegance; tail of a ſhining dark cheſnut; head and body eight inches long; tail twelve.—Inhabits the banks of the Amazons; diſcovered by M. de Condamine.

40. The tamarin, *ſagoinus Midas*, or great-eared monkey, with a round head, ſwarthy, fleſh coloured, naked face; upper lip a little divided; ears very large, erect, naked, and almoſt ſquare; hair on the forehead upright and long; on the body ſoft, but ſhaggy; the head, whole body, and upper part of the limbs black, except the lower part of the back, which is tinged with yellow; hands and feet covered with orange coloured hairs, very fine and ſmooth; nails long and crooked; tail black, and twice the length of the body; teeth very white. It is of the ſize of a ſquirrel. It inhabits the hotter parts of South America, and the iſle of Gorgona, ſouth of Panama, in the South Sea. There are, ſays Dampier, a great many little black monkeys; at low-water they come to the ſea-ſide to take muſcles and periwinkles, which they dig out of the ſhells with their claws.

Beſides theſe which we have deſcribed, there are a great many ſpecies which we have omitted. Thoſe who wiſh to be better acquainted with the ſimiæ may conſult Buffon, Pennant, and Gmelin's edition of the Zoology of Linnæus by Mr. Ker.

SIMILE, or Similitude, in rhetoric, a compariſon of two things, which though different in other reſpects yet agree in ſome one. The difference between a ſimile and compariſon is ſaid to conſiſt in this, that the ſimile properly belongs to whatever we call the quality of a thing, and the compariſon to the quantity. See Comparison and Oratory.

SIMILOR, a name given to an alloy of red copper and zinc; made in the beſt proportions, to imitate ſilver a d gold.

SIMON Maccabeus, a celebrated leader and high prieſt of the Jews, who, after rendering the moſt important ſervices to his country, was at laſt treacherouſly ſlain by his ſon-in-law.—*See the Hiſtory of the Jews.*

Simon Magus, or the Sorcerer, was a native of Gitton, a village of Samaria. According to the uſual practice of the Aſiatics of that age, he viſited Egypt, and there probably became acquainted with the ſublime myſteries taught in the Alexandrian ſchool, and learned thoſe theurgic or magical operations by means of which it was believed that men might be delivered from the power of evil dæmons. Upon his return into his own country, the author of the Clementine Recognitions relates, that he impoſed upon his countrymen by high pretenſions to ſupernatural powers. And St. Luke atteſts, that this artful fanatic, uſing ſorcery, had bewitched the people of Samaria, giving out that he was *ſome great one:* and that he obtained ſuch general attention and reverence in Samaria, that the people all gave heed to him, from the leaſt to the greateſt, ſaying, "This man is the great power of God."

By the preaching of Philip the Deacon, he was with other Samaritans converted to the Chriſtian faith, and admitted into the infant church by the ordinance of baptiſm. His converſion, however, ſeems not to have been real; for, upon ſeeing the miraculous effects of the laying on of the apoſtles' hands, he offered them money, ſaying, "Give me alſo this power, that on whomſoever I lay hands he may receive the Holy Ghoſt."—He probably thought Peter and John magicians like himſelf, but better ſkilled in the art of deceiving the multitude.

Being ſharply reproved for this impiety, he ſeems by his anſwer to have been made ſenſible of his ſin; but his repentance, if ſincere, was of ſhort duration. Returning to his former practices of impoſture, he travelled through various provinces of the empire, oppoſing the progreſs of the goſpel; and arriving at Rome, he led aſtray vaſt numbers of people by his pretended miracles. How long he lived in that metropolis of the world, or in what manner he died, we have no accounts that can be fully depended on. The Chriſtian writers tell us, that, being raiſed in the air by two dæmons, he was deprived of their ſupport by the prayers of St. Peter and St. Paul, and, falling, broke his legs. By ſome he is thought to have been the perſon mentioned by Suetonius, who, undertaking to fly in the preſence of Nero, fell to the ground with ſuch violence, that his blood ſpurted up to the gallery where the emperor was ſitting.

The ſum of this impoſtor's doctrine, diveſted of allegory, was, that from the Divine Being, as a fountain of light, flow various orders of æons, or eternal natures, ſubſiſting within the plenitude of the divine eſſence; that beyond theſe, in the order of emanation, are different claſſes of intelligences, among the loweſt of which are human ſouls; that matter is the moſt remote production of the emanative power, which, on account of its infinite diſtance from the Fountain of Light, poſſeſſes ſluggiſh and malignant qualities, which oppoſe the divine operations, and are the cauſe of evil; that it is the great deſign of philoſophy to deliver the ſoul from its impriſonment in matter, and re-

ftore it to that divine light from which it was derived; and that for this purpofe God had fent him one of the firft æons among men. To his wife Helena he alfo afcribed a fimilar kind of divine nature, pretending that a female æon inhabited the body of this woman, to whom he gave the name of *Εννοια*, *Wifdom*; whence fome Chriftian fathers have faid, that he called her the *Holy Spirit*. He alfo taught the tranfmigration of fouls, and denied the refurrection of the body.

Simon (Richard), a French critic and divine of great fenfe and learning, was born at Dieppe in 1638; and commenced his ftudies among the priefts of the oratory in the fame town. He quitted them for fome time, and went to Paris, where he applied himfelf to divinity, and made a vaft progrefs in the knowledge of the Oriental tongues, for which he had always a particular turn; but he returned to the oratory, and became a prieft of it, about 1660. He died at Dieppe in April 1712. He was author and editor of feveral works. But the moft important work he ever publifhed, was his "Critical Hiftory of the Old Teftament," in 1678: it was immediately fuppreffed by the intrigues and management of Meffieurs du Port Royal, who pretended that it contained things falfe and dangerous to religion and the church. It was re-printed the year after, and was fo much admired for the excellent learning and admirable criticifm it is full of, that it became an object of attention to foreigners; and thus was publifhed in Latin at Amfterdam in 1681; in Englifh at London in 1682. In the mean time, on account of fome fingularities, it laid a foundation for the difputes which he afterwards had with Le Clerc, Ifaac Voffius, Jurieu, and other learned men. He alfo publifhed "The Hiftory of the Rife and Progrefs of Ecclefiaftical Revenues," in 1684, under the name of Jerome a Cofta; it being very common with him to affume fictitious names.

SIMONIACAL, is applied to any perfon guilty of fimony. See Simony.

SIMONIDES, an antient Greek poet and philofopher, was born at Ceos, an ifle in the Ægean fea, about the 56th Olympiad; and kept a fchool in his firft years at Carthea in that ifland, teaching the art of finging and dancing in the chorus. Then he left his country, and removed into Sicily; where, by his wifdom and his verfe, he gained the efteem and favour of the three greateft men perhaps then in the world; Paufanias general of Sparta, Themiftocles the Athenian, and Hiero of Sicily, the wifeft and moft moderate of the antient tyrants. He compofed poems in almoft every way, but efpecially in the elegiac. His wit was above the cenfure of the critics; but the common fault laid to his morals was extreme covetoufnefs. He is generally fuppofed to have been a very long liver. Plutarch has an infcription, which fhows him to have won the poetic prize after he was eighty. Suidas allows him 89 years; and Lucian gives him above 90. If we believe the old Greek epigrams made on his perfon and works, he died in Sicily; and probably in the court of king Hiero.

SIMONY, is the corrupt prefentation of any one to an ecclefiaftical benefice for money, gift, or reward. It is fo called from the refemblance it is faid to bear to the fin of Simon Magus, though the purchafing of holy orders feems to approach nearer to his offence. It was by the canon law a very grievous crime; and is fo much the more odious, becaufe, as Sir Edward Coke obferves, it is ever accompanied with perjury; for the prefentee is fworn to have committed no fimony. However, it was not an offence punifhable in a criminal way at the common law; it being thought fufficient to leave the clerk to ecclefiaftical cenfures. But as thefe did not affect the fimoniacal patron, nor were efficacious enough to repel the notorious practice of the thing, divers acts of parliament have been made to reftrain it by means of civil forfeitures; which the modern prevailing ufage, with regard to fpiritual preferments, calls aloud to be put in execution. The ftatute 31 Eliz. c. 6. enacts, that if any patron, for money or any other corrupt confideration or promife, directly or indirectly given, fhall prefent, admit, inftitute, induct, inftall, or collate any perfon to an ecclefiaftical benefice or dignity, both the giver and taker fhall forfeit two years value of the benefice or dignity; one moiety to the king, and the other to any one who will fue for the fame. If perfons alfo corruptly refign or exchange their benefices, both the giver and taker fhall in like manner forfeit double the value of the money or other corrupt confideration. And perfons who fhall corruptly ordain or licenfe any minifter, or procure him to be ordained or licenfed (which is the true idea of fimony), fhall incur a like forfeiture of forty pounds; and the minifter himfelf of ten pounds, befides an incapacity to hold any ecclefiaftical preferment for feven years afterwards. Corrupt elections and refignations in colleges, hofpitals, and other eleemofynary corporations, are alfo punifhed, by the fame ftatute, with forfeiture of the double value, vacating the place or office, and a devolution of the right of election, for that turn, to the crown.

SIMOOM, a hot wind which blows occafionally in the deferts of Africa, and probably in other widely extended countries parched in the fame manner by a vertical fun. Its effects on the human body are dreadful. If inhaled in any quantity, it produces inftant fuffocation, or at leaft leaves the unhappy fufferer oppreffed with afthma and lownefs of fpirits. The approach of this awful fcourge of God is indicated by a rednefs in the air, well underftood by thofe who are accuftomed to journey through the defert; and the only refuge which they have from it, is to fall down with their faces clofe to the ground, and to continue fo as long as poffible without drawing in their breath.

Mr. Bruce, who, in his journey through the defert, fuffered from the fimoom, gives of it the following graphical defcription: "At eleven o'clock, while we contemplated with great pleafure the rugged top of Chiggre, to which we were faft approaching, and where we were to folace ourfelves with plenty of good water, Idris our guide cried out, with a loud voice, Fall upon your faces, for here is the fimoom. I faw from the fouth-eaft a haze come, in colour like the purple part of the rainbow, but not fo compreffed or thick. It did not occupy twenty yards in breadth, and was about twelve feet high from the ground. It was a kind of blufh upon the air, and it moved very rapidly; for I fcarce could turn to fall upon the ground with my head to the northward, when I felt the heat of its current plainly upon my face. We all lay flat on the ground as if dead, till Idris told us it was blown over. The meteor or purple haze which I faw was indeed paffed, but the light air that ftill blew was of heat to threaten fuffocation. For my part, I found diftinctly in my breaft that I had imbibed a part of it, nor was I free of an afthmatic fenfation till I had been fome months in Italy, at the baths of Poretta, near two years afterwards." Though the feverity of this blaft feems to have paffed over them almoft inftantaneoufly, it continued to blow fo as to exhauft them till twenty minutes before five in the afternoon, lafting through all its ftages very near fix hours, and leaving them in a ftate of the utmoft defpondency.

SIMPLE, fomething not mixed or compounded; in which fenfe it ftands oppofed to *compound*.

Simple, in the materia medica, a general name for all herbs or plants, as having each its particular virtue, whereby it becomes a fimple remedy.

SIMPLOCE. See Oratory.

SIMPSON (Thomas), profeffor of mathematics at the royal academy at Woolwich, fellow of the Royal Society, and member of the Royal Academy at Stockholm, was born at Market Bofworth in Leicefterfhire in 1710. His father, a ftuff-weaver, taught him only to read Englifh, and brought him up to his own bufinefs; but meeting with a fcientifical pedlar, who likewife practifed fortune-telling, young Simpfon by his affiftance.

and advice left off weaving, and profeffed aftrology. As he improved in knowledge, however, he grew difgufted with his pretended art; and, renouncing it, was driven to fuch difficulties for the fubfiftence of his family, that he came up to London, where he worked as a weaver, and taught mathematics at his fpare hours. As his fcholars increafed, his abilities became better known, and he publifhed his Treatife on Fluxions, by fubfcription, in 1737: in 1740, he publifhed his Treatife on the Nature and Laws of Chance; and Effays in Speculative and Mixed Mathematics. After thefe appeared his Doctrine of Annuities and Reverfions; Mathematical Differtations; Treatife on Algebra; Elements of Geometry; Trigonometry, Plane and Spherical; Select Exercifes; and his Doctrine and Application of Fluxions, which he profeffes to be rather a new work, than a fecond edition of his former publication on fluxions. In 1743, he obtained the mathematical profefforfhip at Woolwich academy; and foon after was chofen a member of the Royal Society, when the prefident and council, in confideration of his moderate circumftances, were pleafed to excufe his admiffion-fees, and his giving bonds for the fettled future payments. At the academy he exerted all his abilities in inftructing the pupils who were the immediate objects of his duty, as well as others whom the fuperior officers of the ordnance permitted to be boarded and lodged in his houfe. In his manner of teaching he had a peculiar and happy addrefs, a certain dignity and perfpicuity, tempered with fuch a degree of mildnefs, as engaged the attention, efteem, and friendfhip, of his fcholars. He therefore acquired great applaufe from his fuperiors in the difcharge of his duty. His application and clofe confinement, however, injured his health. Exercife and a proper regimen were prefcribed to him, but to little purpofe: for his fpirits funk gradually, till he became incapable of performing his duty, or even of reading the letters of his friends. The effects of this decay of nature were greatly increafed by vexation of mind, owing to the haughty and infulting behaviour of his fuperior the firft profeffor of mathematics. This perfon, greatly his inferior in mathematical accomplifhments, did what he could to make his fituation uneafy, and even to depreciate him in the public opinion: but it was a vain endeavour, and only ferved to deprefs himfelf. At length his phyficians advifed his native air for his recovery, and he fet out in February 1761; but was fo fatigued by his journey, that upon his arrival at Bofworth he betook himfelf to his chamber, and grew continually worfe till the day of his death, which happened on the 14th of May, in the 51ft year of his age.

SIMSON (Dr. Robert), profeffor of mathematics in the univerfity of Glafgow, was born in the year 1687 of a refpectable family, which had held a fmall eftate in the county of Lanerk. He was educated in the univerfity under the eye of fome of his relations who were profeffors. Eager after knowledge, he made great progrefs in all his ftudies; and, as his mind did not, at the very firft openings of fcience, ftrike into that path which afterwards fo ftrongly attracted him, and in which he proceeded fo far almoft without a companion, he acquired in every walk of fcience a ftock of information, which, though it had never been much augmented afterwards, would have done credit to a profeffional man in any of his ftudies. He became, at a very early period, an adept in the philofophy and theology of the fchools, was able to fupply the place of a fick relation in the clafs of oriental languages, was noted for hiftorical knowledge, and one of the moft knowing botanifts of his time.

It was during his theological ftudies, as preparatory for his entering into orders, that mathematics took hold of his fancy. In this his favourite ftudy he made a rapid progrefs, and when about the age of 25, he was chofen regius profeffor of mathematics in the univerfity of Glafgow. He went to London immediately after his appointment, and there formed an acquaintance with the moft eminent men of that bright era of Britifh fcience; among whom he always mentioned the celebrated Dr. Edmund Halley with particular refpect. Returning at length to his academical chair, Dr. Simfon difcharged the duties of a profeffor for more than 50 years with great honour to the univerfity and to himfelf.

It is almoft needlefs to fay, that in his prelections he followed ftrictly the Euclidian method in elementary geometry. He made ufe of Theodofius as an introduction to fpherical trigonometry. In the higher geometry he prelected from his own Conics; and he gave a fmall fpecimen of the *linear problems* of the antients, by explaining the properties, fometimes of the conchoid, fometimes of the ciffoid, with their application to the folution of fuch problems. In the more advanced clafs he was accuftomed to give Napier's mode of conceiving logarithms, *i. e.* quantities as generated by motion; and Mr. Cotes's view of them, as the fums of ratiunculæ; and to demonftrate Newton's lemmas concerning the limits of ratios; and then to give the elements of the fluxionary calculus; and to finifh his courfe with a felect fet of propofitions in optics, gnomonics, and central forces. His method of teaching was fimple and perfpicuous, his elocution clear, and his manner eafy and impreffive. He had the refpect, and ftill more the affection, of his fcholars.

All the lovers of true geometry will acknowledge their obligations to him for the edition of Euclid's Elements, and data, which he publifhed about 1758. The text is corrected with the moft judicious and fcrupulous care, and the notes are ineftimable, both for their information, and for the tendency which they muft have to form the mind of the ftudent to a true judgment and tafte in mathematical fubjects. The more accomplifhed reader will perhaps be fometimes difpofed to fmile at the axiom which feems to pervade the notes, "that a work of Euclid muft be fuppofed without error or defect." If this was not the cafe, Euclid has been obliged to his editor in more inftances than one. Nor fhould his greateft admirers think it impoffible that, in the progrefs of human improvement, a geometrical truth fhould occur to one of thefe latter days, which efcaped the notice of even the Lincean Euclid. Such merit, however, Dr. Simfon nowhere claims, but lays every blame of error, omiffion, or obfcurity, to the charge of Proclus, Theon, and other editors and commentators of the renowned Grecian.

There is another work of Apollonius on which Dr. Simfon has beftowed great pains, and has reftored, as we imagine, *omnibus numeris perfectum*, viz. the Sectio determinata; one of thofe performances which are of indifpenfable ufe in the application of the antient analyfis. This alfo feems to have been an early tafk, though we do not know the date of his labours on it. It did not appear till after his death, being then publifhed along with the great work, the Porifms of Euclid, at the expenfe of the late Earl Stanhope, a nobleman intimately converfant with the antient geometry, and zealous for its reception among the mathematicians of the prefent age. He had kept up a conftant correfpondence with Dr. Simfon on mathematical fubjects; and at his death in 1768, engaged Mr. Clow profeffor of logic in the univerfity of Glafgow, to whofe care the Doctor had left all his valuable papers, to make a felection of fuch as would ferve to fupport and increafe his well earned reputation.

The life of a literary man rarely teems with anecdote; and a mathematician, devoted to his duties, is perhaps more abftracted than any other perfon from the ordinary occurrences of life, and even the ordinary topics of converfation. Dr. Simfon was of this clafs; and, having never married, lived entirely a college life. Having no occafion for the commodious houfe to which his place in the univerfity entitled him, he contented himfelf with chambers, good indeed, and fpacious enough for his fober accommodation, and for receiving his choice collection of mathematical writers, but without any decoration or commodious furniture. He was of a cheerful difpofition; and though

he did not make the firſt advances to acquaintance, had the moſt affable manner, and ſtrangers were at perfect eaſe in his company. He enjoyed a long courſe of uninterrupted health; but towards the cloſe of life ſuffered from an acute diſeaſe, and was obliged to employ an aſſiſtant in his profeſſional labours for a few years preceding his death, which happened in 1768, at the age of 81. He left to the univerſity his valuable library, which is now arranged apart from the reſt of the books, and the public uſe of it is limited by particular rules. It is conſidered as the moſt choice collection of mathematical books and manuſcripts in the kingdom, and many of them are rendered doubly valuable by Dr. Simpſon's notes.

SINAI, or Sina, a famous mountain of Arabia Petræa, upon which God gave the law to Moſes. It ſtands in a kind of peninſula, formed by the two arms of the Red Sea, one of which ſtretches out towards the north, and is called the *Gulph of Kolſum*; the other extends towards the eaſt, and is called the *Gulph of Elan*, or the *Elanitiſh Sea*. At this day the Arabians call Mount Sinai by the name of *Tor*, that is, the "mountain," by way of excellence; or *Gibel* or *Jibel Mouſa*, "the mountain of Moſes." It is 260 miles from Cairo, and generally it requires a journey of ten days to travel thither. The wilderneſs of Sinai, where the Iſraelites continued incamped for almoſt a year, and where Moſes erected the tabernacle of the covenant, is conſiderably elevated above the reſt of the country; and the aſcent to it is by a very craggy way, the greateſt part of which is cut out of the rock; then one comes to a large ſpace of ground, which is a plain ſurrounded on all ſides by rocks and eminences, whoſe length is nearly 12 miles. Towards the extremity of this plain, on the north ſide, two high mountains ſhow themſelves, the higheſt of which is called *Sinai* and the other *Horeb*. The tops of Horeb and Sinai have a very ſteep aſcent, and do not ſtand upon much ground, in compariſon to their extraordinary height: that of Sinai is at leaſt one third part higher than the other, and its aſcent is more upright and difficult. Much has been ſaid of the writings to be ſeen at Sinai and in the plain about it; and ſuch were the hopes of diſcoveries reſpecting the wanderings of the Iſraelites from theſe writings, that Dr. Clayton biſhop of Clogher offered 500l. ſterling to defray the expenſes of the journey to any man of letters who would undertake to copy them. No man, we believe, undertook this taſk: and the accurate Daniſh traveller Niebuhr found no writings there but the names of perſons who had viſited the place from curioſity, and of Egyptians who had choſen to be buried in that region.

SINAPIS, Mustard, in botany: A genus of plants belonging to the claſs of *tetradynamia*, and to the order of *ſiliquoſa*; and in the natural ſyſtem ranged under the 39th order, *Siliquoſæ*. The calyx conſiſts of four expanding ſtrap-ſhaped deciduous leaves; the ungues or baſes of the petals are ſtraight; two glandules between the ſhorter ſtamina and piſtillum, alſo between the longer and the calyx. There are 17 ſpecies; the arvenſis, orientalis, braſſicata, alba, nigra, pyrenaica, pubeſcens, chinenſis, juncea, erucoides, allioni, hiſpanica, millefolia, incana, lævigata, cernua and japonica. Three of theſe are natives of Britain; the alba, nigra, and arvenſis. 1. The *alba*, or white muſtard, which is generally cultivated as a ſalad herb for winter and ſpring uſe. This riſes with a branched hairy ſtalk two feet high; the leaves are deeply jagged on their edges and rough. The flowers are diſpoſed in looſe ſpikes at the end of the branches, ſtanding upon horizontal footſtalks; they have four yellow petals in form of a croſs, which are ſucceeded by hairy pods, that end with long, compreſſed, oblique beaks; the pods generally contain four white ſeeds. 2. The *nigra*, or common muſtard, which is frequently found growing naturally in many parts of Britain, but is alſo cultivated in fields for the ſeed, of which the ſauce called *muſtard* is made. This riſes with a branching ſtalk four or five feet high: the lower leaves are large, rough, and very like thoſe of turnip; the upper leaves are ſmaller and leſs jagged. The flowers are ſmall, yellow, and grow in ſpiked cluſters at the end of the branches; they have four petals placed in form of a croſs, and are ſucceeded by ſmooth four-cornered pods. 3. The *arvenſis*, grows naturally on arable land in many parts of Britain. The ſeed of this is commonly ſold under the title of *Durham muſtard ſeed*. Of this there are two varieties, if not diſtinct ſpecies; the one with cut, the other with entire leaves. The ſtalks riſe two feet high; the leaves are rough; in the one they are jagged like turnip-leaves; in the other they are long and entire. The flowers are yellow; the pods are turgid, angular, and have long beaks.

Muſtard, by its pungency, ſtimulates the ſolids; and hence is recommended for exciting appetite, aſſiſting digeſtion, promoting the fluid ſecretions, and for the other purpoſes of the acrid plants called *antiſcorbutic*. It imparts its taſte and ſmell in perfection to aqueous liquors, and by diſtillation with water yields an eſſential oil of great acrimony. To rectified ſpirit its ſeeds give out very little either of their ſmell or taſte. Subjected to the preſs, they yield a conſiderable quantity of mild inſipid oil, which is as free from acrimony as that of almonds. They are applied as an external ſtimulant to benumbed or paralytic limbs; to parts affected with fixed rheumatic pains; and to the ſoles of the feet, in the low ſtage of acute diſeaſes, for raiſing the pulſe: in this intention, a mixture of equal parts of the powdered ſeeds and crumb of bread, with the addition ſometimes of a little bruiſed garlic, are made into a cataplaſm with a ſufficient quantity of vinegar.

SINAPISM, in pharmacy, an external medicine, in form of a cataplaſm, compoſed chiefly of muſtard-ſeed pulverized, and other ingredients mentioned in the preceding article.

SINCERITY, honeſty of intention, freedom from hypocriſy. See Moral Philosophy.

SINCIPUT, in anatomy, the forepart of the head, reaching from the forehead to the coronal ſuture.

SINDY, a province of Hindoſtan Proper, bounded on the weſt by Makran, a province of Perſia; on the north by the territories of the king of Candahar; on the north-eaſt by thoſe of the Seiks; on the eaſt by a ſandy deſert; and on the ſouth-eaſt by Cutch. It extends along the courſe of the river Sinde or Indus from its mouth to Behker or Bhakor, on the frontiers of Moultan. Reckoned that way, it is 300 miles long; and its breadth, in its wideſt part, is about 160. In many particulars of ſoil and climate, and in the general appearance of the ſurface, Sindy reſembles Egypt; the lower part of it being compoſed of rich vegetable mould, and extended into a wide dell; while the upper part of it is a narrow ſlip of country, confined on one ſide by a ridge of mountains, and on the other by a ſandy deſert, the river Indus, equal at leaſt to the Nile, winding through the midſt of this level valley, and annually overflowing it. During great part of the ſouth-weſt monſoon, or at leaſt in the months of July, Auguſt, and part of September, which is the rainy ſeaſon in moſt other parts of India, the atmoſphere is here generally clouded; but no rain falls except very near the ſea. Indeed, very few ſhowers fall during the whole year; owing to which, and the neighbourhood of the ſandy deſerts, which bound it on the eaſt and on the north-weſt, the heats are ſo violent, and the winds from thoſe quarters ſo pernicious, that the houſes are contrived ſo as to be occaſionally ventilated by means of apertures on the tops of them, reſembling the funnels of ſmall chimneys. When the hot winds prevail, the windows are cloſely ſhut; and the loweſt part of the current of air, which is always the hotteſt, being thus excluded, a cooler, becauſe more elevated, part deſcends into the houſe through the funnels. By this contrivance alſo vaſt clouds of duſt are excluded; the entrance of which would alone be ſufficient to render the houſes uninhabitable. The roofs are compoſed of thick

layers of earth inſtead of terraces. Few countries are more unwholeſome to European conſtitutions, particularly the lower part of the Delta. The prince of this province is a Mahometan, tributary to the king of Candahar. He reſides at Hydrabad, although Tatta is the capital. The Hindoos, who were the original inhabitants of Sindy, are by their Mahometan governors treated with great rigour, and denied the public exerciſe of their religion; and this ſeverity drives vaſt numbers of them into other countries. The inland parts of Sindy produce ſaltpetre, ſal ammoniac, borax, bezoar, lapis lazuli, and raw ſilk. They have alſo manufactories of cotton and ſilk of various kinds; and they make fine cabinets, inlaid with ivory, and finely lackered. They alſo export great quantites of butter, clarified and wrapt up in duppas, made of the hides of cattle. The ladies wear hoops of Ivory on both their arms and legs, which when they die are burnt with them. They have large black cattle, excellent mutton, and ſmall hardy horſes. Their wild game are deer, hares, antelopes, and foxes, which they hunt with dogs, leopards, and a ſmall fierce creature called a ſhiahguſh.

SINE, or *Right* Sine *of an Arch*, in trigonometry, is a right line drawn from one end of that arch, perpendicular to the radius drawn to the other end of the arch; being always equal to half the cord of twice the arch. See Trigonometry and Geometry.

SINECURE, a nominal office, which has a revenue without any employment.

SINEW, a tendon; that which unites the muſcles to the bones.

SINGING, the action of making divers inflections of the voice, agreeable to the ear, and correſpondent to the notes of a ſong or piece of melody. See Melody. The firſt thing to be done in learning to ſing, is to raiſe a ſcale of notes by tones and ſemitones to an octave, and deſcend by the ſame notes; and then to riſe and fall by greater intervals, as a third, fourth, fifth, &c. and to do all this by notes of different pitch. Then theſe notes are repreſented by lines and ſpaces, to which the ſyllables *fa*, *ſol*, *la*, *mi*, are applied, and the pupil taught to name each line and ſpace thereby; whence this practice is called *ſol-faing*, the nature, reaſon, effects, &c. whereof, ſee under the article Sol-faing.

Singing *of Birds*. It is worthy of obſervation that the female of no ſpecies of birds ever ſings: with birds it is the reverſe of what occurs in human kind. Among the feathered tribe, all the cares of life fall to the lot of the tender ſex; theirs is the fatigue of incubation; and the principal ſhare in nurſing the helpleſs brood; to alleviate theſe fatigues, and to ſupport her under them, nature hath given to the male the ſong, with all the little blandiſhments and ſoothing arts; theſe he fondly exerts (even after courtſhip) on ſome ſpray contiguous to the neſt, during the time his mate is performing her parental duties. But that ſhe ſhould be ſilent is alſo another wiſe proviſion of nature, for her ſong would diſcover her neſt; as would a gaudineſs of plumage, which, for the ſame reaſon, ſeems to have been denied her. On the ſong of birds ſeveral curious experiments and obſervations have been made by the Hon. Daines Barrington. See *Philoſophical Tranſactions*, vol. lxiii.

SINGULAR number, in grammar, that number of nouns and verbs which ſtands oppoſed to plural. See Grammar.

SINISTER, ſomething on or towards the left hand. Hence ſome derive the word *ſiniſter à ſinendo*; becauſe the gods, by ſuch auguries, permit us to proceed in our deſigns.

Sinister, is ordinarily uſed among us for unlucky; though, in the ſacred rites of divination, the Romans uſed it in an oppoſite ſenſe. Thus *avis ſiniſtra*, or a bird on the left hand, was eſteemed a happy omen: whence, in the law of the 12 tables, *Ave ſiniſtra populi magiſter eſto*.

Sinister, in heraldry. The ſiniſter ſide of an eſcutcheon is the left-hand ſide; the ſiniſter chief, the left angle of the chief; the ſiniſter baſe, the left-hand part of the baſe.

Sinister *Aſpect*, among aſtrologers, is an appearance of two planets happening according to the ſucceſſion of the ſigns; as Saturn in Aries, and Mars in the ſame degree of Gemini.

SINISTRI, a ſect of antient heretics, thus called becauſe they held the left hand in abhorrence, and made it a point of religion not to receive any thing therewith.

SINKING fund, a proviſion made by parliament, conſiſting of the ſurpluſage of other funds, intended to be appropriated to the payment of the national debt; on the credit of which very large ſums have been borrowed for public uſes. See National *Debt* and Revenue.

SINOPICA terra, in natural hiſtory, the name of a red earth of the ochre kind, called alſo *rubrica ſinopica*, and by ſome authors *ſinopis*. It is a very cloſe, compact, and weighty earth, of a fine glowing purple colour. It is of a pure texture, but not very hard, and of an even but duſty ſurface. It adheres firmly to the tongue, is perfectly fine and ſmooth to the touch, does not crumble eaſily between the fingers, and ſtains the hands. It melts very ſlowly in the mouth, is perfectly pure and fine, of an auſtere aſtringent taſte, and ferments violently with aquafortis. It was dug in Cappadocia, and carried for ſale to a city in the neighbourhood called *Sinope*, whence it had its name. It is now found in plenty in the New Jerſeys in America, and is called by the people there *bloodſtone*. Its fine texture and body, with its high florid colour, muſt make it very valuable to painters; and from its aſtringency it will probably be a powerful medicine.

SINOPLE, in heraldry, denotes vert, or green colour, in armories.—Sinople is uſed to ſignify love, youth, beauty, rejoicing, and liberty; whence it is that letters of grace, ambition, legitimation, &c. are always ſealed with green wax.

SINUOSITY, a ſeries of bends and turns in arches or other irregular figures, which are ſometimes jutting out and ſometimes falling in.

SINUS, in anatomy, denotes a cavity in certain bones and other parts, the entrance whereof is very narrow, and the bottom wider and more ſpacious.

Sinus, in ſurgery, a little cavity or ſacculus, frequently formed by a wound or ulcer, wherein pus is collected.

SIPHON. See Hydrostatics.

SIPHONANTHUS, in botany: a genus of plants belonging to the claſs of *tetrandria* and order of *monogynia*. The corolla is monopetalous, funnel-ſhaped; the tube is very narrow, and much longer than the calyx. There are four berries, each containing one ſeed. There is only one ſpecies, the *indica*.

SIPONTUM, Sepuntum, or Sipus (anc. geog.), a town of Apulia, ſo denominated (according to Strabo) from the great quantity of *ſepiæ* or cuttle-fiſh that are thrown upon the coaſt. Diomed is ſuppoſed by the ſame author to have been the founder of this place; which appears from Livy to have become a colony of Roman citizens. In the early ages of Chriſtian hierarchy, a biſhop was fixed in this church; but, under the Lombards, his ſee was united to that of Beneventum. Being again ſeparated, Sipontum became an archiepiſcopal dioceſe in 1094, about which time it was ſo ill treated by the Barbarians, that it never recovered its ſplendour, but ſunk into ſuch miſery, that in 1260 it was a mere deſert, from the want of inhabitants, the decay of commerce, and the inſalubrity of the air. Manfred having taken theſe circumſtances into conſideration, began in 1261 to build a new city on the ſea-ſhore, to which he removed the few remaining Sipontines. (See the article Manfredonia.) Sipontum was ſituated at the diſtance of a mile from the ſhore. Excepting a part of its Gothic cathedral, ſcarce one ſtone of the antient city now remains upon another.

SIPUNCULUS, in natural hiſtory, a genus of the *inteſtina* claſs of worms in the Linnæan ſyſtem. Its characters are theſe: the body is round and elongated; the mouth attenuated and cylindrical; and the lateral aperture of the body rugged. There are two ſpecies; one found under ſtones in the European, and the other in the Indian ocean.

SIR, the title of a knight or baronet, which, for diſtinction's ſake, as it is now given indiſcriminately to all men, is always prefixed to the knight's Chriſtian name, either in ſpeaking or writing to them.

SIRCAR, any officer under the government in Hindoſtan. It is ſometimes uſed for the ſtate of government itſelf. Likewiſe a province, or any number of Pergunnahs placed under one head in the government books, for conveniency in keeping accounts. In common uſage in Bengal, the under banyans of European gentlemen are called *ſircars*.

SIRE, a title of honour given to kings, as a mark of ſovereignty; and now commonly uſed in England in addreſſes or dedications to his majeſty.

Sire, was likewiſe antiently uſed in the ſame ſenſe with *ſieur* and *ſeigneur*, and applied to barons, gentlemen and citizens.

SIRENS, in fabulous hiſtory, certain celebrated ſongſtreſſes who were ranked among the demigods of antiquity. Hyginus places their birth among the conſequences of the rape of Proſerpine. Others make them daughters of the river Acheloüs and one of the muſes. The number of the Sirens was three; and their names were *Parthenope*, *Lygea*, and *Leucoſia*. Some make them half women and half fiſh; others, half women and half birds. There are antique repreſentations of them ſtill ſubſiſting under both theſe forms. Pauſanias tells us, that the Sirens, by the perſuaſion of Juno, challenged the muſes to a trial of ſkill in ſinging; and theſe having vanquiſhed them, plucked the golden feathers from the wings of the Sirens and formed them into crowns, with which they adorned their own heads. The Argonauts are ſaid to have been diverted from the enchantment of their ſongs by the ſuperior ſtrains of Orpheus: Ulyſſes, however, had great difficulty in ſecuring himſelf from ſeduction. See *Odyſ.* lib. xii.

Pope, in his notes to the twelfth book of the Odyſſey, obſerves, the critics have greatly laboured to explain what was the foundation of this fiction of the Sirens. We are told by ſome, that the Sirens were queens of certain ſmall iſlands named *Sirenuſæ*, that lie near Capræa in Italy, and chiefly inhabited the promontory of Minerva, upon the top of which that goddeſs had a temple, as ſome affirm, built by Ulyſſes. Here there was a renowned academy, in the reign of the Sirens, famous for eloquence and the liberal ſciences, which gave occaſion to the invention of this fable of the ſweetneſs of the voice and attracting ſongs of the Sirens. But why then are they fabled to be deſtroyers, and painted in ſuch dreadful colours? We are told, that at laſt the ſtudents abuſed their knowledge, to the colouring of wrong, the corruption of manners, and the ſubverſion of government: that is, in the language of poetry, they were feigned to be transformed into monſters, and with their muſic to have enticed paſſengers to their ruin, who there conſumed their patrimonies, and poiſoned their virtues with riot and effeminacy. The place is now called *Maſſa*. Some writers tell us of a certain bay, contracted within winding ſtraits and broken cliffs, which, by the ſinging of the winds and beating of the waters, returns a delightful harmony, that allures the paſſenger to approach, who is immediately thrown againſt the rocks, and ſwallowed up by the violent eddies. Thus Horace, moralizing, calls idleneſs a *Siren*.

—— Vitanda eſt improba Siren
Deſidia. ——

But the fable may be applied to all pleaſures in general, which, if too eagerly purſued, betray the incautious into ruin; while wiſe men, like Ulyſſes, making uſe of their reaſon, ſtop their ears againſt their inſinuations.

The learned Mr. Bryant ſays, that the Sirens were Cuthite and Canaanitiſh prieſts, who had founded temples in Sicily, which were rendered infamous on account of the women who officiated. They were much addicted to cruel rites, ſo that the ſhores upon which they reſided are deſcribed as covered with the bones of men deſtroyed by their artifice. *Virgil. Æneid.* lib. v. v. 864.

All antient authors agree in telling us, that Sirens inhabited the coaſt of Sicily. The name, according to Bochart, who derives it from the Phœnician language, implies a ſongſtreſs. Hence it is probable, ſays Dr. Burney, that in antient times there may have been excellent ſingers, but of corrupt morals, on the coaſt of Sicily, who, by ſeducing voyagers, gave riſe to this fable. And if this conjecture be well founded, he obſerves, the Muſes are not the only pagan divinities who preſerved their influence over mankind in modern times; for every age has its Sirens, and every Siren her votaries: when beauty and talents, both powerful in themſelves, are united, they become ſtill more attractive.

Siren, in zoology, a genus of animals belonging to the claſs of *amphibia* and the order of *meantes*. It is a biped, naked, and furniſhed with a tail; the feet are brachiated with claws. This animal was diſcovered by Dr. Garden in Carolina; it is found in ſwampy and muddy places, by the ſides of pools, under the trunks of old trees that hang over the water. The natives call it by the name of *mud-inguana*. Linnæus firſt apprehended that it was the larva of a kind of lizard; but as its fingers are furniſhed with claws, and it makes a croaking noiſe, he concluded from theſe properties, as well as from the ſituation of the anus, that it could not be the larva of the lizard, and therefore formed of it a new genus under the name of *ſiren*. He was alſo obliged to eſtabliſh for this uncommon animal a new order called *meantes* or *gliders*: the animals of which are amphibious, breathing by means of gills and lungs, and furniſhed with arms and claws.

SIREX, in zoology, a genus of animals belonging to the claſs of *inſects*, and to the order of *hymenopteræ*. The mouth has two ſtrong jaws; there are two truncated palpi or feelers, filiform antennæ, an exſerted, ſtiff, ſerrated ſting, a ſeſſile, mucronated abdomen, and lanceolated wings. There are ſeven ſpecies.

SIRIUM, in botany; a genus of plants belonging to the claſs of *tetrandria* and order of *monogynia*. The calyx is quadrifid; there is no corolla; the nectarium is quadriphyllous, and crowning the throat of the calyx; the germen is below the corolla; the ſtigma is trifid, and the berry trilocular. There is only one ſpecies, the myrtifolium.

SIRIUS, in aſtronomy, a bright ſtar in the conſtellation Canis. See Astronomy.

SIRLET (Flavius), an eminent Roman engraver on precious ſtones: his Laocoon, and repreſentations in miniature of antique ſtatues at Rome, are very valuable and ſcarce. He died in the year 1737.

SIROCCO, a periodical wind which generally blows in Italy and Dalmatia every year about Eaſter. It blows from the ſoutheaſt by ſouth: it is attended with heat, but not rain; its ordinary period is twenty days, and it uſually ceaſes at ſun-ſet. When the ſirocco does not blow in this manner, the ſummer is almoſt free from weſterly winds, whirlwinds, and ſtorms. This wind is prejudicial to plants, drying and burning up the buds; though it hurts not men any otherwiſe than by cauſing an extraordinary weakneſs and laſſitude; inconveniences that are fully compenſated by a plentiful fiſhing, and a good crop of corn on the mountains. In the ſummer time, when the weſterly wind ceaſes for a day, it is a ſign that the ſirocco will blow the day following, which uſually begins with a ſort of whirlwind.

SISKIN. See Fringilla.

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SISON, BASTARD STONE PARSLEY, in botany: A genus of plants belonging to the clafs of *pentandria*, and to the order of *digynia;* and in the natural fyftem arranged under the 45th order, *umbellatæ*. The fruit is egg-fhaped and ftreaked; the involucra are fubtetraphyllous. There are feven fpecies; the amomum, inundatum, fegetum, verticillatum, falfum, canadenfe, and ammi. The four firft are natives of Great Britain. 1. The *amomum*, common baftard parfley, or field ftone-wort, is a biennial plant about three feet high, growing wild in many places of Britain. Its feeds are fmall, ftriated, of an oval figure and brown colour. Their tafte is warm and aromatic. Their whole flavour is extracted by fpirit of wine, which elevates very little of it in diftillation; and hence the fpirituous extract has the flavour in great perfection, while the watery extract has very little. A tincture drawn with pure fpirit is of a green colour. The feeds have been efteemed aperient, diuretic, and carminative; but are little regarded in the present practice. 2. The *inundatum*, leaft water-parfnep. The ftem is about eight or ten inches high, branched, and creeping: the leaves, below the water, are capillary; above it are pinnated: the umbels are bifid. It grows in ditches and ponds. 3. *Segetum*, corn parfley or honeywort. The ftems are numerous, flender, ftriated, branched, and leaning; the leaves are pinnated; the pinnæ are oval, pointed, and ferrated, fix or eight pair, and one at the end; the umbels fmall and drooping; the flowers minute and white. It grows in cornfields and hedges. 4. *Verticillatum*, verticillate fifon, has fmall leaves in whirls, and capillary; the ftem is two feet, with few leaves; the common umbel is compofed of 8 or 10 rays, the partial of 18 or 20; both involucra are compofed of five or fix oval acute foliola; the flowers are all hermaphrodite, and the petals white.

SISTRUM, or CISTRUM, a kind of antient mufical inftrument ufed by the priefts of Ifis and Ofiris. It is defcribed by Spon as of an oval form, in manner of a racket, with three fticks traverfing it breadthwife; which playing freely by the agitation of the whole inftrument, yielded a kind of found which to them feemed melodious. Mr. Malcolm takes the fiftrum to be no better than a kind of rattle. Oifelius obferves, that the fiftrum is found reprefented on feveral medals, and on talifmans.

SISYMBRIUM, WATER-CRESSES, in botany: A genus of plants belonging to the clafs of *tetradynamia*, and to the order of *filiquofa*; and in the natural fyftem ranged under the 39th order, *Siliquofæ*. The filiqua, or pod, opens with valves fomewhat ftraight. The calyx and corolla are expanded. There are 29 fpecies, of which eight are natives of Britain: the nafturtium, or common water-crefs; fylveftre, water-rocket; amphibium, water-radifh; terreftre, annual water-radifh; monenfe; fophia, flixweed; irio, broad-leaved hedge-muftard.

SISYPHUS, in fabulous hiftory, one of the defcendents of Eolus, married Merope, one of the Pleiades, who bore him Glaucus. He refided at Epyra in Peloponnefus, and was a very crafty man. Others fay that he was a Trojan fecretary, who was punifhed for difcovering fecrets of ftate; and others again, that he was a notorious robber, killed by Thefeus. However, all the poets agree that he was punifhed in Tartarus for his crimes, by rolling a great ftone to the top of a hill, which conftantly recoiled, and rolling down inceffantly renewed his labour.

SISYRINCHIUM, in botany: A genus of plants belonging to the clafs of *gynandria*, and order of *triandria*; and in the natural fyftem ranged under the 6th order, *Enfatæ*. The fpatha is diphyllous; there are 6 plane petals. The capfule is trilocular and inferior.—There are two fpecies, the bermudiana and palmifolium.

SITE, denotes the fituation, of a houfe, &c. and fometimes the ground-plot or fpot of earth it ftands on.

SITTA, NUTHATCH, in ornithology: A genus belonging to the clafs of *aves*, and order of *picæ*. It is thus characterized by Dr. Latham: The bill is for the moft part ftraight; on the lower mandible there is a fmall angle; noftrils fmall, covered with briftles reflected over them; tongue fhort, horny at the end, and jagged; toes placed three forward and one backward: the middle toe joined clofely at the bafe to both the outmoft; back toe as large as the middle one.—There are 11 fpecies: the europæa, canadenfis, carolinenfis, jamaicenfis, pufilla, major, nævia, furinamenfis, cafra, longiroftra, and chloris. The europæa, or nuthatch, is in length near five inches three-quarters, in breadth nine inches; the bill is ftrong and ftraight, about three-quarters of an inch long: the upper mandible black, the lower white: the irides are hazel; the crown of the head, back, and coverts of the wings, of a fine blueifh gray; a black ftroke paffes over the eye from the mouth: the cheeks and chin are white; the breaft and belly of a dull orange-colour; the quill-feathers dufky; the wings underneath are marked with two fpots, one white at the root of the exterior quills, the other black at the joint of the baftard-wing; the tail confifts of twelve feathers; the two middle are gray, the two exterior feathers tipt with gray; then fucceeds a tranfverfe white fpot; beneath that the reft is black: the legs are of a pale yellow: the back toe very ftrong, and the claws large. The female is like the male, but lefs in fize, and weighs commonly 5 or at moft 6 drams. The eggs are fix or feven in number, of a dirty white, dotted with rufous; thefe are depofited in fome hole of a tree, frequently one which has been deferted by a woodpecker, on the rotten wood mixed with a little mofs, &c. If the entrance be too large, the bird nicely ftops up part of it with clay, leaving only a fmall hole for itfelf to pafs in and out by. While the hen is fitting, if any one puts a bit of ftick into the hole, fhe hiffes like a fnake, and is fo attached to her eggs, that fhe will fooner fuffer any one to pluck off her feathers than fly away. During the time of incubation, the male fupplies her with fuftenance, with all the tendernefs of an affectionate mate.

The bird runs up and down the bodies of trees, like the woodpecker tribe; and feeds not only on infects, but nuts, of which it lays up a confiderable provifion in the hollows of trees. "It is a pretty fight," fays Mr. Willughby, "to fee her fetch a nut out of her hoard, place it faft in a chink, and then, ftanding above it with its head downwards, ftriking it with all its force, break the fhell, and catch up the kernel. It is fuppofed not to fleep perched on a twig like other birds; for, when confined in a cage, it prefers fleeping in a hole or corner. When at reft it keeps the head down. In autumn it begins to make a chattering noife, being filent for the greateft part of the year." Dr. Plott tells us, that this bird, by putting its bill into a crack in the bough of a tree, can make fuch a violent found as if it was rending afunder, fo that the noife may be heard at leaft twelve fcore yards.

SITOPHYLAX, Σιτοφυλαξ, formed from σιτος "corn," and φυλαξ "keeper," in antiquity, an Athenian magiftrate, who had the fuperintendence of the corn, and was to take care that nobody bought more than was neceffary for the provifion of his family. By the Attic laws, particular perfons were prohibited from buying more than fifty meafures of wheat a man; and that fuch perfons might not purchafe more, the fitophylax was appointed to fee the laws properly executed. It was a capital crime to prevaricate in it. There were 15 of thefe *fitophylaces*, ten for the city, and five for the Piræus.

SIVA, a name given by the Hindoos to the Supreme Being, when confidered as the avenger or deftroyer. Sir William Jones has fhown that in feveral refpects the character of Jupiter and Siva are the fame. As Jupiter overthrew the Titans and giants, fo did Siva overthrow the Daityas, or children of Diti, who frequently rebelled againft Heaven: and as during the conteft the

god of Olympus was furnifhed with lightning and thunder bolts by an eagle, fo Brahma, who is fometimes reprefented riding on the Garuda, or eagle, prefented the god of deftruction with fiery fhafts. Siva alfo correfponds with the Stygian Jove, or Pluto; for, if we can rely on a Perfian tranflation of the Bhágavat, the fovereign of Pátála, or the infernal regions, is the king of ferpents, named *Sefhanaga*, who is exhibited in painting and fculpture with a diadem and fceptre, in the fame manner as Pluto. There is yet another attribute of Siva, or Mahádéva, by which he is vifibly diftinguifhed in the drawings and temples of Bengal. To deftroy, according to the Vedantis of India, the Sufis of Perfia, and many philofophers of our European fchools, is only to generate and reproduce in another form. Hence the god of deftruction is holden in this country to prefide over generation, as a fymbol of which he rides on a white bull. Can we doubt that the loves and feats of Jupiter Genitor (not forgetting the white bull of Europa), and his extraordinary title of Lapis, for which no fatisfactory reafon is commonly given, have a connection with the Indian philofophy and mythology?

SIUM, Water Parsnep, in botany: A genus of plants belonging to the clafs of *pentandria*, and order of *digynia*, and in the natural fyftem ranging under the 45th order, *Umbellatæ*. The fruit is a little ovated, and ftreaked. The involucrum is polyphyllous, and the petals are heart-fhaped. There are 12 fpecies; the latifolium, anguftifolium, nodiflorum, fifarum, ninfi, rigidius, japonicum, falearica, græcum, ficulum, repens, and decumbens. The three firft are natives of Britain. 1. The *latifolium*, or great water-parfnep, which grows fpontaneoufly in many places both of England and Scotland on the fides of lakes, ponds, and rivulets. The ftalk is erect and furrowed, a yard high or more. The leaves are pinnated with three or four pairs of large elliptic pinnæ, with an odd one at the end, all ferrated on the edges. The ftalk and branches are terminated with erect umbels, which is the chief characteriftic of the fpecies. Cattle are faid to have run mad by feeding upon this plant. 2. The *anguftifolium*, or narrow leaved water-parfnep, has pinnated leaves; the axillary umbels are pedunculated, and the general involucrum is pinnatifid. It grows in ditches and rivulets, but is not common. 3. The *nodiflorum*, reclining water-parfnep, has pinnated leaves, but the axillary umbels are feffile. It grows on the fides of rivulets.

The *fium fifarum*, or fkirret, is a native of China, but has been for a long time cultivated in Europe, and particularly in Germany. The root is a bunch of flefhy fibres, each of which is about as thick as a finger, but very uneven, covered with a whitifh rough bark, and has a hard core or pith running through the centre. From the crown of this bunch come feveral winged leaves, confifting of two or three pair of oblong dentated lobes each, and terminated by an odd one. The ftalk rifes to about two feet, is fet with leaves at the joints, and breaks into branches towards the top, each terminating with an umbel of fmall white flowers, which are fucceeded by ftriated feeds like thofe of parfley. Skirrets come neareft to parfneps of any of the efculent roots, both for flavour and nutritive qualities. They are rather fweeter than the parfnep, and therefore to fome few palates are not altogether fo agreeable. Mr. Margraaf extracted from $\frac{1}{2}$lb. of fkirret root $1\frac{1}{2}$ ounce of pure fugar.

SIX-Clerks, officers in chancery of great account, next in degree below the twelve mafters, whofe bufinefs is to inrol commiffions, pardons, patents, warrants, &c. which pafs the great feal, and to tranfact and file all proceedings by bill, anfwer, &c. They were antiently *clerici*, and forfeited their places, if they married; but when the conftitution of the court began to alter, a law was made to permit them to marry. Stat. 14 and 15 Hen. VIII. cap. 8. They are alfo folicitors for parties in fuits depending in the court of chancery. Under them are fix deputies and 60 clerks, who, with the under clerks, do the bufinefs of the office.

SIX Nations. See Niagara.

SIXTH, in mufic, one of the fimple original concords, or harmonical intervals. See Interval.

SIXTUS V. (Pope), was born in 1521, in the figniory of Montalto: his father Francis Peretti, for his faithful fervice to a country gentleman, with whom he lived as a gardener, was rewarded with his mafter's favourite fervant-maid for a wife. Thefe were the parents of that pontiff who, from the inftant of his acceffion to the papacy, even to the hour of his death, made himfelf obeyed and feared, not only by his own fubjects, but by all who had any concern with him. Our pope was their eldeft child, and named Felix. Though he very early difcovered a fitnefs and inclination for learning, the poverty of his parents prevented their indulging it; wherefore, at about nine years of age, his father hired him to an inhabitant of the town, to look after his fheep: but his mafter, being on fome occafion difobliged, removed him to a lefs honourable employ, and gave him the care of his hogs. He was foon releafed, however, from this degrading occupation: for, in 1531, falling accidentally under the cognizance of father Michael Angelo Selleri, a Francifcan friar, who was going to preach during the Lent feafon at Afcoli, the friar was fo exceedingly ftruck with his converfation and behaviour, as to recommend him to the fraternity whither he was going. Accordingly, with the unanimous approbation of the community, he was received among them, invefted with the habit of a lay-brother, and placed under the facriftan, to affift in fweeping the church, lighting the candles, and fuch little offices; who, in return for his fervices, was to teach him the refponfes, and rudiments of grammar.

Such was Felix's introduction to greatnefs. By a quick comprehenfion, ftrong memory, and unwearied application, he made fuch a furprifing progrefs in learning, that in 1534 he was thought fit to receive the cowl, and enter upon his noviciate; and in 1535 was admitted to make his profeffion, being no more than fourteen. He purfued his ftudies with fo much affiduity, that in 1539 he was accounted equal to the beft difputants, and was foon admitted to deacon's orders. In 1545 he was ordained prieft, and affumed the name of father Montalto; the fame year he took his bachelor's degree, and two years after his doctor's; and was pitched upon to keep a divinity act before the whole chapter of the order; at which time he fo effectually recommended himfelf to cardinal Di Carpi, and cultivated fo clofe an intimacy with Boffius his fecretary, that they were both of them ever after his fteady friends. Through the recommendation of father Ghifilieri he was appointed inquifitor-general at Venice, by Paul IV. foon after his acceffion to the papacy in 1555. But the feverity with which he executed his office was fo offenfive to a people jealous of their liberties, as the Venetians were, that he was obliged to owe his prefervation to a precipitate flight from that city.

After his retreat from Venice, we find him acting in many public affairs at Rome, and as often engaged in difputes with the conventuals of his order; till he was appointed to attend, as chaplain and confultor of the Inquifition, cardinal Buon Compagnon, afterwards Gregory XIII. who was then legate de latere to Spain. Here Montalto had great honours paid him: he was offered to be made one of the royal chaplains, with a table and an apartment in the palace, alfo a very large ftipend, if he would ftay there; but, having centred his views at Rome, he declined accepting thefe favours, and only afked the honour of bearing the title of his majefty's chaplain wherever he went. While things were thus circumftanced at Madrid, news was brought of the death of Pius IV. and the elevation of cardinal Alexandrino to the holy fee, with the title of Pius V. Montalto was greatly tranfported at this news, the new pontiff having ever been his

ſteady friend and patron; for this new pontiff was father Ghiſilieri, who had been promoted to the purple by Paul IV. Montalto's joy at the promotion of his friend was not ill founded, nor were his expectations diſappointed; for Pius V. even in the firſt week of his pontificate, appointed him general of his order, an office that he executed with his accuſtomed ſeverity. In 1568 he was made biſhop of St. Agatha; and in 1570 was honoured with a red hat and a penſion. During this reign he had likewiſe the chief direction of the papal councils, and particularly was employed to draw up the bull of excommunication againſt our queen Elizabeth.

Being now in poſſeſſion of the purple, he began to aſpire to the papacy: and upon the death of Pius V. which happened in 1572, he entered the conclave with the reſt of the cardinals; but, appearing to give himſelf no trouble about the election, kept altogether in his apartment, without ever ſtirring from it, except to his devotions. The election being determined in favour of cardinal Buon Compagnon, who aſſumed the name of Gregory XIII. Montalto did not neglect aſſuring him, that he had never wiſhed for any thing ſo much in his life, and that he ſhould always remember his goodneſs, and the favours he received from him in Spain. However, the new pope not only ſhowed very little regard to his compliment, but during his pontificate treated him with the utmoſt contempt, and deprived him of the penſion which had been granted to him by Pius V. Montalto, however, notwithſtanding his affected indifference to what paſſed in the world, was never without able ſpies, who informed him from time to time of every minute particular. He had aſſumed great appearance of imbecility, and all the infirmities of old age, for ſome years before the death of Gregory XIII. in 1585; when it was not without much ſeeming reluctance that Montalto accompanied the reſt of the cardinals into the conclave, where he maintained the ſame uniformity of behaviour in which he had ſo long perſiſted. He kept himſelf cloſe ſhut up in his chamber, and was no more thought or ſpoken of than if he had not been there. He very ſeldom ſtirred out, and, when he went to maſs, or any of the ſcrutinies, appeared ſo little concerned, that one would have thought he had no manner of intereſt in any thing that happened within thoſe walls; and, without promiſing any thing, he flattered every body. This method of proceeding was judiciouſly calculated to ſerve his ambition. He was early appriſed, that there would be great conteſts or diviſions in the conclave; and he knew it was no uncommon caſe, that when the chiefs of the reſpective parties met with oppoſition to the perſon they were deſirous of electing, they would all willingly concur in the choice of ſome very old and infirm cardinal, whoſe life would laſt only long enough to prepare themſelves with more ſtrength againſt another vacancy.

Theſe views directed his conduct, nor was he miſtaken in his expectations of ſucceſs. Three cardinals, who were the heads of potent factions, finding themſelves unable to chooſe the perſons they reſpectively favoured, all concurred to chooſe Montalto. As it was not yet neceſſary for him to diſcover himſelf, when they came to acquaint him with their intention, he fell into ſuch a violent fit of coughing, that they thought he would have expired upon the ſpot. When he recovered himſelf, he told them, that his reign would be but for a few days; nor would he be prevailed on to accept it on any other terms, than that they ſhould all three promiſe not to abandon him, but take the greateſt part of the weight off his ſhoulders, as he was neither able, nor could in conſcience pretend, to take the whole upon himſelf. The cardinals ſwallowed the bait; and, in confidence of engroſſing the adminiſtration, they exerted their joint intereſts ſo effectually, that Montalto was elected. He now immediately pulled off the maſk he had worn for fourteen years with an amazing ſteadineſs and uniformity. As ſoon as ever he found a ſufficient number of votes to ſecure his election, he threw the ſtaff with which he uſed to ſupport himſelf into the middle of the chapel, and appeared taller by almoſt a foot than he had done for ſeveral years. Nor was the change in his manners leſs remarkable than in his perſon: he immediately diveſted himſelf of the humility he had ſo long profeſſed; and, laying aſide his accuſtomed civility and complaiſance, treated every body with reſerve and haughtineſs.

The lenity of Gregory's government had introduced a general licentiouſneſs among all ranks of people; which, though ſomewhat reſtrained while he lived, broke out into open violence the very day after his death; ſo that the reformation of abuſes, in the church as well as the ſtate, was the firſt and principal care of Sixtus V. for ſuch was the title Montalto aſſumed. It having been cuſtomary with preceding popes to releaſe priſoners on the day of their coronation, delinquents were wont to ſurrender themſelves after the pope was choſen: and ſeveral offenders, judging of Montalto's diſpoſition by his behaviour while a cardinal, came voluntarily to the priſons, not making the leaſt doubt of a pardon: but they were fatally diſappointed. Likewiſe, in the place of ſuch judges as were inclined to lenity, he ſubſtituted others of a more auſtere diſpoſition, and appointed commiſſaries to examine not only their conduct, but alſo that of other governors and judges for many years paſt; promiſing rewards to thoſe who could convict them of corruption, or of having denied juſtice to any one at the inſtance or requeſt of men in power. All the nobility and perſons of the higheſt quality were ſtrictly forbid, on pain of diſpleaſure, to aſk the judges any thing in behalf of their neareſt friends or dependants; at the ſame time the judges were to be fined in caſe they liſtened to any ſolicitation. He further commanded every body, on pain of death, not to terrify witneſſes by threats, or tempt them by hopes or promiſes. He ordered the ſyndics and mayors of every town and ſigniory, as well thoſe that were actually in office as thoſe who had been for the laſt ten years, to ſend him a liſt of all the vagrants, common debauchees, looſe and diſorderly people in their diſtricts, threatening them with the ſtrappado and impriſonment, if they omitted or concealed any one. In conſequence of which ordinance, the ſyndic of Albano, leaving his nephew, who was an incorrigible libertine, out of the liſt, underwent the ſtrappado in the public market-place, though the Spaniſh ambaſſador interceded ſtrongly for him. He particularly directed the legates and governors of the eccleſiaſtical ſtate to be expeditious in carrying on all criminal proceſſes; declaring he had rather have the gibbets and galleys full, than the priſons. Adultery he puniſhed with death: nor was he leſs ſevere to thoſe who voluntarily permitted a proſtitution of their wives; a cuſtom at that time very common in Rome. The female ſex, eſpecially the younger part, attracted in a very particular manner the attention of Sixtus: not only the debauching of any of them, whether by force or artifice, but even the attempting of it, or offering the leaſt offence againſt modeſty, was very ſeverely puniſhed. For the more effectual prevention, as well of private aſſaſſinations as public quarrels, he forbade all perſons, on pain of death, to draw a ſword, or to carry arms ſpecified in the edict; nor would he be prevailed on to ſpare any who tranſgreſſed this order: even to threaten another with an intended injury was ſufficient to entitle the menacer to a whipping and the galleys; eſpecially if the nature of their profeſſion furniſhed the means of carrying their threats into execution. He obliged the nobility of Rome, and the country round it, to an exact payment of their debts. He aboliſhed all protections and other immunities, in the houſes of ambaſſadors, cardinals, nobles, or prelates.

Sixtus, before he had been pope two months, quarrelled with Philip II. of Spain, Henry III. of France, and Henry king of Navarre. His intrigues in ſome meaſure may be ſaid to have influenced, in his day, all the councils of Europe. Sixtus had cauſed the Vulgate Latin edition of the Bible to be publiſhed,

which occaſioned a good deal of clamour; but nothing like what there was upon his printing an Italian verſion of it. This ſet all the Roman Catholic part of Chriſtendom in an uproar. Though this pope's behaviour, in ſome particulars, may not command an univerſal applauſe, yet it is certain the holy ſee was under very great obligations to him. His impartial though rigorous adminiſtration of juſtice had a very happy effect: he ſtrenuouſly defended the rights of the poor, the widow, and the orphan; he refuſed audience to nobody, ordering his maſters of the ceremonies to introduce the pooreſt to him firſt; but was more particularly ready to hear any accuſation againſt the magiſtrates: the ſame conduct he obſerved between the clergy and their ſuperiors, always applying quick and effectual, though moſtly ſevere, remedies. To him the city of Rome was obliged for ſeveral of its greateſt embelliſhments, particularly the Vatican library; and to him its citizens were indebted for the introduction of trade into the eccleſiaſtical ſtate. He was exceedingly beneficent, and, among many other noble charities, his appropriation of three thouſand crowns a year for the redemption of Chriſtian ſlaves out of the hands of the infidels will hardly be reckoned the leaſt meritorious.

This great man, who was an encourager of arts as well as arms, died, not without a ſuſpicion of being poiſoned by the Spaniards, Aug. 27, 1590, having enjoyed the papacy little more than five years.

SIYA GHUSH, the caracal of Buffon, an animal of the cat kind. See FELIS.

SIZAR, or SIZER, in Latin *Sizator*, an appellation by which the loweſt order of ſtudents in the univerſities of Cambridge and Dublin are diſtinguiſhed, is derived from the word *ſize*, which in Cambridge, and probably in Dublin likewiſe, has a peculiar meaning. To *ſize*, in the language of the univerſity, is to get any ſort of victuals from the kitchens, which the ſtudents may want in their own rooms, or in addition to their commons in the hall, and for which they pay the cooks or butchers at the end of each quarter. A ſize of any thing is the ſmalleſt quantity of that thing which can be thus bought: two ſizes, or a part of beef, being nearly equal to what a young perſon will eat of that diſh to his dinner; and a ſize of ale or beer being equal to half an Engliſh pint.

The ſizars are divided into two claſſes, viz. ſubſizatores or ſizars, and ſizatores or proper ſizars. The former of theſe are ſupplied with commons from the table of the fellows and fellow-commoners: and in former times, when theſe were more ſcanty than they are now, they were obliged to ſupply the deficiency by ſizing, as is ſometimes the caſe ſtill. The proper ſizars had formerly no commons at all, and were therefore obliged to ſize the whole. In St. John's college they have now ſome commons allowed them for dinner, from a benefaction, but they are ſtill obliged to ſize their ſuppers: in the other colleges they are allowed a part of the fellow-commons, but muſt ſize the reſt; and from being thus obliged to ſize the whole or part of their victuals, the whole order derived the name of *ſizars*.

In Oxford, the order ſimilar to that of ſizar is denominated *ſervitor*, a name evidently derived from the menial duties which they perform. In both univerſities theſe orders were formerly diſtinguiſhed by round caps and gowns of different materials from thoſe of the penſioners or commoners, the order immediately above them. But about 30 years ago the round cap was entirely aboliſhed in both ſeminaries. There is ſtill, however, in Oxford, we believe, a diſtinction in the gowns, and there is alſo a trifling difference in ſome of the ſmall colleges in Cambridge; but in the large colleges the dreſs of the penſioners and ſizars is entirely the ſame.

In Oxford, the ſervitors are ſtill obliged to wait at table on the fellows and gentlemen-commoners; but, much to the credit of the univerſity of Cambridge, this moſt degrading and diſgraceful cuſtom was entirely aboliſhed about 10 or 12 years ago, and of courſe the ſizars of Cambridge are now on a much more reſpectable footing than the fervitors of Oxford.

The ſizars are not upon the foundation, and therefore while they continue ſizars are not capable of being elected fellows; but they may at any time, if they chooſe, become penſioners: and they generally ſit for ſcholarſhips immediately before they take their firſt degree. If ſucceſsful, they are then on the foundation, and are entitled to become candidates for fellowſhips when they have got that degree. In the mean time, while they continue ſizars, beſides free commons they enjoy many benefactions, which have been made at different times, under the name of *ſizar's prætor*, *exhibitions*, &c. and the rate of tuition, the rent of rooms, and other things of that ſort within their reſpective colleges, is leſs than to the other orders. But though their education is thus obtained at a leſs expenſe, they are not now conſidered as a menial order; for ſizars, penſioner ſcholars, and even ſometimes fellow-commoners, mix together with the utmoſt cordiality. It is worthy of remark, that at every period this order has ſupplied the univerſity with its moſt diſtinguiſhed officers; and that many of the moſt illuſtrious members of the church, many of the moſt diſtinguiſhed men in the other liberal profeſſions, have, when under-graduates, been ſizars, when that order was on a leſs reſpectable footing than it is now.

SIZE, the name of an inſtrument uſed for finding the bigneſs of fine round pearls. It conſiſts of thin pieces or leaves, about two inches long, and half an inch broad, faſtened together at one end by a rivet. In each of theſe are round holes driſled of different diameters. Thoſe in the firſt leaf ſerve for meaſuring pearls from half a grain to ſeven grains; thoſe of the ſecond, for pearls from eight grains or two carats to five carats, &c.; and thoſe of the third, for pearls from ſix carats and a half to eight carats and a half.

SIZE, is alſo a ſort of paint, varniſh, or glue, uſed by painters, &c. The ſhreds and parings of leather, parchment, or vellum, being boiled in water and ſtrained, make ſize. This ſubſtance is much uſed in many trades. The manner of uſing ſize is to melt ſome of it over a gentle fire; and ſcraping as much whiting into it as will juſt colour it, let them be well incorporated together; after which you may whiten frames, &c. with it. After it dries, melt the ſize again, and put more whiting, and whiten the frames, &c. ſeven or eight times, letting it dry between each time: but before it is quite dry, between each waſhing with ſize, you muſt ſmooth and wet it over with a clean bruſh-pencil in fair water.

To make *gold ſize*. Take gum animi and aſphaltum, of each one ounce; minium, litharge of gold, and amber, of each half an ounce: reduce all into a very fine powder, and add to them four ounces of linſeed oil, and eight ounces of drying oil: digeſt them over a gentle fire that does not flame, ſo that the mixture may only ſimmer, but not boil, leſt it ſhould run over and ſet the houſe on fire: ſtir it conſtantly with a ſtick till all the ingredients are diſſolved and incorporated, and do not leave off ſtirring till it becomes thick and ropy: after being ſufficiently boiled, let it ſtand till it is almoſt cold, and then ſtrain it through a coarſe linen cloth, and keep it for uſe.—To prepare it for working, put what quantity you pleaſe in a horſe muſcle ſhell, adding as much oil of turpentine as will diſſolve it; and making it as thin as the bottom of your ſeed-lac varniſh, hold it over a candle, and then ſtrain it through a linen-rag into another ſhell; add to theſe as much vermilion as will make it of a darkiſh red: if it is too thick for drawing, you may thin it with ſome oil of turpentine. The chief uſe of this ſize is for laying on metals. The beſt gold-ſize for burniſhing is made as follows: take fine bole, what quantity you pleaſe; grind it finely on a piece of marble, then ſcrape into it a little beef ſuet; grind all well together; after which mix in a ſmall proportion of parchment-ſize with a double proportion of water, and it is done.

To make *silver-size*. Take tobacco-pipe clay in fine powder, into which scrape some black-lead and a little Genoa soap, and grind them all together with parchment size as already directed.

SKATING, an exercise on ice, both graceful and healthy. Although the antients were remarkable for their dexterity in most of the athletic sports, yet skating seems to have been unknown to them. It may therefore be considered as a modern invention; and probably it derived its origin in Holland, where it was practised, not only as a graceful and elegant amusement, but as an expeditious mode of travelling when the lakes and canals were frozen up during winter. In Holland long journeys are made upon skates with ease and expedition; but in general less attention is there paid to graceful and elegant movements, than to the expedition and celerity of what is called *journey skating*. It is only in those countries where it is considered as an amusement that its graceful attitudes and movements can be studied; and there is no exercise whatever better calculated to set off the human figure to advantage. The acquirement of most exercises may be attained at an advanced period of life; but to become an expert skater, it is necessary to begin the practice of the art at a very early age. It is difficult to reduce the art of skating to a system. It is principally by the imitation of a good skater that a young practitioner can form his own practice. The English, though often remarkable for feats of agility upon skates, are very deficient in gracefulness; which is partly owing to the construction of the skates. They are too much curved in the surface which embraces the ice, consequently they involuntarily bring the users of them round on the outside upon a quick and small circle; whereas the skater, by using skates of a different construction, less curved, has the command of his stroke, and can enlarge or diminish the circle according to his own wish and desire. The metropolis of Scotland has produced more instances of elegant skaters than perhaps any other country whatever; and the institution of a skating club about 40 years ago, has contributed not a little to the improvement of this elegant amusement. We are indebted for this article to a gentleman of that club, who has made the practice and improvement of skating his particular study; and as the nature of our work will not permit the insertion of a full treatise on skating, we shall present our readers with a few instructions.

Those who wish to be proficients should begin at an early period of life; and should first endeavour to throw off the fear which always attends the commencement of an apparently hazardous amusement. They will soon acquire a facility of moving on the inside: when they have done this, they must endeavour to acquire the movement on the outside of the skates; which is nothing more than throwing themselves upon the outer edge of the skate, and making the balance of their body tend towards that side, which will necessarily enable them to form a semicircle. In this, much assistance may be derived from placing a bag of lead-shot in the pocket next to the foot employed in making the outside stroke, which will produce an artificial poise of the body, which afterwards will become natural by practice. At the commencement of the outside stroke, the knee of the employed limb should be a little bended, and gradually brought to a rectilineal position when the stroke is completed. When the practitioner becomes expert in forming the semicircle with both feet, he is then to join them together, and proceed progressively and alternately with both feet, which will carry him forward with a graceful movement. Care should be taken to use very little muscular exertion, for the impelling motion should proceed from the mechanical impulse of the body thrown into such a position as to regulate the stroke. At taking the outside stroke, the body ought to be thrown forward easily, the unemployed limb kept in a direct line with the body, and the face and eyes directly looking forward: the unemployed foot ought to be stretched towards the ice, with the toes in a direct line with the leg. In the time of making the curve, the body must be gradually, and almost imperceptibly, raised, and the unemployed limb brought in the same manner forward; so that, at finishing the curve, the body will bend a small degree backward, and the unemployed foot will be about two inches before the other, ready to embrace the ice and form a correspondent curve. The muscular movement of the whole body must correspond with the movement of the skate, and should be regulated so as to be almost imperceptible to the spectators. Particular attention should be paid in carrying round the head and eyes with a regular and imperceptible motion; for nothing so much diminishes the grace and elegance of skating as sudden jerks and exertions, which are too frequently used by the generality of skaters. The management of the arms likewise deserves attention. There is no mode of disposing of them more gracefully in skating outside, than folding the hands into each other, or using a muff.

There are various feats of activity and manœuvres used upon skates; but they are so various that we cannot pretend to detail them. Moving on the outside is the primary object for a skater to attain; and when he becomes an adept in that, he will easily acquire a facility in executing other branches of the art. There are few exercises but will afford him hints of elegant and graceful attitudes. For example, nothing can be more beautiful than the attitude of drawing the bow and arrow whilst the skater is making a large circle on the outside: the manual exercise and military salutes have likewise a pretty effect when used by an expert skater.

SKELETON, in anatomy, the dried bones of any animal joined together by wires, or by the natural ligament dried, in such a manner as to show their position when the creature was alive. We have, in the Philosophical Transactions, an account of a human skeleton, all the bones of which were so united, as to make but one articulation from the back to the os sacrum, and downwards a little way. On sawing some of them, where they were unnaturally joined, they were found not to cohere throughout their whole substance, but only about a sixth of an inch deep all round. The figure of the trunk was crooked, the spinæ making the convex, and the inside of the vertebræ the concave part of the segment. The whole had been found in a charnel-house, and was of the size of a full grown person.

SKIDS, or SKEEDS, in sea-language, are long compassing pieces of timber, notched below so as to fit closely upon the wales, extending from the main-wale to the top of the side, and retained in this position by bolts or spike-nails. They are intended for preserving the planks of the side, when any heavy body is hoisted or lowered.

SKIFF, a small boat resembling a yawl, usually employed for passing rivers.

SKIMMER, BLACK. See SHEARBILL.

SKIMMIA, in botany: A genus of the *monogynia* order, belonging to the *tetrandria* class of plants; and in the natural method ranking under the 40th order, *Personatæ*. The calyx is quadripartite; the corolla consists of four concave petals; and the berry contains four seeds. There is only one species, viz. the *Japonica*.

SKIN, in anatomy, the general covering of the body of any animal. See ANATOMY.

SKIN, in commerce, is particularly used for the membrane stripped off the animal to be prepared by the tanner, skinner, parchment-maker, &c. and converted into leather, &c. See TANNING.

SKINNER (STEPHEN), an English antiquarian, born in 1622. He travelled, and studied in several foreign universities during the civil wars; and in 1654 returned and settled at Lincoln, where he practised physic with success until the year 1667, when he died of a malignant fever. His works were collected in folio in 1671, by Mr. Henshaw, under the title of *Etymologicon Linguæ Anglicanæ*, &c.

SKIPPER, or Saury, a ſpecies of Esox, which ſee.

SKIRMISH, in war, a ſlight engagement between ſmall parties, without any regular order; and therefore eaſily diſtinguiſhed from a *battle*, which is a general engagement between two armies continued for ſome time.

SKULL, in anatomy, the bony caſe in which the brain is incloſed. See Anatomy.

Skull-*Cap*. See Scutellaria.

SKY, the blue expanſe of air or atmoſphere. For the reaſon of its blue colour and concave figure, ſee Optics.

Sky-*Colour*. To give this colour to glaſs, ſet in the furnace a pot of pure metal of fritt from rochetta or barilla, but the rochetta fritt does beſt: as ſoon as the metal is well purified, take for a pot of twenty pounds of metal ſix ounces of braſs calcined by itſelf; put it by degrees at two or three times into the metal, ſtirring and mixing it well every time, and diligently ſkimming the metal with a ladle; at the end of two hours the whole will be well mixed, and a proof may be taken; if the colour be found right, let the whole ſtand 24 hours longer in the furnace, and it will then be fit to work, and will prove of a moſt beautiful ſky colour.

SKYE, an iſland of Scotland, one of the largeſt of the Hebrides. It is 50 miles long, and, in ſome places, above 20 broad. The ſouth-eaſt end is ſeparated from Invernefsſhire (to which it belongs) by a narrow channel, called the Inner Sound; in the moſt narrow part of which, named the Kyle, cattle are made to ſwim acroſs. This ſide of the iſland ſwells gradually from the ſhore, in a verdant ſlope, over which are ſeen the naked hills of Strath; and above theſe riſes the rugged top of Cullin, or Cuchullin. On the ſouth-weſt are ſeen a ſeries of rude mountains, diſcoloured black and red, as by the rage of fire; and on the eaſt a long extent of Alpine hills. There is, notwithſtanding, a great proportion of level ground, with excellent paſturage; and it has numbers of deer and different kinds of game. It abounds with limeſtone, marble, &c. but the baſaltic columns, reſembling the Giant's Cauſeway in Ireland, are its greateſt curioſity. A cave, at the eaſt end of the iſland, afforded an aſylum, in 1746, to the diſappointed pretender, and his faithful guide, for two nights. Many thouſands of black cattle are annually exported hence. Some ſmall horſes are bred, and a great quantity of kelp is manufactured here. Portree is the chief place.

SLAB, an outſide ſappy plank or board ſawed off from the ſides of a timber tree. The word is alſo uſed for a flat piece of marble.

Slab-*Line*, in ſea language, a ſmall cord paſſing up behind a ſhip's main-ſail or fore-ſail, and being reeved through a block attached to the lower part of the yard, is thence tranſmitted in two branches to the foot of the ſail, to which it is faſtened. It is uſed to truſs up the ſail as occaſion requires, and more particularly for the convenience of the pilot or ſteerſman, that they may look forward beneath it as the ſhip advances.

SLACK-water, in ſea language, denotes the interval between the flux and reflux of the tide, or between the laſt of the ebb and the firſt of the flood, during which the current is interrupted, and the water apparently remains in a ſtate of reſt.

SLACKEN, in metallurgy, a term uſed by the miners to expreſs a ſpongy and femivitrified ſubſtance, which they uſed to mix with the ores of metals, to prevent their fuſion. It is the ſcoria or ſcum ſeparated from the ſurface of the former fuſions of metals. To this they frequently add limeſtone, and ſometimes a kind of coarſe iron ore, in the running of the poorer gold ores.

SLATE *(Steganìa)*, a ſtone of a compact texture and laminated ſtructure, ſplitting into fine plates. Dr. Hill diſtinguiſhes four ſpecies of ſtegania. 1. The *whitiſh ſteganium*, being a ſoft, friable, ſlaty ſtone, of a tolerably fine and cloſe texture, conſiderably heavy, perfectly dull and deſtitute of brightneſs, variegated with a pale brown or browniſh yellow. This ſpecies is common in many counties of England, lying near the ſurface of the ground. It is generally very full of perpendicular as well as horizontal cavities, many of which are filled up with a ſpar a little purer and more cryſtalline than the reſt, and is commonly uſed for covering houſes. 2. The *red ſteganium* is a very fine and elegant ſlate, of a ſmooth ſurface, firm and compact texture, conſiderably heavy, and of a very beautiful pale purple, glittering all over with ſmall gloſſy ſpangles. It is compoſed of a multitude of very thin plates or flakes, laid cloſely and evenly over one another, and cohering pretty firmly. This is very common in the northern parts of England, and is much valued as a ſtrong and beautiful covering for houſes. 3. The common *blue ſteganium* is very well known as an uſeful and valuable ſtone, of a fine ſmooth texture and gloſſy ſurface, moderately heavy, and of a pale grayiſh blue; compoſed of a multitude of even plates, laid cloſe upon one another, and eaſily ſplitting at the commiſſures of them. This is alſo very common in the north parts of England, and is uſed in moſt places for the covering of houſes. There are other ſpecies of this ſlate, viz. the browniſh blue friable ſteganium, uſually called *coal-ſlate*; the grayiſh black friable ſteganium, commonly called *ſhiver*; and the grayiſh blue ſparkling ſteganium. 4. The friable, aluminous, *black ſteganium*, being the Iriſh ſlate of the ſhops. This is compoſed of a multitude of thin flakes, laid very evenly and regularly over one another, and ſplits very regularly at the commiſſures of them. It is common in many parts of Ireland, and is found in ſome places in England always lying near the ſurface in very thick ſtrata. The iſland of Euſdale, one of the Hebrides on the weſt coaſt of Scotland, is entirely compoſed of ſlate. The ſtratum is 36 feet thick. About two millions and a half, at the rate of twenty ſhillings per thouſand, are ſold annually to England, Canada, the Weſt Indies, and Norway.

SLAVE, a perſon in the abſolute power of a maſter, either by war or conqueſt. See Servant.—Menage and Voſſius derive the word from *Sclavus*, the name of a Scythian people, whom Charlemagne condemned to perpetual impriſonment; whence the Italians made their *ſchlavo*, the Germans their *ſchlave*, the French their *eſclave*, and we *ſlave*. The Italians and other nations uſed to buy theſe Sclavi or Sclavonians to make drudges of; whence the proper name of a nation became in time the name of a ſtate or condition. The Romans called their ſlaves *ſervi*, from *ſervare*, to "keep, ſave;" as being ſuch as were not killed, but ſaved, to yield money either by ſale or by their work. Though other authors are of opinion that the Roman name *ſervi* might come from that of *Serbi*, as that of *ſlaves* from *Sclavi*, a people.

We find no mention of ſlaves before the deluge; but immediately after, viz. in the curſe of Canaan, Gen. ix. 25.; whence it is eaſily inferred, that ſervitude commenced ſoon after that time; for in Abraham's days we find it generally eſtabliſhed.—Some will have it to have commenced under Nimrod, becauſe it was he who firſt began to make war, and of conſequence to make captives; and to bring ſuch as he took, either in his battles or irruptions, into ſlavery.

Among the Romans, a ſlave, when he was ſet at liberty, changed his name into a ſurname, and took the nomen or prænomen of his maſter; to which he added the cognomen he had been called by when a ſlave. Great part of the Roman wealth conſiſted in ſlaves: they had the power of life and death over them, which no other nation had; but this ſeverity was afterwards moderated by the laws of the Emperors. The ſlaves were eſteemed the proper goods of their maſters, and all they got belonged to them; but if the maſter was too cruel in his correction, he was obliged to ſell his ſlave at a moderate price. The Romans not only approved of, but even invented new ways of

making ſlaves; for inſtance, a man born free among them might ſell his freedom and become a ſlave. There were generally three ways of obtaining ſlaves; either when they bought them with the booty taken from the enemy, diſtinct from the ſhare reſerved for the public, or of thoſe who took them priſoners in war, or of merchants who dealt in them, and ſold them at fairs.

Slavery is abſolutely aboliſhed in Britain and France, as to perſonal ſervitude. See SERVANTS.

SLAVE-TRADE, a traffic in negroes, carried on at preſent by the merchants of Europe with the natives of Africa. It is well known that the Portugueſe were the firſt Europeans who embarked in this trade, and that their example was ſoon followed by the Dutch and the Engliſh. Of the riſe and progreſs of the Engliſh commerce in ſlaves, the reader will find a ſufficient account in other articles of this work. (See COMPANY and GUINEA.) That commerce, though long cheriſhed by the government as a ſource of national and colonial wealth, was from its commencement conſidered by the thinking part of the nation as a traffic inconſiſtent with the rights of man, and ſuſpected to be carried on by acts of violence. Theſe ſuſpicions have been gradually ſpread through the people at large, and confirmed, in many inſtances, by evidence incontrovertible. Laws have in conſequence been enacted to make the negroes more comfortable on what is called the middle paſſage, and to protect them againſt the wanton cruelty of their maſters in the Weſt Indies. But the humanity of the nation was rouſed; and not many years ago a number of gentlemen, of the moſt reſpectable characters, finding that no adequate protection can be afforded to perſons in a ſtate of hopeleſs ſervitude, formed themſelves into a ſociety at London, for the purpoſe of procuring a total abolition of the ſlave trade. That the motives which influence the leading men of this ſociety are of the pureſt kind, cannot, we think, be queſtioned; for their object is to deliver thoſe who had none to help them, and from whom they can expect no other reward for their labours of love than the bleſſings of them who are ready to periſh. To a cauſe ſo truly Chriſtian, who would not pray for ſucceſs? or who but muſt feel the moſt pungent regret, if that ſucceſs has been rendered doubtful, or even been delayed, by the imprudence of ſome of the agents employed by the ſociety? This we apprehend to have been really the caſe; and that language calculated rather to exaſperate the planters than to ſerve the negroes has eſcaped many ſincere and zealous advocates for the abolition of a traffic of which no conſcientious perſon can think well.

Slavery is, indeed, in every form an evil; but it ſeems to be one of thoſe many evils which, having long prevailed in the world, can be advantageouſly removed only by degrees, and as the moral cultivation of the ſlaves may enable them to ſupport the rank and diſcharge the duties of free men. This is doubtleſs the reaſon why it was not expreſsly prohibited by the divine Author of our religion, but ſuffered to vaniſh gradually before the mild influence of his heavenly doctrines. It has vaniſhed before theſe doctrines in moſt countries of Europe; and we truſt that the time is at hand when our traffic in human fleſh with the inhabitants of Africa ſhall ceaſe; and that the period is not very diſtant when the ſlaves in the Weſt Indies ſhall be ſo much improved in moral and religious knowledge, as that they may be ſafely truſted with their own freedom. To ſet them free in their preſent ſtate of ignorance and depravity, is one of the wildeſt propoſals that the ardour of innovation has ever made. Such freedom would be equally ruinous to themſelves and to their maſters; and we may ſay of it what Cicero ſaid of ſome unſeaſonable indulgences propoſed to be granted to the ſlaves in Sicily; *Quæ cum accidunt, nemo eſt, quin intelligat ruere illam rempublicam; hæc ubi veniunt, nemo eſt, qui ullam ſpem ſalutis reliquam eſſe arbitretur.*

SLAUGHTER. See MAN-SLAUGHTER, HOMICIDE, MURDER, &c.

SLEDGE, a kind of carriage, without wheels, for the conveyance of very weighty things, as huge ſtones, bells, &c. The ſledge for carrying criminals, condemned for high treaſon, to execution, is called HURDLE. The Dutch have a kind of ſledge on which they can carry a veſſel of any burden by land. It conſiſts of a plank of the length of the keel of a moderate ſhip, raiſed a little behind, and hollow in the middle; ſo that the ſides go a little aſlope, and are furniſhed with holes to receive pins, &c. The reſt is quite even.

SLEDGE is a ſmith's large hammer, to be uſed with both hands: of this there are two ſorts, the up-hand ſledge, which is uſed by under workmen, when the work is not of the largeſt ſort; it is uſed with both the hands before, and they ſeldom raiſe it higher than their head. But the other, which is called the about-ſledge, and which is uſed for battering or drawing out the largeſt work, is held by the handle with both hands, and ſwung round over their heads, at their arm's end, to ſtrike as hard a blow as they can.

SLEEP, that ſtate of the body in which, though the vital functions continue, the ſenſes are not affected by the ordinary impreſſions of external objects. See DREAMS, and PHYSIOLOGY.

SLEEP-*Walker*, one who walks in his ſleep. Many inſtances might be related of perſons who were addicted to this practice. A remarkable inſtance has been publiſhed from a report made to the Phyſical Society of Lauſanne, by a committee of gentlemen appointed to examine a young man who was accuſtomed to walk in his ſleep. The diſpoſition to ſleep-walking ſeems, in the opinion of this committee, to depend on a particular affection of the nerves, which both ſeizes and quits the patient during ſleep. Under the influence of this affection, the imagination repreſents to him the objects that ſtruck him while awake, with as much force as if they really affected his ſenſes; but does not make him perceive any of thoſe that are actually preſented to his ſenſes, except in ſo far as they are connected with the dreams which engroſs him at the time. If, during this ſtate, the imagination has no determined purpoſe, he receives the impreſſion of objects as if he were awake; only, however, when the imagination is excited to bend its attention towards them. The perceptions obtained in this ſtate are very accurate, and, when once received, the imagination renews them occaſionally with as much force as if they were again acquired by means of the ſenſes. Laſtly, theſe academicians ſuppoſe, that the impreſſions received during this ſtate of the ſenſes diſappear entirely when the perſon awakes, and do not return till the return of the ſame diſpoſition in the nervous ſyſtem. Their remarks were made on the Sieur Devaud, a lad thirteen years and a half old, who lived in the town of Vevay, and who was ſubject to that ſingular affection or diſeaſe called *Somnambuliſm* or ſleep-walking. The particulars however are unworthy of being detailed; as many of the facts are diſputable, and the reaſoning of the Committee on thoſe that are admiſſible is by no means concluſive.

SLEEPERS, in natural hiſtory, a name given to thoſe animals which ſleep all winter; ſuch as bears, marmots, dormice, bats, hedgehogs, ſwallows, &c. Theſe do not feed in winter, have no ſenſible evacuations, breathe little or none at all, and moſt of the viſcera ceaſe from their functions. Some of theſe creatures ſeem to be dead, and others return to a ſtate like that of the fœtus before birth: in this ſtate they continue, till by new heat the fluids are attenuated, the animal is reſtored to life, and the functions begin where they left off.

SLEEPERS, in a ſhip, timbers lying before and aft in the bottom of the ſhip, as the rungheads do: the lowermoſt of them is bolted to the rungheads, and the uppermoſt to the futtocks and rungs.

SLEIDAN (JOHN), an excellent German hiftorian, born of obfcure parents, in 1506, at Sleidan, a fmall town on the confines of the duchy of Juliers. After ftudying fome time in his own country, together with his townfman the learned John Sturmius, he went to France, and in 1535 entered into the fervice of the cardinal and archbifhop John du Bellay. He retired to Strafburg in 1542, where he acquired the efteem and friendfhip of the moft confiderable perfons, particularly of James Sturmius; by whofe advice and affiftance he was enabled to write the hiftory of his own time. He was employed in fome public negotiations; but the death of his wife, in 1555, plunged him into fo deep a melancholy, that he loft his memory entirely, and died the year following. In 1555 came out, in folio, *De ftatu Religionis et Reipublicæ fub Carolo Quinto*, &c. in 25 books; from the year 1517, when Luther began to preach, to the year of its publication; which hiftory was prefently tranflated into moft of the languages of Europe. Befides this great work, he wrote, *De quatuor fummis Imperiis, libri tres;* with fome other hiftorical and political pieces.

SLEIGHT *of* HAND. See LEGERDEMAIN.

SLESWICK, an antient and confiderable town of Denmark, and capital of a duchy of the fame name in the province of Gottorp, with a bifhop's fee, fecularized in 1586. Clofe to it is the old palace of Gottorp, formerly the ducal refidence, but at prefent inhabited by the ftadtholder or governor. This town was once much more confiderable than it is at prefent, having fuffered greatly by the wars of Germany. It is feated on the gulph of Sley, where there is a good harbour, 60 miles north-weft of Lubeck, and 125 fouth-weft of Copenhagen. E. lon. 10. 0. N. lat. 54. 40.

SLESWICK, the duchy of, or *South Jutland*, is about 100 miles in length and 60 in breadth. It is bounded on the north by North Jutland, on the eaft by the Baltic Sea, on the fouth by Holftein, and on the weft by the ocean. It contains 14 cities, 17 towns, 13 caftles, 278 parifhes, 1480 villages, 162 farms, 116 water-mills, and 106 gentlemen's feats. It is a pleafant, fertile, populous country, and a fovereign duchy. Formerly the king of Denmark had half of it, and the other belonged to the houfe of Holftein-Gottorp; but the former having conquered this duchy, had the poffeffion of it confirmed to him by the Treaty of the North in 1720. In 1731, a prince of Bareith-Culmbach was made governor of this duchy, who refides at Gottorp.

SLEUT-HOUNDE, the antient Scots name of the blood-hound. The word is from the Saxon *flot*, "the impreffion that a deer leaves of its foot in the mire," and *hound* "a dog;" fo they derive their name from following the track. See the article BLOOD-*Hound*.

SLICH, in metallurgy, the ore of any metal, particularly of gold, when it has been pounded, and prepared for further working. The manner of preparing the flich at Chremnitz in Hungary is this: they lay a foundation of wood three yards deep, upon this they place the ore, and over this there are 24 beams, armed at their bottoms with iron; thefe by a continual motion beat and grind the ore, till it is reduced to powder: during this operation the ore is covered with water. There are four wheels ufed to move thefe beams, each wheel moving fix; and the water, as it runs off, carrying fome of the metalline particles with it, is received into feveral bafons, one placed behind another; and finally, after having paffed through them all, and depofited fome fediment in each, it is let off into a very large pit, almoft half an acre in extent; in which it is fuffered to ftand fo long, as to depofit all its fediment, of whatever kind, and after this it is let out. This work is carried on day and night, and the ore taken away and replaced by more as often as occafion requires. That ore which lies next the beams, by which it was pounded, is always the cleaneft or richeft.

When the flich is wafhed as much as they can, a hundred weight of it ufually contains about an ounce, or perhaps but half an ounce of metal, which is not all gold; for there is always a mixture of gold and filver, but the gold is in the largeft quantity, and ufually is two-thirds of the mixture: they then put the flich into a furnace with fome limeftone, and flacken, or the fcoria of former meltings, and run them together. The firft melting produces a fubftance called *lech;* this lech they burn with charcoal, to make it lighter, to open its body, and render it porous, after which it is called *roft;* to this roft they add fand in fuch quantity as they find neceffary, and then melt it over again.

At Chremnitz they have many other ways of reducing gold out of its ore, but particularly one, in which they employ no lead during the whole operation; whereas, in general, lead is always neceffary after the before-mentioned proceffes. See GOLD.

SLIDING RULE, a mathematical inftrument, ferving to work queftions in gauging, meafuring, &c. without the ufe of compaffes; merely by the fliding of the parts of the inftrument one by another, the lines and divifions whereof give the anfwer by infpection. This inftrument is varioufly contrived, and applied by various authors, particularly Everard, Coggefhall, Gunter, Hunt, and Partridge; but the moft common and ufeful are thofe of Everard and Coggefhall.

SLIGO, a county, in the province of Connaught, Ireland, 25 miles in length, and as much in breadth; bounded on the eaft by that of Leitrim, on the weft by the county of Mayo, on the north and north-weft by the Weftern Ocean, and on the fouth and fouth-weft by Rofcommon and Mayo. It contains 5970 houfes, 41 parifhes, 6 baronies, 1 borough, and fends four members to parliament, two for the county, and two for the borough of the fame name, which is the only market-town in the county, and is feated on a bay of the fame name, 30 miles weft of Killala, and 110 north eaft of Dublin. W. lon. 8. 26. N. lat. 54. 13.

SLING, an inftrument ferving for cafting ftones with great violence. The inhabitants of the Balearic iflands were famous in antiquity for the dexterous management of the fling: it is faid they ufed three kinds of flings, fome longer, others fhorter, which they ufed according as their enemies were either nearer or more remote. It is added, that the firft ferved them for a head-band, the fecond for a girdle, and that the third they conftantly carried in their hand.

SLINGING is ufed varioufly at fea; but chiefly for hoifting cafks or other heavy things with flings, *i. e.* contrivances of ropes fpliced into themfelves at either end, with one eye big enough to receive the cafk or whatever is to be flung. There are other flings, which are made longer, and with a fmall eye at each end; one of which is put over the breech of a piece of ordnance, and the other eye comes over the end of an iron crow, which is put into the mouth of the piece, to weigh and hoift the gun as they pleafe. There are alfo flings by which the yards are bound faft to the crofs-tree aloft, and to the head of the maft, with a ftrong rope or chain, that if the tie fhould happen to break, or to be fhot to pieces in fight, the yard, neverthelefs, may not fall upon the hatches.

SLINGING *a Man overboard*, in order to ftop a leak in a fhip, is done thus: the man is truffed up about the middle in a piece of canvas, and a rope to keep him from finking, with his arms at liberty, a mallet in one hand, and a plug, wrapped in oakum and well tarred in a tarpawling clout, in the other, which he is to beat with all difpatch into the hole or leak.

SLOANE (Sir HANS), baronet, an eminent phyfician and naturalift, was born at Killileagh in the north of Ireland, in 1660, of Scottifh extraction. The very firft bent of his genius difcovered itfelf towards the knowledge of nature, and this was

encouraged by a proper education. He choſe phyſic for his profeſſion; and, in order to attain a perfect knowledge of the ſeveral branches of it, repaired to London. Here he attended all the public lectures of anatomy, botany, and chemiſtry. Having ſpent four years in London, he went to Paris; and there attended the hoſpitals, heard the lectures of Tournefort the botaniſt, of Du Verney the anatomiſt, and other eminent maſters. Having obtained letters of recommendation from Tournefort, he went to Montpelier. He ſpent a whole year in collecting plants in this place, and travelled through Languedoc with the ſame view. In 1684, he returned to London, with an intent to ſettle, and follow his profeſſion. During which time he was choſen a fellow of the Royal-Society, and of the College of Phyſicians. But a proſpect of making new diſcoveries in natural productions induced him to take a voyage to Jamaica, in quality of phyſician to Chriſtopher, duke of Albemarle, then governor of that iſland. His whole ſtay at Jamaica was ſcarce 15 months; in which time he collected a variety of plants. He now applied himſelf cloſely to his profeſſion, and became ſo eminent, that he was choſen phyſician to Chriſt's-Hoſpital on the firſt vacancy. He was choſen ſecretary to the Royal Society in 1693, and immediately revived the publication of the "Philoſophical Tranſactions," which had been omitted for ſome time: he continued to be editor of them till 1712; and the volumes which were publiſhed in this period contain many pieces written by himſelf. He was created a baronet by George I. choſen a foreign member of the Royal Academy at Paris, preſident of the College of Phyſicians, and preſident of the Royal Society on the death of Sir Iſaac Newton. Having faithfully diſcharged the reſpective duties of the places he enjoyed, and anſwered the high opinion which the public had conceived of him, he retired, at the age of eighty, to Chelſea, to enjoy in a peaceful tranquillity the remains of a well-ſpent life. He died Jan. 11, 1752. He publiſhed the "Hiſtory of Jamaica," in 2 vols. folio; which elaborate work is in high eſtimation.

SLOANEA, in botany: A genus of plants belonging to the claſs of *polyandria*, and order of *monogynia;* and in the natural ſyſtem ranging under the 50th order, *Amentaceæ*. The corolla is pentapetalous; the calyx pentaphyllous and deciduous; the ſtigma is perforated; the berry is corticoſe, echinated, polyſpermous, and gaping. There are two ſpecies, the *dentata* and *emarginata*.

SLOE. See Prunus.

SLOOP, a ſmall veſſel furniſhed with one maſt, the mainſail of which is attached to a gaff above, or to the maſt on its foremoſt edge, and to a long boom below, by which it is occaſionally ſhifted to either quarter. See Ship.

Sloop *of War*, a name given to the ſmalleſt veſſels of war except cutters. They are either rigged as ſhips or ſnows.

SLOT, in the ſportſman's language, a term uſed to expreſs the mark of the foot of a ſtag or other animal proper for the chace in the clay or earth, by which they are able to gueſs when the animal paſſed, and which way he went. The ſlot, or treading of the ſtag, is very nicely ſtudied on this occaſion; if the ſlot be large, deep printed in the ground, and with an open cleft, and, added to theſe marks, there is a large ſpace between mark and mark, it is certain that the ſtag is an old one. If there be obſerved the ſlots or treadings of two, the one long and the other round, and both of one ſize, the long ſlot is always that of the larger animal. There is alſo another way of knowing the old ones from the young ones by the treading; which is, that the hinder feet of the old ones never reach to their fore feet, whereas thoſe of the young ones do.

SLOTH, in zoology. See Bradypus.

SLOUGH, a deep muddy place. The caſt ſkin of a ſnake, the damp of a coal pit, and the ſcar of a wound, are alſo called by the ſame appellation. The ſlough of a wild boar is the bed, ſoil, or mire, wherein he wallows, or in which he lies in the day-time.

SLUCZK, a large and populous town in Poland, in Lithuania, and capital of a duchy of the ſame name; famous for three battles gained here by Conſtantine duke of Oſtrog over the Tartars, in the reign of Sigiſmund I. It is ſeated on the river Sluczk, 72 miles ſouth-eaſt of Minſki, and 70 ſouth of Novogrodeck. E. lon. 27. 44. N. lat. 53. 2.

SLUG, in zoology. See Limax.

SLUICE, a frame of timber, ſtone, or other matter, ſerving to retain and raiſe the water of a river, &c. and on occaſion to let it paſs. Such is the ſluice of a mill, which ſtops and collects the water of a rivulet, &c. to let it fall at length in the greater plenty upon the mill-wheel: ſuch alſo are thoſe uſed as vents or drains to diſcharge water off land. And ſuch are the ſluices of Flanders, &c. which ſerve to prevent the waters of the ſea from overflowing the lower lands. Sometimes there is a kind of canal incloſed between two gates or ſluices, in artificial navigations, to ſave the water, and render the paſſage of boats equally eaſy and ſafe, upwards and downwards; as in the ſluices of Briare in France, which are a kind of maſſive walls built parallel to each other, at the diſtance of 20 or 24 feet, cloſed with ſtrong gates at each end, between which is a kind of canal or chamber, conſiderably longer than broad; wherein a veſſel being incloſed, the water is let out at the firſt gate, by which the veſſel is raiſed 15 or 16 feet, and paſſed out of this canal into another much higher. By ſuch means a boat is conveyed out of the Loire into the Seine, though the ground between them riſe above 150 feet higher than either of thoſe rivers. Sluices are made different ways, according to the uſe for which they are intended: when they ſerve for navigation, they are ſhut with two gates, preſenting an angle towards the ſtream; when they are made near the ſea, two pair of gates are made, the one to keep the water out and the other in, as occaſion requires: in this caſe, the gates towards the ſea preſent an angle that way, and the others the contrary way; and the ſpace incloſed by thoſe gates is called the *chamber*. When ſluices are made in the ditches of a fortreſs, to keep up the water in ſome parts, inſtead of gates, ſhutters are made ſo as to ſlide up and down in grooves; and when they are made to raiſe an inundation, they are then ſhut by means of ſquare timbers let down in culliſes, ſo as to lie cloſe and firm. The word *ſluice* is formed of the French *eſcluſe*, which Menage derives from the Latin *Excluſa*, found in the Salic law in the ſame ſenſe. But this is to be reſtrained to the ſluices of mills, &c. for as to thoſe ſerving to raiſe veſſels, they were wholly unknown to the antients.

SLUR, in muſic, a mark like the arch of a circle, drawn from one note to another, comprehending two or more notes in the ſame or different degrees. If the notes are in different degrees, it ſignifies that they are all to be ſung to one ſyllable; for wind inſtruments, that they are to be made in one continued breath; and for ſtringed inſtruments that are ſtruck with a bow, as a violin, &c. that they are made with one ſtroke. If the notes are in the ſame degree, it ſignifies that it is all one note, to be made as long as the whole notes ſo connected; and this happens moſt frequently betwixt the laſt note of one line and the firſt of the next; which is particularly called *ſyncopation*.

SLUYS, a town of Dutch Flanders, oppoſite the iſland of Cadſand, with a good harbour 10 miles north of Bruges. E. lon. 3. 25. N. lat. 51. 19.

SMACK, a ſmall veſſel, commonly rigged as a ſloop or hoy, uſed in the coaſting or fiſhing trade, or as a tender in the king's ſervice.

SMALAND, or East Gothland, a province of Sweden, which makes part of Gothland; and is bounded on the north by Oſtrogothia or Eaſt Gothland, on the eaſt by the Baltic Sea,

on the ſouth by Schonen and Bleckingia, and on the Weſt by Weſtrogothia or Weſt Gothland. It is about 112 miles in length, and 62 in breadth. Calmar is the capital town.

SMALKALD, a town of Germany in Franconia, and in the county of Henneberg: famous for the confederacy entered into by the German Proteſtants againſt the emperor, commonly called the *league of Smalkald*. The deſign of it was to defend their religion and liberties. It is ſeated on the river Werra, 25 miles ſouth-weſt of Erford, and 50 north-weſt of Bamberg. E. lon. 10. 53. N. lat. 50. 49. It is ſubject to the prince of Heſſe-Caſſel.

SMALLAGE, in botany. See Apium.

SMALT, a kind of glaſs of a dark blue colour, which when levigated appears of a moſt beautiful colour; and if it could be made ſufficiently fine, would be an excellent ſuccedaneum for ultramarine, as not only reſiſting all kinds of weather, but even the moſt violent fires. It is prepared by melting one part of calcined cobalt with two of flint powder, and one of potaſh. At the bottoms of the crucibles in which the ſmalt is manufactured we generally find a regulus of a whitiſh colour inclining to red, and extremely brittle. This is melted afreſh, and when cold ſeparates into two parts; that at the bottom is the cobaltic regulus, which is employed to make more of the ſmalt; the other is biſmuth.

SMARAGDUS, in natural hiſtory. See Emerald.

SMEATON (John), Eſq. F. R. S. was a moſt celebrated civil engineer, unequalled by any of the age he lived in. His building of the Eddyſtone light-houſe, were there no other monument of his fame, would eſtabliſh his character for ever. Of this undertaking Mr. Smeaton publiſhed an account, in which he apologizes for his defects as a writer, and acknowledges that he found much more difficulty in writing than he did in building; for that, although the making of the original draughts, and completing the building, was the work of only three years and a half, writing the deſcription of it was not concluded in leſs than ſeven years: from which he acknowledges that he is almoſt tempted to ſubſcribe to the ſentiment, that "Nature's chief maſter-piece is writing well." In the early part of Mr. Smeaton's life he was appointed one of the receivers for the Derwentwater eſtate for Greenwich-hoſpital; and in that, as well as every other undertaking in which he was engaged, diſtinguiſhed himſelf by his modeſty, punctuality, and undeviating integrity. He was born on the 28th of May 1724 O. S. and died at his native place Auſthorpe in Yorkſhire, Oct. 28, 1792.

SMELL, odour, with regard to the organ, is an impreſſion made on the noſe by little particles continually exhaling from odorous bodies. With regard to the object, it is the figure and diſpoſition of odorous effluvia, which, ſticking on the organ, excite the ſenſe of ſmelling. And with regard to the ſoul, it is the perception of the impreſſion of the object on the organ, or the affection in the ſoul reſulting therefrom.

SMELLING, the act whereby we perceive ſmells, or whereby we become ſenſible of odorous bodies, by means of certain effluvia thereof; which, ſtriking on the olfactory organ briſkly enough to have their impulſe propagated to the brain, excite a ſenſation in the ſoul. The principal organs of ſmelling are the noſtrils and the olfactory nerves; the minute ramifications of which latter are diſtributed throughout the whole concave of the former.

Smelling is performed by drawing into the noſtrils the odorous effluvia floating in the air in inſpiration, which ſtrike againſt the fibrillæ of the olfactory nerves. The matter which chiefly affects the ſenſe of ſmelling, Boerhaave obſerves, is that ſubtile ſubſtance inherent in the oily parts of ſubſtances; ſince, when this is taken away from the moſt fragrant bodies, what remains has ſcarce any ſmell at all. Willis obſerves, that brutes have generally the ſenſe of ſmelling in much greater perfection than man: by this alone they diſtinguiſh the qualities of bodies, which could not otherwiſe be known; hunt out their food at a great diſtance, as hounds and birds of prey; or hid among other ſubſtances, as ducks, &c. Man, having other means of judging of his food, &c. did not need ſo much ſagacity in his noſe; yet have we inſtances of a great deal even in man. In the *Hiſtoire des Antilles*, we are aſſured there are negroes who, by the ſmell alone, can diſtinguiſh between the footſteps of a Frenchman and a negro. The ſenſe of ſmelling may be diminiſhed or deſtroyed by diſeaſes; as by the moiſture, dryneſs, inflammation, or ſuppuration of the olfactory membrane, the compreſſion of the nerves which ſupply it, or ſome fault in the brain itſelf at their origin. If there be reaſon to ſuſpect that the nerves which ſupply the organs of ſmelling are inert, or want ſtimulating, volatile ſalts, or ſtrong ſnuffs, and other things which occaſion ſneezing, may be applied to the noſe; the forehead may likewiſe be anointed with balſam of Peru, to which may be added a little oil of amber.

SMELT, in ichthyology. See Salmo.

SMELTING, in metallurgy, the fuſion or melting of the ores of metals, in order to ſeparate the metalline part from the earthy, ſtony, and other parts. See Metallurgy, Part III.

SMEW, in ornithology. See Mergus.

SMILAX, rough bindweed, in botany: A genus of plants belonging to the claſs of *diœcia* and order of *hexandria*; and in the natural ſyſtem ranging under the 11th order, *Sarmentaceæ*. The male calyx is hexaphyllous, and there is no corolla; the female calyx is alſo hexaphyllous, without any corolla: there are three ſtyles, a trilocular berry, and two ſeeds. There are 18 ſpecies; the aſpera, excelſa, zeilanica, ſarſaparilla, china, rotundifolia, laurifolia, tamnoides, caduca, bona nox, herbacea, tetragona, lanceolata, and pſeudo-china. Of theſe, the ſmilax ſarſaparilla, which affords the ſarſaparilla root, is the moſt valuable. This is well deſcribed in the London Medical Journal by Dr. Wright, who, during a long reſidence in Jamaica, made botany his peculiar ſtudy.

"This ſpecies (ſays he) has ſtems of the thickneſs of a man's finger: they are jointed, triangular, and beſet with crooked ſpines. The leaves are alternate, ſmooth and ſhining on the upper ſide; on the other ſide are three nerves or coſtæ, with ſundry ſmall crooked ſpines. The flower is yellow, mixed with red. The fruit is a black berry, containing ſeveral brown ſeeds.

"Sarſaparilla delights in low moiſt grounds and near the banks of rivers. The roots run ſuperficially under the ſurface of the ground. The gatherers have only to looſen the ſoil a little, and to draw out the long fibres with a wooden hook. In this manner they proceed till the whole root is got out. It is then cleared of the mud, dried, and made into bundles.

"The ſenſible qualities of ſarſaparilla are mucilaginous and farinaceous, with a ſlight degree of acrimony. The latter, however, is ſo ſlight as not to be perceived by many; and I am apt to believe that its medicinal powers may fairly be aſcribed to its demulcent and farinaceous qualities."

The china, or oriental ſpecies of china root, has roundiſh prickly ſtalks and red berries, and is a native of China and Japan. The pſeudo-china, or occidental ſpecies, has rounder ſmooth ſtalks and black berries, grows wild in Jamaica and Virginia, and bears the colds of our own climate. At preſent the china root is very rarely made uſe of, having for ſome time given place to ſarſaparilla, which is ſuppoſed to be more effectual. Proſper Alpinus informs us, that this root is in great eſteem among the Egyptian women for procuring fatneſs and plumpneſs.

SMITH (Sir Thomas), was born at Walden in Eſſex in 1512. At fourteen he was ſent to Queen's college, Cambridge, where he diſtinguiſhed himſelf ſo much, that he was made Henry VIII.'s ſcholar together with John Cheke. He was

chosen a fellow of his college in 1531, and appointed two years after to read the public Greek lecture. The common mode of reading Greek at that time was very faulty; the same sound being given to the letters and diphthongs ι, η, υ, ει, οι, υι. Mr. Smith and Mr. Cheke had been for some time sensible that this pronunciation was wrong: and after a good deal of consultation and research, they agreed to introduce that mode of reading which prevails at present. Mr. Smith was lecturing on Aristotle *de Republica* in Greek. At first he dropped a word or two at intervals in the new pronunciation, and sometimes he would stop as if he had committed a mistake, and correct himself. No notice was taken of this for two or three days; but as he repeated it more frequently, his audience began to wonder at the unusual sounds, and at last some of his friends mentioned to him what they had remarked. He owned that something was in agitation, but that it was not yet sufficiently digested to be made public. They entreated him earnestly to discover his project: he did so; and in a short time great numbers resorted to him for information. The new pronunciation was adopted with enthusiasm, and soon became universal at Cambridge. It was afterwards opposed by bishop Gardiner the chancellor; but its superiority to the old mode was so visible, that in a few years it spread over all England.

In 1539 he travelled into foreign countries, and studied for some time in the universities of France and Italy. On his return he was made regius professor of civil law at Cambridge. About this time he published a treatise on the mode of pronouncing English. He was useful likewise in promoting the Reformation. Having gone into the family of the duke of Somerset, the protector during the minority of Edward VI. he was employed by that nobleman in public affairs; and in 1548 was made secretary of state, and received the honour of knighthood. While that nobleman continued in office, he was sent ambassador, first to Brussels and afterwards to France.

Upon Mary's accession he lost all his places, but was fortunate enough to preserve the friendship of Gardiner and Bonner. He was exempted from persecution, and was allowed, probably by their influence, a pension of 100l. During Elizabeth's reign he was employed in public affairs, and was sent three times by that princess as her ambassador to France. He died in 1577. His abilities were excellent, and his attainments uncommonly great. He was a philosopher, a physician, a chemist, mathematician, linguist, historian, and architect. He wrote, 1. A treatise called the *English commonwealth*. 2. A letter *De Recta et Emendata Linguæ Græcæ Pronunciati ne*. 3. *De Moribus Turcarum*. 4. *De Druidum Moribus*.

Smith (Edmund), a distinguished English poet, the only son of Mr. Neale an eminent merchant, by a daughter of baron Lechmere, was born in 1668. By his father's death he was left young to the care of Mr. Smith, who had married his father's sister, and who treated him with so much tenderness, that at the death of his generous guardian he assumed his name. His writings are not many, and those are scattered about in miscellanies and collections: his celebrated tragedy of Phædra and Hippolytus was acted in 1707; and being introduced at a time when the Italian opera so much engrossed the polite world, gave Mr. Addison, who wrote the prologue, an opportunity to rally the vitiated taste of the public. However, notwithstanding the esteem it has always been held in, it is perhaps rather to be considered as a fine poem than as a good play. This tragedy, with a Poem to the memory of Mr. John Philips, three or four odes, with a Latin oration spoken at Oxford *in laudem Thomæ Bodleii*, were published as his works by his friend Mr. Oldisworth. Mr. Smith died in 1710, sunk into indolence and intemperance by poverty and disappointments; the hard fate of many a man of genius.

Smith (John), an excellent mezzotinter, flourished about 1700; but neither the time of his birth nor death is accurately known. He united softness with strength, and finished with freedom. He served his time with one Tillet a painter in Moorfields; and as soon as he became his own master, learned from Becket the secret of mezzotinto, and, being further instructed by Van der Vaart, was taken to work in sir Godfrey Kneller's house; and, as he was to be the publisher of that master's works, doubtless received considerable hints from him, which he amply repaid. "To posterity perhaps his prints (says Mr. Walpole) will carry an idea of something burlesque; perukes of an enormous length flowing over suits of armour, compose wonderful habits. It is equally strange that fashion could introduce the one, and establish the practice of representing the other when it was out of fashion. Smith excelled in exhibiting both, as he found them in the portraits of Kneller, who was less happy in what he substituted to armour. In the Kit-cat club he has poured full bottoms chiefly over night-gowns. If those streams of hair were *incommode* in a battle, I know nothing (he adds) they were adapted to that can be done in a night-gown. Smith composed two large volumes, with proofs of his own plates, for which he asked 50l. His finest works are duke Schomberg on horseback; that duke's son and successor Maynhard, the earls of Pembroke, Dorset, and Albemarle; three plates, with two figures in each, of young persons or children, in which he shone; William Cowper; Gibbons and his wife; queen Anne; the duke of Gloucester, a whole length, with a flower-pot; a very curious one of queen Mary, in a high head, fan, and gloves; the earl of Godolphin; the duchess of Ormond, a whole length, with a black; sir George Rooke, &c. There is a print by him of James II. with an anchor, but no inscription; which not being finished when the king went away, is so scarce that it is sometimes sold for above a guinea. Smith also performed many historic pieces; as the loves of the Gods, from Titian, at Blenheim, in ten plates; Venus standing in a shell, from a picture by Correggio, and many more, of which perhaps the most delicate is the holy family with angels, after Carlo Maratti."

SMITH (Adam), LL.D. and F. R. S. of London and Edinburgh, was born in the latter of these cities in the year 1723, and educated at the university of Glasgow. After having gone through the necessary classes, he was, at the age of twenty-two, sent an exhibitioner to Baliol college, Oxford, where it seems that either the prejudices too frequently entertained against his countrymen occasioned him to be treated with some illiberality; or, at least, that his national jealousy (of which he seems to possess no small portion) led him to suspect as much. The dissatisfaction he felt during his residence here increased his attachment to solitude, to which he undoubtedly owed much of the rusticity and awkwardness of his manners, and fortified that love of study which had ever been the ruling passion of his youth.

About the year 1750, he opened a class at Edinburgh for teaching rhetoric; where he soon acquired a degree of reputation that occasioned him to be invited back to Glasgow, and made professor, first of logic, and then of moral philosophy, in that university.

Dr. Smith's lectures, continually improving, and continually disseminating, by the fluctuation of pupils, acquired, in time, considerable celebrity; and the right hon. Charles Townshend, during his journey to Scotland, after marrying the countess dowager of Dalkeith, was attracted to Glasgow by the reputation of Dr. Smith, whom he soon after engaged, on very liberal terms, to undertake the office of travelling tutor to his lady's son, the young duke of Buccleugh. The doctor being now necessitated to resign his professorship, requested his students to attend on a particular day, and, ordering the censor to call over their names, returned the several sums which he had received

as fees; ſaying, that as he had not completely fulfilled his engagement, his claſs ſhould be taught that year gratis, and that the remainder of his lectures ſhould be read by one of his upper ſtudents. This did him the more honour, as he was extremely jealous of the property of his lectures; and uſed often to repeat, when he ſaw any one taking notes, that he hated ſcribblers.

Another circumſtance, ariſing from a ſimilar principle of generoſity, diſtinguiſhed the conduct of Dr. Smith, on his appointment to the office of one of the commiſſioners of the cuſtoms in Scotland; when, attributing his promotion to the interference of the duke of Buccleugh, he offered to reſign the annuity of 300l. which had been granted him for directing his grace's education. This offer, however, his patron has generouſly refuſed.

Dr. Smith had travelled with this nobleman two years; and it was ſhortly after his return that he publiſhed his work "On the Nature and Cauſes of the Wealth of Nations" a performance which, though not particularly popular at firſt, attained ſuch celebrity in time, as to be repeatedly quoted in the Britiſh houſe of commons and national aſſembly of France, and to be appealed to as an authoritative ſtandard of political axiom and political obſervation. He died July 18, 1790.

SMITHIA, in botany: A genus of the *decandria* order, belonging to the *diadelphia* claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The calyx is monophyllous and bilabiated; the corolla winged; the legumen incloſed in the calyx, with three or four joints, and containing as many ſeeds, which are ſmooth, compreſſed, and kidney-ſhaped. There is only one ſpecies, viz. the *ſenſitiva*.

SMITZ (Gaspar), who, from painting a great number of Magdalens, was called *Magdalen Smith*, was a Dutch painter, who came to England ſoon after the Reſtoration. For theſe portraits ſat a woman that he kept, and called his wife. A lady, whom he had taught to draw, took him with her to Ireland, where he painted ſmall portraits in oil, had great buſineſs, and high prices. His flowers and fruit were ſo much admired, that one bunch of grapes ſold there for 40l. In his Magdalens he generally introduced a thiſtle on the fore ground. He had ſeveral ſcholars, particularly Maubert, and one Gawdy of Exeter. Yet, notwithſtanding his ſucceſs, he died poor in Ireland in 1707.

SMITHERY, a ſmith's ſhop; alſo the art of a ſmith, by which iron is wrought into any ſhape by means of fire, hammering, filing, &c.

Smiting-line, in a ſhip, is a ſmall rope faſtened to the mizen-yard-arm, below at the deck, and is always furled up with the mizen-ſail, even to the upper end of the yard, and thence it comes down to the poop. Its uſe is to looſe the mizen-ſail without ſtriking down the yard, which is eaſily done, becauſe the mizen-ſail is furled up only with rope yarns; and therefore when this rope is pulled hard, it breaks all the rope yarns, and ſo the ſail falls down of itſelf. The ſailor's phraſe is, *ſmite the mizen* (whence this rope takes its name), that is, hale by this rope that the ſail may fall down.

SMOKE, a denſe elaſtic vapour, ariſing from burning bodies. As this vapour is extremely diſagreeable to the ſenſes, and often prejudicial to the health, mankind have fallen upon ſeveral contrivances to enjoy the benefit of fire without being annoyed by ſmoke. The moſt univerſal of theſe contrivances is a tube leading from the chamber in which the fire is kindled to the top of the building, through which the ſmoke aſcends, and is diſperſed into the atmoſphere. Theſe tubes are called *chimneys*; which, when conſtructed in a proper manner, carry off the ſmoke entirely; but, when improperly conſtructed, they carry off the ſmoke imperfectly, to the great annoyance of the inhabitants.

Although we would naturally imagine, that the cauſes which occaſion ſmoke in rooms are exceedingly various, yet, upon examination, it will be found, that they may all be reduced to one of theſe three general heads, each of which will admit of ſeveral varieties. 1. To a fault in the form of the tube or chimney itſelf. 2. To ſome fault in the other parts of the building, and a wrong poſition of the chimney with reſpect to theſe. Or, 3. To an improper ſituation of the houſe with reſpect to external objects. It is of the utmoſt conſequence, in attempting a cure, accurately to diſtinguiſh from which of theſe defects the ſmoke proceeds, otherwiſe the means uſed will be very uncertain. The celebrated Dr. Franklin's treatiſe on ſmoky chimneys is well known; but able as his writings on the ſubject have been, they are now in a great meaſure ſuperſeded by the late improvements in conſtructing fire places ſuggeſted by count Rumford. See the article Fire-place.

Chimneys whoſe funnels go up in the north wall of a houſe, and are expoſed to the north winds, are not ſo apt to draw well as thoſe in a ſouth wall; becauſe, when rendered cold by thoſe winds, they draw downwards. Chimneys incloſed in the body of a houſe are better than thoſe whoſe funnels are expoſed in cold walls. Chimneys in ſtacks are apt to draw better than ſeparate funnels, becauſe the funnels that have conſtant fires in them warm the others in ſome degree that have none.

Smoke-*Jack*. This ingenious machine is of German extraction; and Meſſinger, in his *Collection of Mechanical Performances*, ſays it is very antient, being repreſented in a painting at Nurenberg, which is known to be older than the year 1350. Its conſtruction is ſimple. An upright iron ſpindle placed in the narrow part of the kitchen chimney, turns round on two pivots. The upper one paſſes through an iron bar, which is built in acroſs the chimney; and the lower pivot is of tempered ſteel, and is conical or pointed, reſting in a conical bell-metal ſocket fixed on another croſs bar. On the upper end of the ſpindle is a circular fly, conſiſting of 4, 6, 8, or more thin iron plates, ſet obliquely on the ſpindle like the ſails of a windmill. Near the lower end of the ſpindle is a pinion, which works in the teeth of a contrate or face wheel, turning on a horizontal axis. One pivot of this axis turns in a cock fixed on the croſs bar, which ſupports the lower end of the upright ſpindle, and the other pivot turns in a cock fixed on the ſide wall of the chimney; ſo that this axle is parallel to the front of the chimney. On the remote end of this horizontal axle there is a ſmall pulley, having a deep angular groove. Over this pulley there paſſes a chain, in the lower bight of which hangs the large pulley of the ſpit. This end of the ſpit turns looſely between the branches of the fork of the rack or raxe, but without reſting on it. This is on the top of a moveable ſtand, which can be ſhifted nearer to or further from the fire. The other end turns in one of the notches of another rack. The number of teeth in the pinion and wheel, and the diameters of the pulleys, are ſo proportioned that the fly makes from 12 to 20 turns for one turn of the ſpit.

The manner of operation of this uſeful machine is too well underſtood to need a particular deſcription. See the article *Smoke*-Jack.

Smoke-*Farthings*. The pentecoſtals or cuſtomary oblations offered by the diſperſed inhabitants within a dioceſe when they made their proceſſion to the mother or cathedral church, came by degrees into a ſtanding annual rent called *ſmoke-farthings*.

Smoke-*Silver*. Lands were holden in ſome places by the payment of the ſum of 6d. yearly to the ſheriff, called *ſmoke-ſilver* (Par. 4 Ed. VI.) Smoke-ſilver and ſmoke-penny are to be paid to the miniſters of divers pariſhes as a *modus* in lieu of tithe-wood: and in ſome manors formerly belonging to religious houſes, there is ſtill paid, as appendant to the ſaid manors, the antient Peter-pence, by the name of *ſmoke-money* (*Twiſd. Hiſt. Vindicat.* 77.) —The biſhop of London, *anno* 1444, iſſued out his commiſſion, *Ad levandum le* ſmoke-farthings, &c.

SMOLENSKO, a large and ftrong city of Ruffia, and capital of a palatinate of the fame name, with a caftle feated on a mountain, and a bifhop's fee. It is ftrong by its fituation, being in the middle of a wood, and furrounded by almoft inacceffible mountains. It has been taken and retaken feveral times by the Poles and Ruffians; but thefe laft have had poffeffion of it ever fince the year 1687. It is feated on the river Nieper, near the frontiers of Lithuania, 188 miles fouth-weft of Mofcow. E. lon. 31. 22. N. lat. 54. 50.

SMOLENSKO, a duchy and palatinate of Ruffia, bounded on the north by Biela, on the eaft by the duchy of Mofcow, on the fouth by that of Severia and the palatinate of Meiflaw, and on the weft by the fame palatinate and by that of Witepfk. It is full of forefts and mountains, and the capital is of the fame name.

SMOLLET (Dr. TOBIAS), a phyfician, but memorable only as an author, was born near Cameron, on the banks of the river Leven, in Scotland, in 1720. He appears to have received a claffical education, and was bred to phyfic and furgery. He was at the fiege of Carthagena as furgeon, or furgeon's mate; and, in his novel of "Roderick Random," has given an account of this expedition. In 1756, he is fuppofed to have been the editor of "A Compendium of Authentic Voyages, digefted in a Chronological Series," 7 vols. 12mo; among which is inferted a fhort narrative of the expedition to Carthagena, in 1741; which, however, like moft of his productions, is written with too much acrimony.

His connection with the fea feems not to have lafted long, and he probably wrote feveral things before he became known by his capital productions. In 1746 and 1747, he publifhed "A Satire, in two parts," which is re-printed among his "Plays and Poems." At eighteen, he had written a tragedy called "The Regicide," founded on the ftory of the affaffination of James I. of Scotland: this he publifhed by fubfcription in 1749, with a preface; in which he bitterly inveighs againft falfe patrons, and the duplicity of theatrical managers. In 1757, his comedy of "The Reprifals," an after-piece of two acts, was performed at Drury-lane theatre; which, with his tragedy, is printed in the above collection. He had before prepared for Mr. Rich an opera, entitled, "Alcefte," which was never performed or printed. In 1748, he publifhed in two vols. 12mo. his novel of "Roderick Random," by which he acquired fo much reputation, as almoft to infure fuccefs to every future production. In 1751, "Peregrine Pickle" appeared in 4 vols. 12mo; a work of much ingenuity and contrivance. In 1754, were publifhed "Ferdinand Count Fathom;" in 1762, "Sir Launcelot Greaves," in 2 vols. 12mo; and in 1771, "Humphrey Clinker," in 3 vols. 12mo; all of them works of great merit, but inferior to the former.

Before he took a houfe at Chelfea, he attempted to fettle as practitioner of phyfic at Bath, and with that view publifhed, in 1752, a Treatife upon the Waters there; but, not fucceeding, he abandoned phyfic altogether as a profeffion, and turned his thoughts to writing, as to what he muft depend on for fupport. He tranflated "Gil Blas" and "Don Quixote;" the latter was publifhed in 1755, in 2 vols. 4to: and, fince his death, a tranflation of "Telemachus" has alfo appeared. His name likewife appears to a tranflation of Voltaire's profe works, in which, however, he is fuppofed to have had little concern. In 1757, he publifhed an "Hiftory of England," in 4 vols. 4to; and was employed, during the laft years of his life, in preparing a new edition of "The Antient and Modern Univerfal Hiftory." He had originally written fome part of this himfelf, particularly the hiftories of France, Italy, and Germany. In 1755, he had fet on foot the "Critical Review," and continued the principal manager of it till he went abroad for the firft time in 1763. This publication involved him in fome controverfies.

In 1762, when lord Bute was fuppofed to have the reins of government in his hands, writers were fought to be aiding and affifting to him; and among others Dr. Smollet was pitched upon, who, on the 29th of May in that year, publifhed the firft number of "The Briton." This was immediately followed by the publication of "The North-Briton," which at length diffolved a friendfhip that had long fubfifted between the authors of thefe performances. "The Briton" continued to be publifhed until Feb. 12, 1763 when it was laid down: yet Dr. Smollet is fuppofed to have written other pieces in fupport of the fame caufe; and the "Adventures of an Atom," in two fmall volumes, is known to be his production.

In 1766 he publifhed an account of his travels, in 2 vols. 8vo: having left England on account of his health and other difagreeable things, he went again to Italy, where he died Oct. 21, 1771. A monument hath been erected to his memory near Leghorn, with an epitaph written by his friend Dr. Armftrong.

SMUGGLERS, perfons who import or export prohibited goods without paying the duties appointed by the law. The duties of cuftoms, it is faid, were originally inftituted, in order to enable the king to afford protection to trade againft pirates: they have fince been continued as a branch of the public revenue. As duties impofed upon the importation of goods neceffarily raife their price above what they might otherwife have been fold for, a temptation is prefented to import the commodity clandeftinely and to evade the duty. Many perfons, prompted by the hopes of gain, and confidering the violation of a pofitive law of this nature as in no refpect criminal (an idea in which they have been encouraged by a great part of the community, who make no fcruple to purchafe fmuggled goods), have engaged in this illicit trade. It was impoffible that government could permit this practice, which is highly injurious to the fair trader, as the fmuggler is enabled to underfell him, while at the fame time he impairs the national revenue, and thus wholly deftroys the end for which thefe duties were appointed. Such penalties are therefore inflicted as it was thought would prevent fmuggling.

Many laws have been made with this view. If any goods be fhipped or landed without warrant and prefence of an officer, the veffel fhall be forfeited, and the wharfinger fhall forfeit 100l. and the mafter or mariner of any fhip inward bound fhall forfeit the value of the goods: and any carman, porter, or other affifting, fhall be committed to gaol, till he find furety of the good behaviour, or until he fhall be difcharged by the court of Exchequer (13 & 14 C. II. c. 11). If goods be relanded after drawback, the veffel and goods fhall be forfeited; and every perfon concerned therein fhall forfeit double the value of the drawback (8 An. c. 13). Goods taken in at fea fhall be forfeited, and alfo the veffel into which they are taken; and every perfon concerned therein fhall forfeit treble value (9 G. II. c. 35). A veffel hovering near the coaft fhall be forfeited, if under 50 tons burden; and the goods fhall alfo be forfeited, or the value thereof (5 G. III. c. 43). Perfons receiving or buying run goods fhall forfeit 20l. (8 G. c. 18). A concealer of run goods fhall forfeit treble value (8 G. c. 18). Offering run goods to fale, the fame fhall be forfeited, and the perfon to whom they are offered may feize them; and the perfon offering them to fale fhall forfeit treble value (11 G. c. 30). A porter or other perfon carrying run goods fhall forfeit treble value (9 G. II. c. 35). Perfons armed or difguifed carrying run goods fhall be guilty of felony, and tranfported for feven years (8 G. c. 18. 9 G. II. c. 35).

But the laft ftatute, 19 G. II. c. 34. is for this purpofe *inftar omnium*; for it makes all forcible acts of fmuggling, carried on in defiance of the laws, or even in difguife to evade them, felony without benefit of clergy: enacting, that if three or more perfons fhall affemble, with fire-arms or other offenfive weapons, to affift in the illegal exportation or importation of goods, or in refcuing the fame after feizure, or in refcuing offenders in cuftody for fuch offences; or fhall pafs with fuch goods in difguife; or

ſhall wound, ſhoot at, or aſſault, any officers of the revenue when in the execution of their duty; ſuch perſons ſhall be felons, without the benefit of clergy.

When we conſider the nature, and ſtill more the hiſtory, of mankind, we muſt allow that the enacting of ſevere penal laws is not the way to prevent crimes. It were indeed much to be wiſhed that there were no ſuch thing as a political crime; for the generality of men, but eſpecially the lower orders, not diſcerning the propriety or utility of ſuch laws, conſider them as oppreſſive and tyrannical, and never heſitate to violate them when they can do it with impunity. Inſtead therefore of puniſhing ſmugglers, it would be much better to remove the temptation. But the high duties which have been impoſed upon the importation of many different ſorts of foreign goods, in order to diſcourage their conſumption in Great Britain, have in many caſes ſerved only to encourage ſmuggling; and in all caſes have reduced the revenue of the cuſtoms below what more moderate duties would have afforded. The ſaying of Dr. Swift, that in the arithmetic of the cuſtoms two and two, inſtead of making four, make ſometimes only one, holds perfectly true with regard to ſuch heavy duties, which never could have been impoſed, had not the mercantile ſyſtem taught us, in many caſes, to employ taxation as an inſtrument, not of revenue, but of monopoly.

The bounties which are ſometimes given upon the exportation of home produce and manufactures, and the drawbacks which are paid upon the re-exportation of the greater part of foreign goods, have given occaſion to many frauds, and to a ſpecies of ſmuggling more deſtructive of the public revenue than any other. In order to obtain the bounty or drawback, the goods, it is well known, are ſometimes ſhipped and ſent to ſea, but ſoon afterwards clandeſtinely relanded in ſome other part of the country.

Heavy duties being impoſed upon almoſt all goods imported, our merchant importers ſmuggle as much, and make entry of as little as they can. Our merchant exporters, on the contrary, make entry of more than they export; ſometimes out of vanity, and to paſs for great dealers in goods which pay no duty; and ſometimes to gain a bounty or a drawback. Our exports, in conſequence of theſe different frauds, appear upon the cuſtomhouſe books greatly to overbalance our imports: to the unſpeakable comfort of thoſe politicians who meaſure the national proſperity by what they call the balance of trade.

SMUT, in huſbandry, a diſeaſe in corn, when the grains, inſtead of being filled with flour, are full of a ſtinking black powder. See WHEAT.

SMYRNA, a ſeaport of Turkey in Aſia, in Natolia, and one of the largeſt and richeſt cities of the Levant. The goodneſs of the harbour has cauſed it to be rebuilt ſeveral times, after having been deſtroyed by earthquakes. It is the rendezvous of merchants from almoſt all parts of the world, and the magazine of their merchandiſe. The Turks have 19 moſques, the Greeks two churches, the Jews eight ſynagogues, the Armenians one church, and the Latins three convents. There are three biſhops, one Greek, the other Latin, and the third Armenian. The ſtreets are more open, better paved, and the houſes better built, than in other towns of the continent. The ſtreet of the Franks is the fineſt in Smyrna, and lies all along the harbour. It is eight days journey from Conſtantinople by land, 25 days from Aleppo, by the caravans, ſix from Cogni, ſeven from Cataya, and ſix from Satalia. The caravans of Perſia often bring 200 bales of ſilk in a year, beſide drugs and cloths. The other commodities brought here, are thread made of goats hair, cotton yarn, cotton in bags, various kinds of drugs, and all ſorts of carpets. The Engliſh and Dutch factors have proteſtant chapels, and taverns are as open here as in Europe. The fortifications conſiſt of a fort, a caſtle, a mountain, and an old citadel. It is ſeated at the bottom of a large bay, 183 miles W. by S. of Conſtantinople. E. lon. 27. 19. N. lat. 38. 28.

SMYRNIUM, ALEXANDERS: a genus of plants belonging to the claſs of *pentandria*, and to the order of *digynia*; and in the natural ſyſtem ranging under the 45th order, *Umbellatæ*. The fruit is oblong and ſtriated, the petals have a ſharp point, and are keel-ſhaped. There are five ſpecies: 1. The *perfoliatum*, or perfoliate alexanders, which is a native of Candia and Italy. 2. The *Ægyptiacum*; 3. The *aureum*, or golden alexanders, which is a native of North America; 4. The *integerrimum*; 5. The *olufatrum*, common alexanders, a native of Britain; the leaves of which are cauline, ternate, petiolated, and ſerrated. It grows on the ſea-coaſt at Dunglaſs on the borders of Berwick-ſhire, North Britain. Since the introduction of celery into the garden, the alexanders is almoſt forgotten. It was formerly cultivated for ſalading, and the young ſhoots or ſtalks blanched were eaten either raw or ſtewed. The leaves too were boiled in broths and ſoups. It is a warm comfortable plant to a cold weak ſtomach, and was in much eſteem among the monks, as may be inferred by its ſtill being found in great plenty by old abbey walls.

SNAFFLE, in the manege, is a very ſlender bit-mouth without any branches, much uſed in England; the true bridles being reſerved for war.

SNAIL, in zoology. See HELIX and LIMAX.

SNAKE, in zoology. See ANGUIS and SERPENS.

Method of Preſerving SNAKES. When the ſnake is killed, it muſt firſt be waſhed clean, and freed from all filth and naſtineſs; then it is to be put into a glaſs of a proper ſize, the tail firſt, and afterwards the reſt of the body, winding it in ſpiral aſcending circles, and diſpoſing the back, which is always the moſt beautiful, outwardly. A thread, connected with a ſmall glaſs bead, is, by the help of a needle, to be paſſed through the upper jaw from within outwardly, and then through the cork of the bottle, where it muſt be faſtened; by this means the head will be drawn into a natural poſture, and the mouth kept open by the bead, whereby the teeth, &c. will be diſcovered: the glaſs is then to be filled with rum, and the cork ſealed down to prevent its exaltation. A label, containing the name and properties of the ſnake, is then to be affixed to the wax over the cork; and in this manner the ſnake will make a beautiful appearance, and may be preſerved a great number of years; nor will the ſpirits impair or change the luſtre of its colours.

SNAKE-*Stones*, *Ammonitæ*, in natural hiſtory, the name of a large genus of foſſil ſhells, very few of any of which are yet known in their recent ſtate, or living either on our own or any other ſhores; ſo that it ſeems wonderful whence ſo vaſt a number and variety of them ſhould be brought into our ſubterranean regions. They ſeem indeed diſperſed in great plenty throughout the world, but are no where found in greater numbers, beauty, and variety, than in our iſland.

Mr. Harenberg found prodigious numbers of them on the banks of a river in Germany. He traced this river through its ſeveral windings for many miles, and among a great variety of belemnitæ, cornua ammonis, and cochlitæ, of various kinds; he found alſo great quantities of wood, of recent petrifaction, which ſtill preſerved plain marks of the axe by which it had been cut from the trees then growing on the ſhore. The water of this river he found in dry ſeaſons, when its natural ſprings were not diluted with rains, to be conſiderably heavier than common water; and many experiments ſhowed him that it contained ferruginous as well as ſtony particles in great quantity; whence the petrifactions in it appeared the leſs wonderful, though many of them of recent date.

Of the cornua ammonis, or ſerpent-ſtones, he there obſerved more than 30 different ſpecies. They lie immerſed in a blueiſh foſſil ſtone, of a ſoft texture and fatty appearance, in prodigious numbers, and of a great variety of ſizes, from the larger known

ſorts down to ſuch as could not be ſeen without very accurate inſpection or the aſſiſtance of a microſcope. Such as lie in the ſofteſt of theſe ſtones are ſoft like their matrix, and eaſily crumble to pieces; others are harder. In a piece of this ſtone, of the bigneſs of a finger, it is common to find 30 or more of theſe foſſils; and often they are ſeen only in form of white ſpecks, ſo minute that their figure cannot be diſtinguiſhed till examined by the microſcope.

They all conſiſt of ſeveral volutæ, which are different in number in the different ſpecies, and their ſtriæ alſo are extremely various; ſome very deep with very high ridges between them, others very ſlight; ſome ſtraight, others crooked; others undulated, and ſome terminating in dots, tubercles, or cavities, towards the back, and others having tubercles in two or three places. They are all compoſed of a great number of chambers or cells, in the manner of the *nautilus Græcorum*, each having a communication with the others, by means of a pipe or ſiphunculus. There is a ſmall white ſhell fiſh of Barbadoes, which ſeems truly a recent animal of this genus; and in the Eaſt Indies there is another alſo, ſmall and grayiſh; but the large and beautifully marked ones are found only foſſil.

They are compoſed of various foſſil bodies, often of quarry ſtone, ſometimes of the matter of the common pyrites, and of a great variety of other ſubſtances; and though they appear uſually mere ſtones, yet in ſome the pearly part of the original ſhell is preſerved in all its beauty. Sometimes alſo, while the outer ſubſtance is of the matter of the pyrites, or other coarſe, ſtony, or mineral matter, the inner cavity is filled with a pure white ſpar of the common plated texture. This gives a great beauty to the ſpecimen. The cornua ammonis, or ſnake-ſtones, are found in many parts of England, particularly in Yorkſhire, where they are very plentiful in the alum rocks of ſeveral ſizes.

SNAKE-*Root*, in botany. See POLYGALA.

SNAKE-*Weed*, in botany. See POLYGONUM.

SNAPEDRAGON, in botany. See ANTIRRHINUM.

SNEEZING, a convulſive motion of the muſcles of the breaſt, whereby the air is expelled from the noſe with much vehemence and noiſe. It is cauſed by the irritation of the upper membrane of the noſe, occaſioned by acrid ſubſtances floating in the air, or by medicines called *ſternutatory*.

The irritation is performed either externally, by ſtrong ſmells, as marjoram, roſes, &c. or by duſt floating in the air, and taken in by inſpiration; or by ſharp pungent medicines, as creſſes and other ſternutatories, which vellicate the membrane of the noſe; or internally, by the acrimony of the lympha or mucus, which naturally moiſtens that membrane. The matters caſt forth in ſneezing come primarily from the noſe and throat; the pituitary membrane continually exuding a mucus thither; and, ſecondarily, from the breaſt, the trachea, and the bronchia of the lungs.

The practice of ſaluting the perſon who ſneezed exiſted in Africa, among nations unknown to the Greeks and Romans. The accounts we have of Monomotapa inform us, that when the prince ſneezes, all his ſubjects in the capital are advertiſed of it, that they may offer up prayers for his ſafety. The author of the Conqueſt of Peru aſſures us, that the cacique of Guachoia having ſneezed in preſence of the Spaniards, the Indians of his train fell proſtrate before him, ſtretched forth their hands, and diſplayed to him the accuſtomed marks of reſpect, while they invoked the ſun to enlighten him, to defend him, and to be his conſtant guard.

Every body knows that the Romans ſaluted each other on theſe occaſions: and Pliny relates, that Tiberius exacted theſe ſigns of homage when drawn in his chariot. Superſtition, whoſe influence can debaſe every thing, had degraded this cuſtom for ſeveral ages, by attaching favourable or unfavourable omens to ſneezing, according to the hour of the day or night, according to the ſigns of the zodiac, according as a work was more or leſs advanced, or according as one had ſneezed to the right or to the left. If a man ſneezed at riſing from table or from his bed, it was neceſſary for him to ſit or lie down again. You are ſtruck with aſtoniſhment, ſaid Timotheus to the Athenians, who wiſhed to return into the harbour with their fleet becauſe he had ſneezed; you are ſtruck with aſtoniſhment, becauſe among 10,000 there is one man whoſe brain is moiſt.

Polydore Virgil pretends, that in the time of Gregory the Great there reigned in Italy an epidemic diſtemper, which carried off by ſneezing all thoſe who were ſeized by it; and that this pontiff ordered prayers to be made againſt it, accompanied by certain ſigns of the croſs. But, beſides that there are very few caſes in which ſneezing can be conſidered as dangerous, and that it is frequently a favourable ſyſtem, it is evident that we ought not to date from the ſixth century the origin of a cuſtom which loſes itſelf in the obſcurity of antiquity. Avicenna and Cardan ſay, it is a ſort of convulſion, which gives occaſion to dread an epilepſy, and that this diſeaſe is endeavoured to be warded off by prayers. Clement of Alexandria conſiders it as a mark of intemperance and effeminacy, which ought to be proſcribed. And he inveighs bitterly againſt thoſe who endeavour to procure ſneezing by external aid. Montaigne, on the contrary, explains this fact in a tone rather cynical. It is ſingular enough, that ſo many ridiculous, contradictory, and ſuperſtitious opinions have not aboliſhed thoſe cuſtomary civilities which are ſtill preſerved equally among high and low; and which only the Anabaptiſts and Quakers have rejected, becauſe they have renounced ſalutations in every caſe.

SNIGGLING, a method of fiſhing for eels, chiefly uſed in the day-time, when they are found to hide themſelves near wears, mills, or flood-gates. It is performed thus: Take a ſtrong line and hook, baited with a garden-worm, and, obſerving the holes where the eels lie hid, thruſt your bait into them by the help of a ſtick; and if there be any, you ſhall be ſure to have a bite; and may, if your tackling hold, get the largeſt eels.

SNIPE, in ornithology. See SCOLOPAX and SHOOTING.

SNOW, a well known ſubſtance formed by the freezing of the vapours in the atmoſphere. It differs from hail and hoar-froſt, in being as it were cryſtallized, which they are not. The lightneſs of ſnow, although it is firm ice, is owing to the exceſs of its ſurface, in compariſon to the matter contained under it; as gold itſelf may be extended in ſurface till it will ride upon the leaſt breath of air.

According to Beccaria, clouds of ſnow differ in nothing from clouds of rain, but in the circumſtance of cold that freezes them. Both the regular diffuſion of the ſnow, and the regularity of the ſtructure of its parts (particularly ſome figures of ſnow or hail which fall about Turin, and which he calls *roſette)*, ſhow that clouds of ſnow are acted upon by ſome uniform cauſe like electricity; and he endeavours to ſhow how electricity is capable of forming theſe figures. He was confirmed in his conjectures by obſerving, that his apparatus for obſerving the electricity of the atmoſphere never failed to be electrified by ſnow as well as rain. Profeſſor Winthrop ſometimes found his apparatus electrified by ſnow when driven about by the wind, though it had not been affected by it when the ſnow itſelf was falling. A more intenſe electricity, according to Beccaria, unites the particles of hail more cloſely than the more moderate electricity does thoſe of ſnow, in the ſame manner as we ſee that the drops of rain which fall from thunder-clouds are larger than thoſe which fall from others, though the former deſcend through a leſs ſpace.

But we are not to conſider ſnow merely as a curious and beautiful phenomenon. The Great Diſpenſer of univerſal bounty has ſo ordered it, that it is eminently ſubſervient, as well as all the works of creation, to his benevolent deſigns. The internal parts of the earth, by ſome principle which we

do not underftand, are heated uniformly to the 48th degree of Fahrenheit's thermometer. This degree of heat is greater than that in which the watery juices of vegetables freeze, and it is propagated from the inward parts of the earth to the furface, on which the vegetables grow. The atmofphere being variably heated by the action of the fun in different climates, and in the fame climate at different feafons, communicates to the furface of the earth and to fome diftance below it the degree of heat or cold which prevails in itfelf. Different vegetables are able to preferve life under different degrees of cold, but all of them perifh when the cold which reaches their roots is extreme. Providence has therefore, in the coldeft climates, provided a covering of fnow for the roots of vegetables, by which they are protected from the influence of the atmofpherical cold. The fnow keeps in the internal heat of the earth, which furrounds the roots of vegetables, and defends them from the cold of the atmofphere.

Snow or ice water is always deprived of its fixed air, which efcapes during the procefs of congelation. Accordingly, as fome of the inhabitants of the Alps who ufe it for their conftant drink have enormous wens upon their throats, it has been afcribed to this circumftance. If this were the caufe of thefe wens, it would be eafy to remove it by expofing the fnow-water to the air for fome time. But feveral eminent phyficians have rejected the notion that fnow-water is the caufe of thefe wens; for in Greenland, where fnow-water is commonly ufed, the inhabitants are not affected with fuch fwellings; on the otherhand, they are common in Sumatra, where fnow is never feen.

Snow, in fea-affairs, is generally the largeft of all two-mafted veffels employed by Europeans, and the moft convenient for navigation. The fails and rigging on the mainmaft and foremaft of a fnow are exactly fimilar to thofe on the fame mafts in a fhip; only that there is a fmall maft behind the mainmaft of the former, which carries a fail nearly refembling the mizen of a fhip. The foot of this maft is fixed on a block of wood on the quarter-deck abaft the mainmaft; and the head of it is attached to the aftertop of the maintop. The fail which is called the *tri fail* is extended from its maft towards the ftern of the veffel. When floops of war are rigged as fnows, they are furnifhed with a horfe, which anfwers the purpofe of a trifail-maft, the fore-part of the fail being attached by rings to the faid horfe, in different places of its height.

Snow-*Grotto*, an excavation made by the waters on the fide of Mount Etna, by making their way under the layers of lava, and by carrying away the bed of pozzolana below them. It occurred to the proprietor, that this place was very fuitable for a magazine of fnow: for in Sicily, at Naples, and particularly at Malta, they are obliged for want of ice to make ufe of fnow for cooling their wine, fherbet, and other liquors, and for making fweetmeats. This grotto was hired or bought by the knights of Malta, who having neither ice nor fnow on the burning rock which they inhabit, have hired feveral caverns on Etna, into which people whom they employ collect and preferve quantities of fnow to be fent to Malta when needed. This grotto has therefore been repaired within at the expenfe of that order: flights of fteps are cut into it, as well as two openings from above, by which they throw in the fnow, and through which the grotto is enlightened. Above the grotto they have alfo levelled a piece of ground of confiderable extent: this they have inclofed with thick and lofty walls, fo that when the winds, which at this elevation blow with great violence, carry the fnow from the higher parts of the mountain, and depofit it in this inclofure, it is retained and amaffed by the walls. The people then remove it into the grotto through the two openings; and it is there laid up, and preferved in fuch a manner as to refift the force of the fummer heats; as the layers of lava with which the grotto is arched above prevent them from making any impreffion. When the feafon for exporting the fnow comes on, it is put into large bags, into which it is preffed as clofely as poffible; it is then carried by men out of the grotto, and laid upon mules, which convey it to the fhore, where fmall veffels are waiting to carry it away. But before thofe lumps of fnow are put into bags, they are wrapped in frefh leaves; fo that, while they are conveyed from the grotto to the fhore, the leaves may prevent the rays of the fun from making any impreffion upon them.

The Sicilians carry on a confiderable trade in fnow, which affords employment to fome thoufands of mules, horfes, and men. They have magazines of it on the fummits of their loftieft mountains, from which they diftribute it through all their cities, towns, and houfes; for every perfon in the ifland makes ufe of fnow. They confider the practice of cooling their liquors as abfolutely neceffary for the prefervation of health; and in a climate the heat of which is conftantly relaxing the fibres, cooling liquors, by communicating a proper tone to the fibres of the ftomach, muft greatly ftrengthen them for the performance of their functions. In this climate a fcarcity of fnow is no lefs dreaded than a fcarcity of corn, wine, or oil. We are informed by a gentleman who was at Syracufe in the year 1777, when there was a fcarcity of fnow, the people of the town learned that a fmall veffel loaded with that article was paffing the coaft: without a moment's deliberation they ran in a body to the fhore and demanded her cargo; which when the crew refufed to deliver up, the Syracufans attacked and took, though with the lofs of feveral men.

Snow *Drop*, in botany. See Chionanthus.

SNOWDON-hill, the name of a mountain in Caernarvonfhire in Wales, generally thought to be the higheft in Britain; though fome have been of opinion that its height is equalled, or even exceeded, by mountains in the Highlands of Scotland. The mountain is furrounded by many others, called in the Welch language *Crib Coch*, *Crib y Diftill*, *Lliweddy yr Arran*, &c.

According to Mr. Pennant, this mountainous tract yields fcarcely any corn. Its produce is cattle and fheep, which, during fummer, keep very high in the mountains, followed by their owners with their families, who refide during that feafon in *havodtys*, or "fummer dairy houfes," as the farmers in the Swifs Alps do in their *fennes*. Thefe houfes confift of a long low room, with a hole at one end to let out the fmoke from the fire which is made beneath. Their furniture is very fimple; ftones are fubftituted for ftools, and their beds are of hay, ranged along the fides. They manufacture their own clothes, and dye them with the *lichen omphaloides* and *lichen parietinus*, moffes collected from the rocks. During fummer the men pafs their time in tending their herds, or in making hay, &c. and the women in milking, or in making butter and cheefe. For their own ufe they milk both ewes and goats, and make cheefe of the milk.—Their diet confifts of milk, cheefe, and butter; and their ordinary drink is whey; though they have, by way of referve, a few bottles of very ftrong beer, which they ufe as a cordial when fick. They are people of good underftanding, wary, and circumfpect; tall, thin, and of ftrong conftitutions. In the winter time they defcend into the *hen-dref*, or "old dwelling," where they pafs their time in inactivity.

The view from the higheft peak of Snowdon is very extenfive. From it Mr. Pennant faw the county of Chefter, the high hills of Yorkfhire, part of the North of England, Scotland, and Ireland; a plain view of the Ifle of Man; and that of Anglefea appeared like a map extended under his feet, with every rivulet vifible. Our author took much pains to have this view to advantage; fat up at a farm on the weft till about 12, and walked up the whole way. The night was remarkably fine and ftarry; towards morning the ftars faded away, leaving an interval of darknefs, which, however, was foon difpelled by the dawn of day. The body of the fun appeared moft diftinct, with the roundnefs of the moon, before it appeared too brilliant to be looked at.

The sea, which bounded the western part of the prospect, appeared gilt with the sun-beams, first in slender streaks, and at length glowed with redness. The prospect was disclosed like the gradual drawing up of a curtain in a theatre; till at last the heat became sufficiently strong to raise mists from the various lakes, which in a slight degree obscured the prospect. The shadow of the mountain extended many miles, and showed its bicapitated form; the Wyddfa making one head, and Crib y Distill the other. At this time he counted between 20 and 30 lakes either in Caernarvon or in Merionethshire. In making another visit, the sky was obscured very soon after he got up. A vast mist involved the whole circuit of the mountain, and the prospect down was horrible. It gave an idea of numbers of abysses, concealed by a thick smoke furiously circulating around them. Very often a gust of wind made an opening in the clouds, which gave a fine and distinct vista of lake and valley. Sometimes they opened in one place, at others in many at once; exhibiting a most strange and perplexing sight of water, fields, rocks, and chasms. They then closed again, and every thing was involved in darkness; in a few minutes they would separate again, and repeat the above-mentioned scene with infinite variety. From this prospect our traveller descended with great reluctance; but before he had reached the place where his horses were left, he was overtaken by a thunder storm. The rolling of the thunder claps, being reiterated by the mountains, was inexpressibly awful; and, after he had mounted, he was in great danger of being swept away by the torrents which poured down in consequence of a very heavy rain.

It is very rare (Mr. Pennant observes) that the traveller gets a proper day to ascend this hill: it indeed often appears clear; but by the evident attraction of the clouds by this lofty mountain, it becomes suddenly and unexpectedly enveloped in mist, when the clouds have just before appeared very high and very remote. At times he observed them lower to half their height; and notwithstanding they have been dispersed to the right and left, yet they have met from both sides, and united to involve the summit in one great obscurity.

The height of Snowdon was measured, in 1682, by Mr. Caswell, with instruments made by Flamstead; according to his mensuration, the height is 3720 feet; but more modern computations make it only 3558, reckoning from the quay at Caernarvon to the highest peak. The stone that composes this mountain is excessively hard. Large coarse crystals, and frequently cubic pyrites, are found in the fissures. An immense quantity of water rushes down the sides of Snowdon and the neighbouring mountains, insomuch that Mr. Pennant supposes, if collected into one stream, they would exceed the waters of the Thames.

SNUFF, a powder chiefly made of tobacco, the use of which is too well known to need any description here. Tobacco is usually the basis of snuff; other matters being only added to give it a more agreeable scent, &c. The kinds of snuff, and their several names, are infinite, and new ones are daily invented; so that it would be difficult, not to say impossible, to give a detail of them. We shall only say, that there are three principal sorts: the first granulated; the second an impalpable powder; and the third the bran, or coarse part remaining after sifting the second sort. "Every professed, inveterate, and incurable snuff-taker (says lord Stanhope), at a moderate computation, takes one pinch in ten minutes. Every pinch, with the agreeable ceremony of blowing and wiping the nose and other incidental circumstances, consumes a minute and half. One minute and a half out of every ten, allowing 16 hours to a snuff-taking day, amounts to two hours and 24 minutes out of every natural day, or one day out of every ten. One day out of every 10 amounts to 36 days and a half in a year. Hence, if we suppose the practice to be persisted in 40 years, two entire years of the snuff-taker's life will be dedicated to tickling his nose, and two more to blowing it. The expense of snuff, snuff-boxes, and handkerchiefs, will be the subject of a second essay; in which it will appear, that this luxury encroaches as much on the income of the snuff-taker as it does on his time; and that, by a proper application of the time and money thus lost to the public, a fund might be constituted for the discharge of the national debt." See NICOTIANA.

SNYDERS (FRANCIS), a Flemish painter, born at Antwerp in 1579, and bred under his countryman Henry Van Balen. His genius first displayed itself in painting fruit; he afterwards attempted animals, huntings, &c. in which he exceeded all his predecessors. He also painted kitchens, &c. and gave dignity to subjects that seemed incapable of it. He was made painter to Ferdinand and Isabella, archduke and duchess, and became attached to the house of the cardinal infant of Spain. The king of Spain and the elector palatine adorned their palaces with huntings by this artist. Rubens, Jordaens, and Snyders, used to co-operate in the enriching of each other's pictures according to their several talents; and thus they became more valuable than if finished by either of them singly. Snyders died in 1657.

SOAL-FISH, in ichthyology. See PLEURONECTES.

SOAP, a composition of caustic, fixed alkaline salt, and oil, sometimes hard and dry, sometimes soft and liquid; much used in washing, whitening linens, and by dyers and fullers.—Soap may be made by several methods, which, however, all depend upon the same principle. The soap which is used in medicine is made without heat. See CHEMISTRY. In manufactures where large quantities of it are prepared, soap is made with heat. A lixivium of quicklime and soda is made, but is less concentrated than that above referred to, and only so much that it can sustain a fresh egg. A part of this lixivium is to be even diluted and mixed with an equal weight of oil of olives. The mixture is to be put on a gentle fire, and agitated, that the union may be accelerated. When the mixture begins to unite well, the rest of the lixivium is to be added to it; and the whole is to be digested with a very gentle heat, till the soap be completely made. A trial is to be made of it, to examine whether the just proportion of oil and alkali has been observed. Good soap of this kind ought to be firm, and very white when cold; not subject to become moist by exposure to air, and entirely miscible with pure water, to which it communicates a milky appearance, but without any drops of oil floating on the surface. When the soap has not these qualities, the combination has not been well made, or the quantity of salt or of oil is too great; which faults must be corrected.

In soft or liquid soaps, green or black soaps, cheaper oils are employed, as oil of nuts, of hemp, of fish, &c. These soaps, excepting in consistence, are not essentially different from white soap. Fixed alkalis are much disposed to unite with oils that are not volatile, both vegetable and animal, since this union can be made even without heat. The compound resulting from this union partakes at the same time of the properties of oil and of alkali, but these properties are modified and tempered by each other, according to the general rule of combinations. Alkali formed into soap has not nearly the same acrimony as when it is pure; it is even deprived of almost all its causticity, and its other saline alkaline properties are almost entirely abolished. The same oil contained in soap is less combustible than when pure, from its union with the alkali, which is an uninflammable body. It is miscible, or even soluble, in water, to a certain degree, by means of the alkali. Soap is entirely soluble in spirit of wine; and still better in aquavitæ sharpened by a little alkaline salt, according to an observation of Mr. Geoffroy. The manufacture of soap in London first began in the year 1524; before which time this city was served with white soap from foreign countries, and with gray soap speckled with white from Bristol, which was sold for a penny a pound; and also with black soap, which sold for a halfpenny the pound.

The principal ſoaps of our own manufacture are the ſoft, the hard, and the ball ſoap. The ſoft ſoap is either white or green. When oil unites with alkali in the formation of ſoap, it is little altered in the connection of its principles; for it may be ſeparated from the alkali by decompoſing ſoap with any acid, and may be obtained nearly in its original ſtate.

Alkaline ſoaps are very uſeful in many arts and trades. Their principal utility conſiſts in a deterſive quality that they receive from their alkali, which, although it is in ſome meaſure ſaturated with oil, is yet capable of acting upon oily matters, and of rendering them ſaponaceous and miſcible with water. Hence ſoap is very uſeful to cleanſe any ſubſtances from all fat matters with which they happen to be ſoiled. Soap is therefore daily uſed for the waſhing and whitening of linen, for the cleanſing of woollen-cloths from oil, and for whitening ſilk and freeing it from the reſinous varniſh with which it is naturally covered. Pure alkaline lixiviums being capable of diſſolving oils more effectually than ſoap, might be employed for the ſame purpoſes; but when this activity is not mitigated by oil, as it is in ſoap, they are capable of altering, and even of deſtroying entirely by their cauſticity, moſt ſubſtances, eſpecially animal matters, as ſilk, wool, and others: whereas ſoap cleanſes from oil almoſt as effectually as pure alkali, without danger of altering or deſtroying; which renders it very uſeful.

Soap was imperfectly known to the antients. It is mentioned by Pliny as made of fat and aſhes, and as an invention of the Gauls. Aretæus and others inform us, that the Greeks obtained their knowledge of its medical uſe from the Romans. Its virtues, according to Bergius, are detergent, reſolvent, and aperient, and its uſe recommended in jaundice, gout, calculous complaints, and in obſtructions of the viſcera. The efficacy of ſoap in the firſt of theſe diſeaſes was experienced by Sylvius, and ſince recommended very generally by various authors who have written on this complaint; and it has alſo been thought of uſe in ſupplying the place of bile in the primæ viæ. The utility of this medicine in icterical caſes was inferred chiefly from its ſuppoſed power of diſſolving biliary concretions; but this medicine has loſt much of its reputation in jaundice, ſince it is now known that gall-ſtones have been found in many after death who had been daily taking ſoap for ſeveral months and even years. Of its good effects in urinary calculous affections, we have the teſtimony of ſeveral, eſpecially when diſſolved in lime-water, by which its efficacy is conſiderably increaſed; for it thus becomes a powerful ſolvent of mucus, which an ingenious modern author ſuppoſes to be the chief agent in the formation of calculi: it is, however, only in the incipient ſtate of the diſeaſe that theſe remedies promiſe effectual benefit; though they generally abate the more violent ſymptoms where they cannot remove the cauſe. With Boerhaave ſoap was a general medicine: for, as he attributed moſt complaints to viſcidity of the fluids, he, and moſt of the Boerhaavian ſchool, preſcribed it in conjunction with different reſinous and other ſubſtances, in gout, rheumatiſm, and various viſceral complaints. Soap is alſo externally employed as a reſolvent, and gives name to ſeveral officinal preparations.

From the properties of ſoap we may know that it muſt be a very effectual and convenient anti-acid. It abſorbs acids as powerfully as pure alkalis and abſorbent earths, without having the cauſticity of the former, and without oppreſſing the ſtomach by its weight like the latter.

Laſtly, we may perceive that ſoap, next to alkaline ſalt, muſt be the beſt of all antidotes to ſtop quickly, and with the leaſt inconvenience, the bad effects of acid or corroſive poiſons, as aquafortis, corroſive ſublimate, &c.

Soap imported is ſubject by 10 Ann. cap. 19. to a duty of 2d. a pound (over and above former duties); and by 12 Ann. ſtat. 2. cap. 9. to the further ſum of 1d. a pound. And by the ſame acts, the duty on ſoap made in the kingdom is 1½d. a pound. By 17 G. III. cap. 52. no perſon within the limits of the head office of exciſe in London ſhall be permitted to make any ſoap unleſs he occupy a tenement of 10l. a year, be aſſeſſed, and pay the pariſh rates; or elſewhere, unleſs he be aſſeſſed, and pay to church and poor. Places of making are to be entered, on pain of 50l. and covers and locks to be provided under a forfeiture of 100l.; the furnace-door of every utenſil uſed in the manufacture of ſoap ſhall be locked by the exciſe officer, as ſoon as the fire is damped or drawn out, and faſtenings provided, under the penalty of 50l.; and opening or damaging ſuch faſtening incurs a penalty of 100l. Officers are required to enter and ſurvey at all times, by day or night, and the penalty of obſtructing is 20l. and they may unlock and examine every copper, &c. between the hours of five in the morning and eleven in the evening, and the penalty of obſtructing is 100l. Every maker of ſoap before he begins any making, if within the bills of mortality, ſhall give 12 hours, if elſewhere 24 hours, notice in writing to the officer, of the time when he intends to begin, on pain of 50l. No maker ſhall remove any ſoap unſurveyed on pain of 20l. without giving proper notice of his intention. And if any maker ſhall conceal any ſoap or materials, he ſhall forfeit the ſame, and alſo 500l. Every barrel of ſoap ſhall contain 256 lb. avoirdupois, half barrel 128 lb. firkin 64 lb. half-firkin 32 lb. beſides the weight or tare of each caſk: and all ſoap, excepting hard cake ſoap and ball ſoap, ſhall be put into ſuch caſks and no other, on pain of forfeiture, and 5l. The maker ſhall weekly enter in writing at the next office the ſoap made by him in each week, with the weight and quantity at each boiling, on pain of 50l.; and within one week after entry clear off the duties. on pain of double duty. See, beſides the ſtatutes above cited, 5 Geo. III. cap. 43. 12 Geo. III. cap. 46. 11 Geo. cap. 30. 1 Geo. ſtat. 2. cap. 36.

Acid SOAP. This is formed by the addition of concentrated acids to the expreſſed oils. Thus the oil is rendered partially ſoluble in water; but the union is not ſufficiently complete to anſwer any valuable purpoſe.

SOAP-*Berry Tree*. See SAPINDUS.

SOAP-*Earth*. See STEATITES.

SOAPWORT. See SAPONARIA.

SOC (Sax.), ſignifies power or liberty to miniſter juſtice or execute laws: alſo the circuit or territory wherein ſuch power is exerciſed. Whence our law-Latin word *ſocca* is uſed for a ſeigniory or lordſhip enfranchiſed by the king, with the liberty of holding or keeping a court of his *ſockmen*: And this kind of liberty continues in divers parts of England to this day, and is known by the names of *ſoke* and *ſoken*.

SOCAGE, in its moſt general and extenſive ſignification, ſeems to denote a tenure by any certain and determinate ſervice. And in this ſenſe it is by our antient writers conſtantly put in oppoſition to chivalry or knight-ſervice, where the render was precarious and uncertain. The ſervice muſt therefore be certain in order to denominate it ſocage; as to hold by fealty and 20s. rent; or by homage, fealty, and 20s. rent; or, by homage and fealty without rent; or, by fealty and certain corporal ſervice, as ploughing the lord's land for three days; or, by fealty only without any other ſervice: for all theſe are tenures in ſocage.

Socage is of two ſorts: *free*-ſocage, where the ſervices are not only certain but honourable; and *villein*-ſocage, where the ſervices, though certain, are of a baſer nature (ſee VILLENAGE). Such as hold by the former tenure are called, in Glanvil and other ſubſequent authors, by the name of *liberi ſokemanni*, or tenants in free ſocage. The word is derived from the Saxon appellation *ſoc*, which ſignifies liberty or privilege; and, being joined to an uſual termination, is called *ſocage*, in Latin *ſocagium*; ſignifying thereby a free or privileged tenure.

It ſeems probable that the ſocage-tenures were the relics of Saxon liberty; retained by ſuch perſons as had neither forfeited

them to the king, nor been obliged to exchange their tenure for the more honourable, as it was called, but at the ſame time more burthenſome, tenure of knight ſervice. This is peculiarly remarkable in the tenure which prevails in Kent, called *gavelkind*, which is generally acknowledged to be a ſpecies of ſocage-tenure; the preſervation whereof inviolate from the innovations of the Norman conqueror is a fact univerſally known. And thoſe who thus preſerved their liberties were ſaid to hold in free and common ſocage.

As therefore the grand criterion and diſtinguiſhing mark of this ſpecies of tenure are the having its renders or ſervices aſcertained, it will include under it all other methods of holding free lands by certain and invariable rents and duties; and in particular, *Petit* SERJEANTY, *Tenure in* BURGAGE, and GAVELKIND. See thoſe articles.

SOCIETY, a number of rational and moral beings, united for their common preſervation and happineſs. There are ſhoals of fiſhes, herds of quadrupeds, and flocks of birds. But till obſervation enable us to determine with greater certainty, how far the inferior animals are able to look through a ſeries of means to the end which theſe are calculated to produce, how far their conduct may be influenced by the hope of reward and the fear of puniſhment, and whether they are at all capable of moral diſtinctions—we cannot with propriety apply to them the term *Society*. We call crows, and beavers, and ſeveral other ſpecies of animals, *gregarious;* but it is hardly good Engliſh to ſay that they are *ſocial*.

It is only human ſociety, then, that can become the ſubject of our preſent inveſtigation. The phænomena which it preſents are highly worthy of our notice. Such are the advantages which each individual evidently derives from living in a ſocial ſtate; and ſo helpleſs does any human being appear in a ſolitary ſtate, that we are naturally led to conclude, that if there ever was a period at which mankind were ſolitary beings, that period could not be of long duration; for their averſion to ſolitude and love of ſociety would ſoon induce them to enter into ſocial union. Such is the opinion which we are led to conceive, when we compare our own condition as members of civilized and enlightened ſociety with that of the brutes around us, or with that of ſavages in the earlier and ruder periods of ſocial life. When we hear of Indians wandering naked through the woods, deſtitute of arts, unſkilled in agriculture, ſcarce capable of moral diſtinctions, void of all religious ſentiments, or poſſeſſed with the moſt abſurd notions concerning ſuperior powers, and procuring means of ſubſiſtence in a manner equally precarious with that of the beaſts of prey—we look down with pity on their condition, or turn from it with horror. When we view the order of cultivated ſociety, and conſider our inſtitutions, arts, and manners—we rejoice over our ſuperior wiſdom and happineſs.

Man in a civilized ſtate appears a being of a ſuperior order to man in a ſavage ſtate; yet ſome philoſophers tell us, that it is only he who, having been educated in ſociety, has been taught to depend upon others, that can be helpleſs or miſerable when placed in a ſolitary ſtate. They view the ſavage who exerts himſelf with intrepidity to ſupply his wants, or bears them with fortitude, as the greateſt hero, and poſſeſſing the greateſt happineſs. And therefore if we agree with them, that the propenſities of nature may have prompted men to enter into ſocial union, though they may have hoped to enjoy ſuperior ſecurity and happineſs by engaging to protect and ſupport each other, we muſt conclude that the Author of the univerſe has deſtined man to attain greater dignity and happineſs in a ſavage and ſolitary than in a ſocial ſtate; and therefore that thoſe diſpoſitions and views which lead us to ſociety are fallacious and inimical to our real intereſt.

Whatever be the ſuppoſed advantages of a ſolitary ſtate, certain it is that mankind, at the earlieſt periods, were united in ſociety. Various theories have been formed concerning the circumſtances and principles which gave riſe to this union: but we have elſewhere ſhown, that the greater part of them are founded in error; that they ſuppoſe the original ſtate of man to have been that of ſavages; and that ſuch a ſuppoſition is contradicted by the moſt authentic records of antiquity. For though the records of the earlier ages are generally obſcure, fabulous, and imperfect; yet happily there is *one* free from the imperfections of the reſt, and of undoubted authenticity, to which we may ſafely have recourſe. This record is the Pentateuch of Moſes, which preſents us with a genuine account of the origin of man and of ſociety.

SOCIETIES, aſſociations voluntarily formed by a number of individuals for promoting knowledge, induſtry, or virtue. They may therefore be divided into three claſſes; ſocieties for promoting ſcience and literature, ſocieties for encouraging and promoting arts and manufactures, and ſocieties for diffuſing religion and morality and relieving diſtreſs. Societies belonging to the firſt claſs extend their attention to all the ſciences and literature in general, or devote it to one particular ſcience. The ſame obſervation may be applied to thoſe which are inſtituted for improving arts and manufactures. Thoſe of the third claſs are eſtabliſhed, either with a view to prevent crimes, as the Philanthropic; Society for diffuſion of the Chriſtian religion among unenlightened nations, as the Society for the Propagation of the Goſpel in foreign Parts; or for introducing arts and civilization, along with a knowledge of the Chriſtian religion, as the Sierra Leona company.

The honour of planning and inſtituting ſocieties for thoſe valuable purpoſes is due to modern times. A literary aſſociation is ſaid to have been formed in the reign of Charlemagne, but the plan ſeems to have been rude and defective. Several others were inſtituted in Italy in the 16th century; but from the accounts which we have ſeen of them, they ſeem to have been far inferior to thoſe which are moſt flouriſhing at preſent. The moſt enlarged idea of literary ſocieties ſeems to have originated with the great Lord Bacon, the father of modern philoſophy, who recommended to the reigning prince to inſtitute ſocieties of learned men, who ſhould give to the world from time to time a regular account of their reſearches and diſcoveries. It was the idea of this great philoſopher, that the learned world ſhould be united, as it were, into one immenſe republic; which, though conſiſting of many detached ſtates, ſhould hold a ſtrict union and preſerve a mutual intelligence with each other, in every thing that regards the common intereſt. The want of this union and intelligence he laments as one of the chief obſtacles to the advancement of ſcience; and, juſtly conſidering the inſtitution of public ſocieties, in the different countries of Europe, under the auſpices of the ſovereign, to be the beſt remedy for that defect, he has given, in his fanciful work, the New Atalantis, the delineation of a philoſophical ſociety on the moſt extended plan, for the improvement of all arts and ſciences; a work which, though written in the language, and tinctured with the colouring of romance, is full of the nobleſt philoſophic views. The plan of Lord Bacon, which met with little attention from the age in which he lived, was deſtined to produce its effect in a period not very diſtant. The ſcheme of a philoſophical college by Cowley is acknowledged to have had a powerful influence in procuring the eſtabliſhment of the Royal Society of London by charter from Charles II.; and Cowley's plan is manifeſtly copied in almoſt all its parts from that in the New Atalantis. The inſtitution of the Royal Society of London was ſoon followed by the eſtabliſhment of the Royal Academy of Sciences at Paris; and theſe two have ſerved as models to the philoſophical academies o[f] [the] beſt reputation in the other kingdoms of Europe.

The experience of ages has ſhown, that improvements of a public nature are beſt carried on by ſocieties of liberal and inge-

nious men, uniting their labours without regard to nation, fect, or party, in one grand purfuit alike interefting to all, whereby mutual prejudices are worn off, and a humane philofophical fpirit is cherifhed. Men united together, and frequently meeting for the purpofe of advancing the fciences, the arts, agriculture, manufactures, and commerce, may oftentimes fuggeft fuch hints to one another as may be improved to important ends; and fuch focieties, by being the repofitories of the obfervations and difcoveries of the learned and ingenious, may from time to time furnifh the world with ufeful publications which might otherwife be loft; for men of ingenuity and modefty may not choofe to rifk their reputation, by fending abroad unpatronized what a learned fociety might judge richly worthy the public eye: or perhaps their circumftances being ftraitened, they may not be able to defray the expenfe of publication. Societies inftituted for promoting knowledge may alfo be of eminent fervice, by exciting a fpirit of emulation, and by enkindling thofe fparks of genius which otherwife might for ever have been concealed; and if, when poffeffed of funds fufficient for the purpofe, they reward the exertions of the induftrious and enterprifing with pecuniary premiums or honorary medals, many important experiments and ufeful difcoveries will be made, from which the public may reap the higheft advantages.

Eminent inftances of the beneficial effects of fuch inftitutions we have in the Royal Academy of Sciences at Paris, the Royal Society, and the Society inftituted for the encouragement of Arts, Manafactures, and Commerce, in London, and many others of a fimilar kind. Hereby a fpirit of difcovery and improvement has been excited among the ingenious in almoft every nation; knowledge of various kinds, and greatly ufeful to mankind, has taken place of the dry and uninterefting fpeculations of fchoolmen; and bold and erroneous hypothefis has been obliged to give way to demonftrative experiment. In fhort, fince the eftablifhment of thefe focieties, folid learning and philofophy have more increafed than they had done for many centuries before.

As to thofe focieties eftablifhed for promoting induftry, religion and morality, and relieving diftrefs, the defign is laudable and excellent, and prefents a beautiful picture of the philanthropy of modern times. We are happy to find, from the minutes of fome of thefe focieties, that their beneficial effects are already confpicuous.

The moft eminent focieties may be arranged under the three following claffes. 1. *Religious and Humane Societies.* 2. *Societies for Promoting Science and Literature.* 3. *Societies for Encouraging Arts, Manufactures, &c.* Thefe inftitutions are too generally known, to require a particular defcription.

Society *Ifles*, iflands in the Pacific ocean, difcovered by captain Cook in 1769, fituate between W. lon. 150. 57. and 152. 0. and S. lat. 16. 10. and 16. 55. They are fix in number; namely, Huahine, Ulietea, Otaha, Bolabola, Maurua, and Tabooyamanoo, or Saunders' Ifland. The foil, productions, people, their language, religion, cuftoms, and manners, are nearly the fame as at Otaheite. Nature has been equally bountiful in uncultivated plenty, and the inhabitants are as luxurious and as indolent. A plantain branch is the emblem of peace, and changing names the greateft token of friendfhip. Their dances are more elegant, their dramatic entertainments have fomething of plot and confiftency, and they exhibit temporary occurrences as the objects of praife or fatire; fo that the origin of antient comedy may be already difcerned among them. The people of Huahine are in general ftouter and fairer than thofe of Otaheite, and this ifland is remarkable for its populoufnefs and fertility. Thofe of Ulietea, on the contrary, are fmaller and blacker, and much lefs orderly.

SOCINIANS, in church-hiftory, a fect of Chriftian heretics, is called from their founder Fauftus Socinus (fee Socinus). They maintain, "That Jefus Chrift was a mere man, who had no exiftence before he was conceived by the Virgin Mary; that the Holy Ghoft is no diftinct perfon, but that the Father is truly and properly God. They own, that the name of God is given in the Holy Scriptures to Jefus Chrift; but contend, that it is only a deputed title, which, however, invefts him with an abfolute fovereignty over all created beings, and renders him an object of worfhip to men and angels. They deny the doctrines of fatisfaction and imputed righteoufnefs; and fay that Chrift only preached the truth to mankind, fet before them in himfelf an example of heroic virtue, and fealed his doctrines with his blood. Original fin and abfolute predeftination they efteem fcholaftic chimæras. They likewife maintain the fleep of the foul, which they fay becomes infenfible at death, and is raifed again with the body at the refurrection, when the good fhall be eftablifhed in the poffeffion of eternal felicity, while the wicked fhall be configned to a fire that will not torment them eternally, but for a certain duration proportioned to their demerits."

This fect has long been indignant at being ftyled *Socinians.* They difclaim every human leader; and profeffing to be guided folely by the word of God and the deductions of reafon, they call themfelves *Unitarians*, and affect to confider all other Chriftians, even their friends the Arians, as *Polytheifts.* Modern Unitarianifm, as taught by Dr. Prieftley, is, however, a very different thing from Socinianifm, as we find it in the Racovian catechifm and other ftandard works of the fect. This far-famed philofopher has difcovered what efcaped the fagacity of all the *Fratres Poloni*, that Jefus Chrift was the fon of Jofeph as well as Mary; that the evangelifts miftook the meaning of Ifaiah's prophecy, that "a virgin fhould conceive and bear a fon;" that the applying of this prophecy to the birth of our Saviour, led them to conclude that his conception was miraculous; and that we are not to wonder at this miftake, as the apoftles were not always infpired, and were in general inconclufive reafoners. The modefty of the writer in claiming the merit of fuch difcoveries will appear in its proper colours to all our readers: the truth of his doctrine fhall be confidered in another place. See Theology.

SOCINUS (Lælius), the firft author of the fect of the Socinians, was born at Sienna in Tufcany in 1525. Being defigned by his father for the law, he began very early to fearch for the foundation of that fcience in the Word of God; and by that ftudy difcovered that the Romifh religion taught many things contrary to revelation; when, being defirous of penetrating further into the true fenfe of the Scriptures, he ftudied Greek, Hebrew, and even Arabic. In 1547 he left Italy, to go and converfe with the Proteftants; and fpent four years in travelling through France, England, the Netherlands, Germany, and Poland, and at length fettled at Zurich. He by this means became acquainted with the moft learned men of his time, who teftified by their letters the efteem they had for him: but as he difcovered to them his doubts, he was greatly fufpected of herefy. He, however, conducted himfelf with fuch addrefs, that he lived among the capital enemies of his opinions without receiving the leaft injury. He met with fome difciples, who heard his inftructions with refpect; thefe were Italians who left their native country on account of religion, and wandered about in Germany and Poland. He communicated likewife his fentiments to his relations by his writings, which he caufed to be conveyed to them at Sienna. He died at Zurich in 1562. Thofe who were of fentiments oppofite to his, and were perfonally acquainted with him, confefs that his outward behaviour was blamelefs. He wrote a Paraphrafe on the firft chapter of St. John; and other works are afcribed to him.

Socinus (Fauftus), nephew of the preceding, and principal founder of the Socinian fect, was born at Sienna in 1539. The letters which his uncle Lælius wrote to his relations, and which

infused into them many seeds of heresy, made an impression upon him; so that, knowing himself not innocent, he fled as well as the rest when the inquisition began to persecute that family. He was at Lyons when he heard of his uncle's death, and departed immediately to take possession of his writings. He returned to Tuscany; and made himself so agreeable to the grand duke, that the charms which he found in that court, and the honourable posts he filled there, hindered him for twelve years from remembering that he had been considered as the person who was to put the last hand to the system of Samosatenian divinity, of which his uncle Lælius had made a rough draught. At last he went into Germany in 1574, and paid no regard to the grand duke's advices to return. He staid three years at Basil, and studied divinity there; and having adopted a set of principles very different from the system of Protestants, he resolved to maintain and propagate them; for which purpose he wrote a treatise *De Iesu Christo Servatore*. In 1579 Socinus retired into Poland, and desired to be admitted into the communion of the Unitarians; but as he differed from them in some points, on which he refused to be silent, he met with a repulse. However, he did not cease to write in defence of their churches against those who attacked them. At length his book against James Paleologus furnished his enemies with a pretence to exasperate the king of Poland against him; but though the mere reading of it was sufficient to refute his accusers, Socinus thought proper to leave Cracow, after having resided there four years. He then lived under the protection of several Polish lords, and married a lady of a good family; but her death, which happened in 1587, so deeply afflicted him as to injure his health; and to complete his sorrow, he was deprived of his patrimony by the death of Francis de Medicis great duke of Florence. The consolation he found in seeing his sentiments at last approved by several ministers, was greatly interrupted in 1598; for he met with a thousand insults at Cracow, and was with great difficulty saved from the hands of the rabble. His house was plundered and he lost his goods; but this loss was not so uneasy to him as that of some manuscripts, which he extremely regretted. To deliver himself from such dangers, he retired to a village about nine miles distant from Cracow, where he spent the remainder of his days at the house of Abraham Blonski, a Polish gentleman, and died there in 1604. All Faustus Socinus's works are contained in the two first volumes of the *Bibliotheca Fratrum Polonorum*.

SOCMANS, Sokemans, or *Socmen* (*Socmanni*), are such tenants as hold their lands and tenements by socage tenure. See Socage.

SOCOTORA, an island lying between Asia and Arabia Felix; about 50 miles in length, and 22 in breadth. It is particularly noted for its fine aloes, known by the name of *Socotrine* Aloes. The religion of the natives is a mixture of Mahometanism and Paganism; but they are civil to strangers who call there in their passage to the East Indies. It abounds in fruit and cattle; and they have a king of their own, who is dependent on Arabia.

SOCRATES, the greatest of the antient philosophers, was born at Alopece, a small village of Attica, in the fourth year of the 77th Olympiad, or about 467 years before Christ. His parents were very mean; Sophroniscus his father being a statuary or carver of images in stone, and Phœnareta his mother a midwife; who yet is so represented by Plato, as shows that she was a woman of a bold, generous, and quick spirit. However, he is observed to have been so far from being ashamed of these parents, that he often took occasion to mention them. As soon as he was born, Sophroniscus his father, consulting the oracle, was advised to suffer the son to do what he pleased, never compelling him to do what he disliked, or diverting him from what he was inclined to. But Sophroniscus, regardless of the oracle, put him to his own trade of carving statues; which, though contrary to the inclination of Socrates, yet afterwards stood him in good stead: for his father dying, and his money and effects lost by being placed in bad hands, he was upon that necessitated to continue his trade for ordinary subsistence. But being naturally averse to this profession, he only followed it while necessity compelled him; and, upon getting a little beforehand, would for a while lay it entirely aside. These intermissions of his trade were bestowed upon philosophy, to which he was naturally addicted; and this being observed by Crito, a rich philosopher of Athens, Socrates was at length taken from his shop, and put into a condition of philosophising at his leisure.

His first master was Anaxagoras, and then Archelaus: by which last he was much beloved, and travelled with him to Samos, to Pytho, and to the Isthmus. He was scholar likewise of Damon, a most pleasing teacher of music. He learned poetry of Euenus, husbandry of Ichomacus, and geometry of Theodorus.

That Socrates had an attendant spirit, genius, or dæmon, which diverted from dangers, is testified by Plato, Xenophon, and Antisthenes, who were his contemporaries, and confirmed by innumerable authors of antiquity; but what this attendant spirit, genius, or dæmon was, or what we are to understand by it, neither antient nor modern writers have been able to determine. There is some disagreement concerning the name, and more concerning the nature of it: only it is agreed, that the advice it gave him was always dissuasive; "never impelling," says Cicero, "but often restraining him." It is commonly named his dæmon, by which title he himself owned it. Plato sometimes calls it his guardian, and Apuleius his god; because the name of dæmon, as St. Austin tells us, at last grew odious. As for the sign or manner in which this dæmon or genius foretold, and by foretelling guarded him against evils to come, nothing certain can be collected about it. Some affirm that it was by sneezing, either in himself or others: but Plutarch rejects this opinion, and conjectured, first, that it might be some apparition; but at last concludes, that it was his observation of some inarticulate unaccustomed sound or voice, conveyed to him by some extraordinary way, as we see in dreams. Others confine this foreknowledge of evils within the soul of Socrates himself; and, when he said that "his genius advised him," interpret him as if he had said, that "his mind foreboded and so inclined him." But this is inconsistent with the description which Socrates himself gives of a voice and signs from without, and with his further affirmation, "That there was a dæmon constantly near him, which had kept him company from a child, and by whose beck and instruction he guided his life."

The altercations that Socrates had with the Sophists, were not attended with any ill, but rather with good effects to him; for they gained him respect, and made him popular with the Athenians: but he had a private quarrel with one Anytus, which after many years continuance was the occasion of his death. Anytus was an orator by profession, who was privately maintained and enriched by leather-sellers. He had placed two of his sons under Socrates, to be taught; but, because they had not acquired such knowledge from him as to enable them to get their living by pleading, he took them away, and put them to the trade of leather-selling. Socrates, displeased with this illiberal treatment of the young men, whose ruin he presaged at the same time, reproached and indeed exposed Anytus in his discourses to his scholars. Anytus was grievously vexed and hurt by this, and studied all occasions and ways of revenge; but feared the Athenians, who highly reverenced Socrates, as well on account of his great wisdom and virtue, as for the particular opposition which he had made to those vain babblers the Sophists. Many years passed from the first falling out between Socrates and Anytus, during which one continued openly

eproving, the other secretly undermining; till at length Anytus, observing a fit conjuncture, procured Melitus to prefer a bill against him to the Senate in these terms: "Melitus son of Melitus, a Pythean, accuseth Socrates son of Sophroniscus, an Alopecian. Socrates violates the law, not believing the deities which this city believeth, but introducing other new gods. He violates the law likewise in corrupting youth; the punishment death." This bill being preferred upon oath, Crito became bound to the judges for his appearance on the day of trial; till which, Socrates employed himself in his usual philosophical exercises, taking no care to provide any defence. The day being come, Anytus, Lyco, and Melitus, accused him: Socrates made his own defence, without procuring an advocate, as the custom was, to plead for him. He did not defend himself with the tone and language of a suppliant or guilty person, but, as if he were master of the judges themselves, with freedom, firmness, and some degree of contumacy. Many of his friends spoke also in his behalf; and, lastly, Plato went up into the chair, and began a speech in these words: "Though I, Athenians, am the youngest of those that come up into this place" —but they stopped him, crying out, "Of those that go down," which he was thereupon constrained to do: and, then proceeding to vote, they cast Socrates by two hundred and eighty-one voices. It was the custom of Athens, as Cicero informs us, when any one was cast, if the fault were not capital, to impose a pecuniary mulct; when the guilty person was asked the highest rate, at which he estimated his offence. This was proposed to Socrates, who told the judges, that to pay a penalty was to own an offence; and that, instead of being condemned for what he stood accused, he deserved to be maintained at the public charge out of the Prytanæum. This was the greatest honour the Grecians could confer: and the answer so exasperated the judges, that they condemned him to death by eighty votes more. The sentence being passed, he was sent to prison; which he entered with the same resolution and firmness with which he had opposed the thirty tyrants. He lay here in fetters thirty days; and was constantly visited by Crito, Plato, and other friends, with whom he passed the time in dispute after his usual manner. He was often solicited by them to an escape, which he not only refused, but derided.

He died, according to Plato, when he was more than seventy, having drunk the cup of poison which was given him with the utmost intrepidity. He was buried with many tears and much solemnity by his friends; yet, as soon as they had performed that last service, fearing the cruelty of the thirty tyrants, they stole out of the city, the greater part to Megara to Euclid, who received them kindly, the rest to other places. Soon after, however, the Athenians were awakened to a sense of the injustice they had committed against Socrates; and became so exasperated, that nothing would serve them, but the authors of it should be put to death: as Melitus was, while Anytus was banished. In further testimony of their penitence, they called home his friends to their former liberty of meeting; they forbade public spectacles of games and wrestlings for a time; they caused his statue, made in brass by Lysippus, to be set up in the Pompeium: and a plague ensuing, which they imputed to this unjust act, they made an order, that no man should mention Socrates publicly and on the theatre, in order to forget the sooner what they had done.

As to his person, he was very homely; was bald, had a dark complexion, a flat nose, eyes sticking out, and a severe down-cast look. In short, his countenance promised so ill, that Zopyrus, a physiognomist, pronounced him incident to various passions, and given to many vices: which when Alcibiades and others who were present laughed at, knowing him to be free from every thing of that kind, Socrates justified the skill of Zopyrus by owning, that "he was by nature prone to these vices, but suppressed his inclination by reason." He had two wives, one of which was the noted Xantippe. Several instances are recorded of her impatience and his long-suffering. He chose this wife, we are told, for the same reason that they, who would be excellent in horsemanship, choose the roughest and most spirited horses; supposing, that if they are able to manage them, they may be able to manage any.

Socrates was also the name of an ecclesiastical historian of the fifth century, born at Constantinople in the beginning of the reign of Theodosius: he professed the law and pleaded at the bar, whence he obtained the name of *Scholasticus*. He wrote an ecclesiastical history from the year 309, where Eusebius ended, down to 440; and wrote with great exactness and judgment. An edition of Eusebius and Socrates, in Greek and Latin, with notes by Reading, was published at London in 1720.

SODA, the name given by the French chemists to the mineral alkali, which is found native in many parts of the world: it is obtained also from common salt, and from the ashes of the *kali*, a species of salsola. See Alkali and Chemistry.

Soda is also a name for a heat in the stomach, or heart-burn.

SODOM, formerly a town of Palestine in Asia, famous in Scripture for the wickedness of its inhabitants, and their destruction by fire from heaven on account of that wickedness. The place where it stood is now covered by the waters of the Dead Sea, or the Lake Asphaltites. See Asphaltites.

SODOMY, an unnatural crime, so called from the city of Sodom, which was destroyed by fire for the same. The Levitical law adjudged those guilty of this execrable crime to death; and the civil laws assign the same punishment to it. The law of England makes it felony. There is no statute in Scotland against Sodomy; the libel of the crime is therefore founded on the divine law, and practice makes its punishment to be burned alive.

SODOR, a village in Icolmkill, one of the Western Isles of Scotland, near that of Mull. It was formerly a bishop's see, which comprehended all the islands, together with the Isle of Man; for which reason the bishop of Man is still called bishop of Sodor and Man.

SOFA, in the east, a kind of alcove raised half a foot above the floor of a chamber or other apartment; and used as the place of state, where visitors of distinction are received. Among the Turks the whole floor of their state rooms is covered with a kind of tapestry, and on the window-side is raised a sofa or sopha, laid with a kind of mattress, covered with a carpet much richer than the other. On this carpet the Turks are seated, both men and women, like the taylors in England, cross-legged, leaning against the wall, which is bolstered with velvet, satin, or other stuff suitable to the season. Here they eat their meals; only laying a skin over the carpet to serve as a table-cloth, and a round wooden board over all, covered with plates, &c.

SOFALA, or Cefala, a kingdom of Africa, lying on the coast of Mosambique, near Zanguebar. It is bounded on the north by Monomotapa; on the east by the Mosambique sea; on the south by the kingdom of Sabia; and on the west by that of Manica. It contains mines of gold and iron, and a great number of elephants. It is governed by a king, tributary to the Portuguese, who built a fort at the principal town, wich is of the same name, and of great importance for their trade to the East Indies. It is seated in a small island, near the mouth of a river. E. lon. 35. S. lat. 20. 20.

SOFFITA, or Soffit, in architecture, any timber ceiling formed of cross beams of flying cornices, the square compartments or pannels of which are enriched with sculpture, painting, or gilding; such are those in the palaces of Italy, and in the apartments of Luxembourg at Paris.

Soffita, or *Soffit*, is also used for the underside or face of an architrave; and more particularly for that of the corona or larmier, which the antients called *lacunar*, the French *plafond*,

and we usually the *drip*. It is enriched with compartments of roses; and in the Doric order has 18 drops, disposed in three ranks, six in each, placed to the right of the guttæ, at the bottom of the triglyphs.

SOFI, or SOPHI. See SOPHI.

SOFTENING, in painting, the mixing and diluting of colours with the brush or pencil.

SOIL, the mould covering the surface of the earth, in which vegetables grow. It serves as a support for vegetables, and as a reservoir for receiving and communicating their nourishment. Soils are commonly double or triple compounds of the several reputed primitive earths, except the barytic (see EARTHS). The magnesian likewise sparingly occurs. The more fertile soils afford also a small proportion of coaly substance arising from putrefaction, and some traces of marine acid and gypsum. The vulgar division into clay, chalk, sand, and gravel, is well understood. Loam denotes any soil moderately adhesive; and, according to the ingredient that predominates, it receives the epithets of clayey, chalky, sandy, or gravelly. The intimate mixture of clay with the oxydes of iron is called *till*, and is of a hard consistence and a dark reddish colour. Soils are found by analysis to contain their earthy ingredients in very different proportions. According to M. Giobert, fertile mould in the vicinity of Turin, where the fall of rain amounts yearly to 40 inches, affords for each 100 parts, from 77 to 79 of silex, from 8 to 14 of argill, and from 5 to 12 of calx; besides about one-half of carbonic matter, and nearly an equal weight of gas, partly carbonic, and partly hydrocarbonic. The same experimenter represents the composition of barren soils in similar situations to be from 42 to 88 *per cent* of silex, from 20 to 30 of argill, and from 4 to 20 of calx. The celebrated Bergman found rich soils in the valleys of Sweden, where the annual quantity of rain is 24 inches, to contain, for each 100 parts, 56 of siliceous sand, 14 of argill, and 30 of calx. In the climate of Paris, where the average fall of rain is 20 inches, fertile mixtures, according to M. Tillet, vary from 46 to 52 *per cent.* of silex, and from 11 to 17 of argill, with 37 of calx. Hence it appears that in dry countries rich earths are of a closer texture, and contain more of the calcareous ingredient, with less of the siliceous. Mr. Arthur Young has discovered, that the value of fertile lands is nearly proportioned to the quantities of gas which equal weights of their soil afford by distillation. See HUSBANDRY.

SOISSONS, an antient and considerable city of France, in the department of Aisne and late province of Soissonnois. It was the capital of a kingdom of the same name, under the first race of the French monarchs. It contains 12,000 inhabitants, and is a bishop's see. Here St. Lewis, Philip the Bold, and Lewis XIV. were crowned. The fine cathedral has one of the most considerable chapters in the kingdom; and the bishop, when the archbishop of Rheims was absent, had a right to crown the king. The castle, though antient, is not that in which the kings of the first race resided. Among the late abbeys here, that of St. Medard is remarkable: Lewis le Debonnaire was confined in it by his children. Soissons is seated in a fertile valley, on the river Aisne, 30 miles W. by N. of Rheims, and 60 N. E. of Paris. E. lon. 3. 18. N. lat. 49. 23.

SOKE, or SOK. See SOCAGE.

SOKEMANS. See SOC and SOCAGE.

SOL, in music, the fifth note of the gamut, *ut, re, mi, fa, sol, la*. See GAMUT.

SOL, or *Sous*, a French coin made up of copper mixed with a little silver, and is worth upwards of an English halfpenny, or the 23d part of an English shilling. The sol when first struck was equal in value to 12 deniers Tournois, whence it was also called *douzain*, a name it still retains, though its antient value be changed; the sol having been since augmented by three deniers, and struck with a puncheon of a fleur de lis, to make it current for 15 deniers. Soon after the old sols were coined over again, and both old and new were indifferently made current for 15 deniers. In 1709, the value of the same sols was raised to 18 deniers. Towards the latter end of the reign of Louis XIV. the sol of 18 deniers was again lowered to 15; and by the late king it was reduced to the original value of 12. What it is at present posterity may perhaps discover. The Dutch have also two kinds of sols: the one of silver, called *sols de gros*, and likewise *schelling*; the other of copper, called also the *stuyver*.

SOL, the *Sun*, in astronomy, astrology, &c. See ASTRONOMY.

SOL, in chemistry, is gold; thus called from an opinion that this metal is in a particular manner under the influence of the sun.

SOL, in heraldry, denotes Or, the golden colour in the arms of sovereign princes.

SOLÆUS, or SOLEUS, in anatomy, one of the extensor muscles of the foot, rising from the upper and hinder parts of the tibia and fibula.

SOLAN-GOOSE, in ornithology. See PELICANUS.

SOLANDRA, in botany: A genus of plants belonging to the class of *monadelphia*, and to the order of *polyandria*; and in the natural system arranged under the 38th order, *Tricoccæ*. The calyx is simple; the capsule oblong, wreathed, and five-celled; the seeds are many, disposed in cells in a double order. The valves after maturity are divaricated, even to the base, and winged inwards by the partition. The only species is the *Lobata*. This genus was first named *Solandra*, in honour of Dr. Solander, by Murray in the 14th edition of the *Systema Vegetabilium*.

SOLANUM, in botany: A genus of the *monogynia* order, belonging to the *pentandria* class of plants; and in the natural method ranking under the 28th order, *Luridæ*. The calyx is inferior; the corolla is rotate, and generally monophyllous; the fruit a berry, bilocular, and containing many small and flat seeds. Of this genus there are 66 species, most of them natives of the East and West Indies. The most remarkable of which are the following.

1. The *Dulcamara*, a native of Britain and of Africa, is a slender climbing plant, rising to six or more feet in height. The leaves are generally oval, pointed, and of a deep green colour; the flowers hang in loose clusters, of a purple colour, and divided into five pointed segments. The calyx is purple, persistent, and divided into five. The five filaments are short, black, and inserted into the tube of the corolla. The antheræ yellow, erect, and united in a point as usual in this genus. The style is long, and terminates in an obtuse stigma. The berry, when ripe, is red, and contains many flat yellowish seeds. It grows in hedges well supplied with water, and flowers about the end of June. On chewing the roots, we first feel a bitter, then a sweet, taste; hence the name. The berries are said to be poisonous, and may easily be mistaken by children for currants. The *stipites* or younger branches are directed for use, and may be employed either fresh or dried: they should be gathered in the autumn. This plant is generally given in decoction or infusion. Razou directs the following: Take dried dulcamara twigs half a dram, and pour upon it 16 ounces of spring water, which must be boiled down to 8 ounces; then strain it. Three or four tea spoonfuls to be taken every four hours, diluted with milk to prevent its exciting a nausea. Several authors take notice, that the dulcamara partakes of the milder powers of the nightshade, joined to a resolvent and saponaceous quality; hence it promotes the secretions of urine, sweat, the menses, and lochia. It is recommended in a variety of disorders; but particularly in rheumatisms, obstructed menses, and lochia; also in some obstinate cutaneous diseases.

2. The *Nigrum*, common in many places in Britain about

dunghills and waste places. It rises to about two feet in height. The stalk herbaceous, the leaves alternate, irregularly oval, indented, and clothed with soft hairs. The flowers are white; the berries black and shining. It appears to possess the deleterious qualities of the other nightshades in a very high degree, and even the smell of the plant is said to cause sleep. The berries are equally poisonous with the leaves; causing *cardialgia*, and *delirium*, and violent distortions of the limbs in children. Mr. Getaker in 1757 recommended its internal use in old sores, in scrofulous and cancerous ulcers, cutaneous eruptions, and in dropsies. He says, that one grain infused in an ounce of water sometimes produced a considerable effect; that in the dose of two or three grains it seldom failed to evacuate the first passages, to increase very sensibly the discharges by the skin and kidneys, and sometimes to occasion headach, drowsiness, giddiness, and dimness of sight. Mr. Broomfield declares, that in cases in which he tried this solanum they were much aggravated by it; and that in one case in the dose of one grain it proved mortal to one of his patients; therefore he contends its use is prejudicial. This opinion seems tacitly to be confirmed, as it is now never given internally. In antient times it was employed externally as a discutient and anodyne in some cutaneous affections, tumefactions of the glands, ulcers, and disorders of the eyes. The *solanum nigrum e rubrum*, a native of the West Indies, is called *guma* by the negroes. It is so far from having any deleterious quality, that it is daily served up at table as greens or spinnage. It has an agreeable bitter taste.

3. *Lycoperficum*, the love-apple, or tomato, cultivated in gardens in the warmer parts of Europe and in all tropical countries. The stalk is herbaceous, the leaves pinnated, oval, pointed, and deeply divided. The flowers are on simple *racemi*: they are small and yellow. The berry is of the size of a plum; they are smooth, shining, soft; and are either of a yellow or reddish colour. The tomato is in daily use; being either boiled in soups or broths, or served up boiled as garnishes to flesh-meats.

4. *Melongena*, the egg-plant, or vegetable egg. This is also cultivated in gardens, particularly in Jamaica. It seldom rises above a foot in height. The stalk is herbaceous and smooth; the leaves oval and downy; the flowers are large and blue; the fruit is as big as, and very like, the egg of a goose. It is often used boiled as a vegetable along with animal food or butter, and supposed to be aphrodisiac and to cure sterility.

5. *Longum*. This plant is also herbaceous, but grows much ranker than the foregoing. The flowers are blue; and the fruit is six or eight inches long, and proportionally thick. It is boiled and eaten at table as the egg-plant.

6. *Tuberosum*, the common potato. See POTATO.

SOLAR, something belonging to the SUN.

SOLAR-*spots*. See ASTRONOMY.

SOLDAN. See SULTAN.

SOLDANELLA, in botany: A genus of plants belonging to the class of *pentandria*, and order of *monogynia*; and in the natural system arranged under the 21st order, *Preciæ*. The corolla is campanulated; the border being very finely cut into a great many segments. The capsule is unilocular, and its apex polydentate.

SOLDER, SODDER, or *Soder*, a metallic or mineral composition used in soldering or joining together other metals. Solders are made of gold, silver, copper, tin, bismuth, and lead; usually observing, that in the composition there be some of the metal that is to be soldered mixed with some higher and finer metals. Goldsmiths usually make four kinds of solder, viz. solder of eight, where to seven parts of silver there is one of brass or copper; solder of six, where only a sixth part is copper; solder of four, and solder of three. It is the mixture of copper in the solder that makes raised plate come always cheaper than flat.

As mixtures of gold with a little copper are found to melt with less heat than pure gold itself, these mixtures serve as solders for gold: two pieces of fine gold are soldered by gold that has a small admixture of copper; and gold alloyed with copper is soldered by such as is alloyed with more copper: the workmen add a little silver as well as copper, and vary the proportions of the two to one another, so as to make the colour of the solder correspond as nearly as may be to that of the piece. A mixture of gold and copper is also a solder for fine copper as well as for fine gold. Gold being particularly disposed to unite with iron, proves an excellent solder for the finer kinds of iron and steel instruments.

The solder used by plumbers is made of two pounds of lead to one of block-tin. Its goodness is tried by melting it, and pouring the bigness of a crown piece on a table; for, if good, there will arise little bright shining stars therein. The solder for *copper* is made like that of the plumbers; only with copper and tin; and for very nice works, instead of tin, they sometimes use a quantity of silver. Solder for *tin* is made of two-thirds of tin and one of lead, or of equal parts of each; but where the work is any thing delicate, as in organ-pipes, where the juncture is scarce discernible, it is made of one part of bismuth and three parts of pewter. The pewterers use a kind of solder made with two parts of tin and one of bismuth; this composition melts with the least heat of any of the solders.

Silver solder is that which is made of two parts of silver and one of brass, and used in soldering those metals. Spelter solder is made of one part of brass and two of spelter or zinc, and is used by the braziers and coppersmiths for soldering brass, copper, and iron. This solder is improved by adding to each ounce of it one pennyweight of silver; but as it does not melt without a considerable degree of heat, it cannot be used when it is inconvenient to heat the work red hot; in which case copper and brass are soldered with silver.

Though spelter solder be much cheaper than silver-solder, yet workmen in many cases prefer the latter. And Mr. Boyle informs us, that he has found it to run with so moderate a heat, as not much to endanger the melting of the delicate parts of the work to be soldered; and if well made, this silver solder will lie even upon the ordinary kind itself; and so fill up those little cavities that may chance to be left in the first operation, which is not easily done without a solder more easily fusible than the first made use of. As to iron, it is sufficient that it be heated to a white heat, and the two extremities, in this state, be hammered together; by which means they become incorporated one with the other.

SOLDERING, the joining and fastening together of two pieces of the same metal, or of two different metals, by the fusion and application of some metallic composition on the extremities of the metals to be joined. To solder upon silver, brass, or iron: Take silver, five pennyweights; brass, four pennyweights; melt them together for soft solder, which runs soonest. Take silver, five pennyweights; copper, three pennyweights; melt them together for hard solder. Beat the solder thin, and lay it on the place to be soldered, which must be first fitted and bound together with wire as occasion requires; then take borax in powder, and temper it like pap, and lay it upon the solder, letting it dry; then cover it with live coals, and blow, and it will run immediately; take it presently out of the fire, and it is done. It is to be observed, that if any thing is to be soldered in two places, which cannot well be done at one time, you must first solder with the harder solder, and then with the soft; for, if it be first done with the soft, it will unsolder again before the other is softened. Let it be observed, that if you would not have your solder run about the piece that is to be soldered, you must rub such places over with chalk.—In the soldering either of gold, silver, copper, or either of the metals above mentioned, there is generally used borax in powder, and sometimes rosin. As to iron,

it is ſufficient that it be heated red-hot, and the two extremities thus hammered together, by which means they will become incorporated with each other. For the finer kinds of iron and ſteel inſtruments, however, gold proves an excellent ſolder. This metal will diſſolve twice or thrice its weight of iron in a degree of heat very far leſs than that in which iron itſelf melts: hence if a ſmall plate of gold is wrapped round the parts to be joined, and afterwards melted by a blow-pipe, it ſtrongly unites the pieces together without any injury to the inſtrument, however delicate.

SOLDIER, a military man liſted to ſerve a prince or ſtate in conſideration of a certain daily pay.

SOLDIER-*Crab*. See CANCER.

Freſh Water SOLDIER. See STRATIOTES.

SOLE, in the manege, a ſort of horn under a horſe's foot, which is much more tender than the other horn that encompaſſes the foot, and by reaſon of its hardneſs is properly called the *horn* or *hoof*.

SOLE, in ichthyology. See PLEURONECTES.

SOLEA. See SANDAL and SHOE.

SOLECISM, in grammar, a falſe manner of ſpeaking, contrary to the rules of grammar, either in reſpect of declenſion, conjugation, or ſyntax.—The word is Greek, σολοικισμος, derived from the *Soli*, a people of Attica, who being tranſplanted to Cilicia, loſt the purity of their antient tongue, and became ridiculous to the Athenians for the improprieties into which they fell.

SOLEN, RAZOR SHEATH, or *Knife-handle Shell*; a genus belonging to the claſs of *vermes*, and order of *teſtacea*. The animal is an aſcidia. The ſhell is bivalve, oblong, and opening at both ſides: the hinge has a tooth ſhaped like an awl, bent back, often double, not inſerted into the oppoſite ſhell; the rim at the ſides ſomewhat worn away, and has a horny cartilaginous hinge. There are 23 ſpecies. Three of them, viz. the ſiliqua, vagina, and enſis, are found on the Britiſh coaſts, and lurk in the ſand near the low-water mark in a perpendicular direction. When in want of food they elevate one end a little above the ſurface, and protrude their bodies far out of the ſhell. On the approach of danger they dart deep into the ſand, ſometimes two feet at leaſt. Their place is known by a ſmall dimple on the ſurface. Sometimes they are dug out with a ſhovel; at other times they are taken by ſtriking a barbed dart ſuddenly into them. When the ſea is down, theſe fiſh uſually run deep into the ſand; and to bring them up, the common cuſtom is to throw a little ſalt into the holes, on which the fiſh raiſes itſelf, and in a few minutes appears at the mouth of its hole. When half the ſhell is diſcovered, the fiſherman has nothing more to do than to take hold of it with his fingers and draw it out: but he muſt be cautious not to loſe the occaſion, for the creature does not continue a moment in that ſtate; and if by any means the fiſherman has touched it, and let it ſlip away, it is gone for ever; for it will not be decoyed again out of its hole by ſalt; ſo that there is then no way of getting it but by digging under it, and throwing it up with the ſand. The fiſh has two pipes, each compoſed of four or five rings or portions of a hollow cylinder, of unequal lengths, joined one to another; and the places where they join are marked by a number of fine ſtreaks or rays. Now the reaſon why the ſalt makes theſe creatures come up out of their holes, is, that it gives them violent pain, and even corrodes theſe pipes. This is ſomewhat ſtrange, as the creature is nouriſhed by means of ſalt-water; but it is very evident, that if a little ſalt be ſtrewed upon theſe pipes in a fiſh taken out of its habitation, it will corrode the joinings of the rings, and often make one or more joints drop off: the creature, to avoid this miſchief, ariſes out of its hole, and throws off the ſalt, and then retires back again. The uſe of theſe pipes to the animal is the ſame with that of many other pipes of a like kind in other ſhell-fiſh; they all ſerve to take in water: they are only a continuation of the outer membrane of the fiſh, and ſerve indifferently for taking in and throwing out the water, one receiving and the other diſcharging it, and either anſwering equally well to their purpoſe.

This fiſh was uſed as food by the antients; and Athenæus, from Sophron, ſpeaks of it as a great delicacy, and particularly grateful to widows. It is often uſed as food at preſent, and is brought up to table fried in eggs.

SOLEURE, a canton of Swiſſerland, which holds the 11th rank in the Helvetic confederacy, into which it was admitted in the year 1481. It ſtretches partly through the plain, and partly along the chains of the Jura, and contains about 50,000 inhabitants. It is 35 miles in length from north to ſouth, and 35 in breadth from eaſt to weſt. The ſoil for the moſt part is exceedingly fertile in corn, and the diſtricts within the Jura abound in excellent paſtures. The trade both of the town and canton is of little value, although they are very commodiouſly ſituated for an extenſive commerce. It is divided into 11 bailiwicks, the inhabitants of which are all Roman Catholics, except thoſe of the bailiwick of Buckeberg, who profeſs the reformed religion.

SOLEURE, an antient and extremely neat town of Swiſſerland, capital of the canton of the ſame name. It contains about 4000 inhabitants, and is pleaſantly ſeated on the Aar, which here expands into a noble river. Among the moſt remarkable objects of curioſity in this town is the new church of St. Urs, which was begun in 1762 and finiſhed in 1772. It is a noble edifice of a whitiſh gray ſtone, drawn from the neighbouring quarries, which admits a poliſh, and is a ſpecies of rude marble. The lower part of the building is of the Corinthian, the upper of the Compoſite order. The façade, which conſiſts of a portico, ſurmounted by an elegant tower, preſents itſelf finely at the extremity of the principal ſtreet. It coſt at leaſt 80,000l. a conſiderable ſum for ſuch a ſmall republic, whoſe revenue ſcarcely exceeds 12,000l. a year. Soleure is ſurrounded by regular ſtone fortifications, and is 20 miles north north-eaſt of Bern, 27 ſouth ſouth-weſt of Baſle, and 45 weſt of Zuric. E. lon. 7. 20. N. lat. 47. 15.

SOLFAING, in muſic, the naming or pronouncing the ſeveral notes of a ſong by the ſyllables *ut, re, mi, fa, ſol*, &c. in learning to ſing it. Of the ſeven notes in the French ſcale, *ut, re, mi, fa, ſol, la, ſi*, only four are uſed among us in ſinging, as *mi, fa, ſol, la*: their office is principally, in ſinging, that by applying them to every note of the ſcale, it may not only be pronounced with more eaſe, but chiefly that by them the tones and ſemitones of the natural ſcale may be better marked out and diſtinguiſhed. This deſign is obtained by the four ſyllables *fa, ſol, la, mi*. Thus from *fa* to *ſol* is a tone, alſo from *ſol* to *la*, and from *la* to *mi*, without diſtinguiſhing the greater or leſs tone; but from *la* to *fa*, alſo from *mi* to *fa*, is only a ſemitone. If then theſe be applied in this order, *fa, ſol, la, fa, ſol, la, mi, fa*, &c. they expreſs the natural ſeries from C; and if that be repeated to a ſecond or third octave, we ſee by them how to expreſs all the different orders of tones and ſemitones in the diatonic ſcale; and ſtill above *mi* will ſtand *fa, ſol, la*, and below it the ſame inverted *la, ſol, fa*, and one *mi* is always diſtant from another an octave; which cannot be ſaid of any of the reſt, becauſe after *mi* aſcending come always *fa, ſol, la*, which are repeated invertedly deſcending.

To conceive the uſe of this, it is to be remembered, that the firſt thing in learning to ſing, is to make one raiſe a ſcale of notes by tones and ſemitones to an octave, and deſcend again by the ſame; and then to riſe and fall by greater intervals at a leap, as thirds and fourths, &c. and to do all this by beginning at notes of different pitch. Then thoſe notes are repreſented by lines and ſpaces, to which theſe ſyllables are applied, and the learners taught to name each line and ſpace thereby, which makes what we call *ſolfaing*; the uſe whereof is, that while they are learning to tune the degrees and intervals of ſound expreſſed by notes on

a line or ſpace, or learning a ſong to which no words are applied, they may not only do it the better by means of articulate ſounds, but chiefly that by knowing the degrees and intervals expreſſed by thoſe ſyllables, they may more readily know the places of the ſemitones, and the true diſtance of the notes. See the article SINGING.

SOLFATARA, a lake of Italy, in Campagna di Roma, near Tivoli, formerly called Lacus Albulus. In this lake are certain ſubſtances which have the name of floating iſlands. They are nothing but bunches of bullruſhes, ſpringing from a ſoil formed by duſt and ſand blown from the adjacent ground, and glued together by the bitumen which ſwims on the ſurface of the lake, and the ſulphur with which its waters are impregnated. Some of thoſe iſlands are 15 yards long; and the ſoil is ſtrong enough to bear five or ſix people, who, by a pole, may move to different parts of the lake. From this lake iſſues a whitiſh muddy ſtream, which emits vapour of a ſulphureous ſmell, till it reaches the Teverone. The water of this lake has the quality of covering every ſubſtance that is put into it for a few days, with a hard white ſtony matter; but this encruſtating quality is not ſo ſtrong in the lake itſelf as in the rivulet that runs from it; and the further the water has flowed from the lake, till it is quite loſt in the Teverone, the ſtronger is this quality. Fiſh are found in the Teverone, both above and below Tivoli, till it receives this lake; after which, during the reſt of its courſe to the Tiber, there are none.

SOLICITOR, a perſon employed to take care of and manage ſuits depending in the courts of law or equity. Solicitors are within the ſtatute to be ſworn, and admitted by the judges, before they are allowed to practiſe in our courts, in like manner as attorneys. There is alſo a great officer of the law, next to the attorney-general, who is ſtyled the king's ſolicitor general; who holds his office by patent during the king's pleaſure, has the care and concern of managing the king's affairs, and has fees for pleading, beſides other fees ariſing by patents, &c. He attends on the privy-council; and the attorney-general and he were antiently reckoned among the officers of the exchequer; they have their audience, and come within the bar in all other courts.

SOLID, in philoſophy, a body whoſe parts are ſo firmly connected together, as not eaſily to give way or ſlip from each other; in which ſenſe *ſolid* ſtands oppoſed to *fluid*. Geometricians define a ſolid to be the third ſpecies of magnitude, or that which has three dimenſions, viz. length, breadth, and thickneſs or depth. Solids are commonly divided into regular and irregular. The regular ſolids are thoſe terminated by regular and equal planes, and are only five in number, viz. the tetrahedron, which conſiſts of four equal triangles; the cube or hexahedron, of ſix equal ſquares; the octahedron, of eight equal triangles; the dodecahedron, of twelve; and the icoſahedron, of twenty equal triangles. The irregular ſolids are almoſt infinite, comprehending all ſuch as do not come under the definition of regular ſolids; as the ſphere, cylinder, cone, parallelogram, priſm, parallelopiped, &c.

SOLIDS, in anatomy, are the bones, ligaments, membranes, muſcles, nerves and veſſels, &c. The ſolid parts of the body, though equally compoſed of veſſels, are different with regard to their conſiſtence; ſome being hard and others ſoft. The hard, as the bones and cartilages, give firmneſs and attitude to the body, and ſuſtain the other parts: the ſoft parts, either alone or together with the hard, ſerve to execute the animal functions. See ANATOMY.

SOLIDAGO, in botany: a genus of plants belonging to the claſs of *ſyngeneſia*, and to the order of *polygamia ſuperflua*; and in the natural ſyſtem ranging under the 49th order, *Compoſitæ*. The receptacle is naked; the pappus ſimple; the radii are commonly five; the ſcales of the calyx are imbricated and curved inward. There are 14 ſpecies; ſempervirens, canadenſis, altiſſima, lateriflora, bicolor, lanceolata, cœſia, mexicana, flexicaulis, latifolia, virgaurea, minuta, rigida, noveboracenſis. Among theſe there is only one ſpecies which is a native of Britain, the *virgaurea*, or golden rod, which grows frequently in rough mountainous paſtures and woods. The ſtems are branched, and vary from ſix inches to five feet high, but their common height is about a yard. The leaves are a little hard and rough to the touch; the lower ones oval-lanceolate, generally a little ſerrated, and ſupported on footſtalks; thoſe on the ſtalks are elliptical; the flowers are yellow, and grow in ſpikes from the alæ of the leaves; the ſcales of the calyx are lanceolate, of unequal length, and of a pale green colour; the female florets in the rays are from five to eight in number; the hermaphrodite flowers in the diſc from ten to twelve. There is a variety of this ſpecies called *cambrica* to be found on rocks from ſix inches to a foot high.

SOLIDITY, that property of matter, or body, by which it excludes all other bodies from the place which itſelf poſſeſſes; and as it would be abſurd to ſuppoſe that two bodies could poſſeſs one and the ſame place at the ſame time, it follows that the ſofteſt bodies are equally ſolid with the hardeſt. Among geometricians, the ſolidity of a body denotes the quantity or ſpace contained in it, and is called alſo its ſolid content. The ſolidity of a cube, priſm, cylinder, or parallelopiped, is had by multiplying its baſis into its height. The ſolidity of a pyramid or cone is had by multiplying either the whole baſe into a third part of the height, or the whole height into a third part of the baſe.

SOLILOQUY, a reaſoning or diſcourſe which a man holds with himſelf; or, more properly, according to Papias, it is a diſcourſe by way of anſwer to a queſtion that a man propoſes to himſelf. Soliloquies are become very common on the modern ſtage; yet nothing can be more inartificial, or more unnatural, than an actor's making long ſpeeches to himſelf, to convey his intentions to the audience. Where ſuch diſcoveries are neceſſary to be made, the poet ſhould rather take care to give the dramatic perſons ſuch confidants as may neceſſarily ſhare their inmoſt thoughts; by which means they will be more naturally conveyed to the audience; yet even this is a ſhift which an accurate poet would not have occaſion for.

SOLIPUGA, or SOLIFUGA, in natural hiſtory, the name given by the Romans to a ſmall venomous inſect of the ſpider kind, called by the Greeks *helioccntros*; both words ſignifying an animal which ſtings moſt in the country and ſeaſons where the ſun is moſt hot. Solinus makes this creature peculiar to Sardinia; but this is contrary to all the accounts given us by the antients. It is common in Africa and ſome parts of Europe. Almoſt all the hot countries produce this venomous little creature. It lies under the ſand to ſeize other inſects as they go by; and, if it meet with any uncovered part of a man, produces a wound which proves very painful: it is ſaid that the bite is abſolutely mortal, but probably this is not true. Solinus writes the word *ſoliſuga*, and ſo do many others, erroneouſly deriving the name from the notion that this animal flies from the ſun's rays, and buries itſelf in the ſand.

SOLIS (ANTONIO DE), an ingenious Spaniſh writer, of an antient and illuſtrious family, born at Placenza in Old Caſtile, in 1610. He was intended for the law; but his inclination toward poetry prevailed, and he cultivated it with great ſucceſs. Philip IV. of Spain made him one of his ſecretaries; and after his death the queen regent appointed him hiſtoriographer of the Indies, a place of great profit and honour; his Hiſtory of the Conqueſt of Mexico ſhows that ſhe could not have named a fitter perſon. He is better known by this hiſtory, at leaſt abroad, than by his poetry and dramatic writings, though in theſe he was alſo diſtinguiſhed. He turned prieſt at 57 years of age, and died in 1686.

SOLITARIES, a denomination of nuns of St. Peter of Alcantara, inſtituted in 1676, the deſign of which was to imitate the ſevere penitent life of that ſaint. Thus they are to keep a continual ſilence, never to open their mouths to a ſtranger; to employ their time wholly in ſpiritual exerciſes, and leave their temporal concerns to a number of maids, who have a particular ſuperior in a ſeparate part of the monaſtery: they always go bare-footed, without ſandals; gird themſelves with a thick cord, and wear no linen.

SOLO, in the Italian muſic, is frequently uſed in pieces conſiſting of ſeveral parts, to mark thoſe that are to perform alone; as *flauto ſolo, violino ſolo.* It is alſo uſed for ſonatas compoſed for one violin, one German flute, or other inſtrument, and a baſs; thus we ſay, *Corelli's ſolos, Geminiani's ſolos,* &c. When two or three parts play or ſing ſeparately from the grand chorus, they are called a *doi ſoli,* a *tre ſoli,* &c. Solo is ſometimes denoted by *S.*

SOLOMON, the ſon of David king of Iſrael, renowned in Scripture for his wiſdom, riches, and magnificent temple and other buildings. Towards the end of his life he ſullied all his former glory by his apoſtacy from God; from which cauſe vengeance was denounced againſt his houſe and nation. He died about 975 B. C.

SOLOMON's *Seal,* in botany; a ſpecies of CONVALLARIA.

SOLON, one of the ſeven ſages of Greece, was born at Athens about the 35th Olympiad. He diſtinguiſhed himſelf early by the greatneſs of his courage, and the brightneſs of his parts, which advantages raiſed him to the government of his country. He reſtrained luxury, aboliſhed a great many ſuperſtitious ceremonies, and permitted thoſe Athenians who had no children to leave their fortunes to whom they pleaſed. He made no laws againſt parricides, becauſe he could not think human nature capable of the crime. When Piſiſtratus became tyrant of Athens, Solon oppoſed him as much as he could; but, when he found it was to no purpoſe, he retired abroad. He died at eighty. It is ſaid that he wrote a treatiſe of laws, of eloquence, of elegies, of Iambic verſe; and that he either inſtituted or improved the Areopagus at Athens.

SOLSTICE, in aſtronomy, that time when the ſun is in one of the ſolſtitial points; that is, when he is at his greateſt diſtance from the equator; thus called becauſe he then appears to ſtand ſtill, and not to change his diſtance from the equator for ſome time; an appearance owing to the obliquity of our ſphere, and which thoſe living under the equator are ſtrangers to. The ſolſtices are two in each year; the æſtival or ſummer ſolſtice, and the hyemal or winter ſolſtice. The ſummer ſolſtice is when the ſun ſeems to deſcribe the tropic of cancer, which is on June 22, when he makes the longeſt day: the winter ſolſtice is when the ſun enters the firſt degree, or ſeems to deſcribe the tropic of capricorn, which is on December 22, when he makes the ſhorteſt day. This is to be underſtood as in our northern hemiſphere; for, in the ſouthern, the ſun's entrance into capricorn makes the ſummer ſolſtice, and that into cancer the winter ſolſtice. The two points of the ecliptic, wherein the ſun's greateſt aſcent above the equator, and his deſcent below it, are terminated, are called the *ſolſtitial points*; and a circle, ſuppoſed to paſs through the poles of the world and theſe points, is called the *ſolſtitial colure.* The ſummer ſolſtitial point is in the beginning of the firſt degree of cancer, and is called the *æſtival* or *ſummer point*; and the winter ſolſtitial point is in the beginning of the firſt degree of capricorn, and is called the *winter point.* Theſe two points are diametrically oppoſite to each other.

SOLUTION, in chemiſtry, denotes an intimate union of ſolid with fluid bodies, ſo as to form a tranſparent liquor. See DISSOLUTION and CHEMISTRY.

SOLUTION *of Metals.* See METALS *(Solution of).*

SOLVENT, that which diſſolves a ſolid body into a tranſparent fluid.

SOLWAY MOSS. See *Moving* MOSS.

SOMBRERO, the name of an uninhabited iſland in the Weſt Indies in the form of a hat, whence the name is derived. It is alſo the name of one of the Nicobar iſlands in the Eaſt Indies.

Wonderful Plant of SOMBRERO, is a ſtrange kind of ſenſitive plant growing in the Eaſt Indies, in ſandy bays and in ſhallow water. It appears like a ſlender ſtraight ſtick, but, when you attempt to touch it, immediately withdraws itſelf into the ſand. Mr. Miller gives an account of it in his deſcription of Sumatra. He ſays, the Malays call it *lalan lout,* that is, ſea graſs. He never could obſerve any tentacula; but, after many unſucceſsful attempts, drew out a broken piece about a foot long. It was perfectly ſtraight and uniform, and reſembled a worm drawn over a knitting-needle. When dry it appears like a coral.

SOMERS (JOHN), lord high chancellor of England, was born at Worceſter in 1652. He was educated at Oxford, and afterwards entered himſelf at the Middle-Temple, where he ſtudied the law with great vigour. In 1688 he was one of the counſel for the ſeven biſhops at their trial, and argued with great learning and eloquence againſt the diſpenſing power. In the convention which met by the prince of Orange's ſummons, January 22, 1689, he repreſented Worceſter; and was one of the managers for the Houſe of Commons, at a conference with the Houſe of Lords upon the word *abdicated.* Soon after the acceſſion of King William and Queen Mary to the throne, he was appointed ſolicitor-general, and received the honour of knighthood. In 1692 he was made attorney-general, and in 1693 advanced to the poſt of lord keeper of the great ſeal of England. In 1695 he propoſed an expedient to prevent the practice of clipping the coin. In 1697 he was created lord Somers, baron of Eveſham, and made lord high chancellor of England. In the beginning of 1700 he was removed from his poſt of lord chancellor, and the year after was impeached of high crimes and miſdemeanors by the Houſe of Commons, of which he was acquitted upon trial by the Houſe of Lords. He then retired to a ſtudious courſe of life, and was choſen preſident of the Royal Society. In 1706 he propoſed a bill for the regulation of the law; and the ſame year was one of the principal managers for the union between England and Scotland. In 1708 he was made lord preſident of the council; from which poſt he was removed in 1710, upon the change of the miniſtry. In the latter end of Queen Anne's reign his lordſhip grew very infirm in his health; which is ſuppoſed to be the reaſon that he held no other poſt than a ſeat at the council-table after the acceſſion of King George I. He died of an apoplectic fit in 1716. Mr. Addiſon has drawn his character very beautifully in the Freeholder.

SOMERSETSHIRE, a county of England, 65 miles long and 45 broad; bounded on the N. W. by the Briſtol Channel, on the N. by Glouceſterſhire, on the E. by Wiltſhire, on the S. E. by Dorſetſhire, and on the S. W. by Devonſhire. It lies in the dioceſes of Briſtol, and of Bath and Wells; contains 42 hundreds, three cities, 31 market towns, and 385 pariſhes; and ſends 18 members to parliament. The air in the lower grounds is univerſally mild, and generally wholeſome. The ſoil in the N. E. quarter is in general ſtony, and poſſeſſes a lofty mineral tract, called the Mendip Hills. Toward the centre, where its principal rivers unite, are fens and marſhy moors of great extent. On the W. ſide are the Quantock Hills, with many downs and open heaths; and in the N. W. corner is the black ſterile region of Exmoor. The S. part, toward Dorſetſhire, is high, but well cultivated; and throughout the county, eſpecially in its S. W. quarter, vales of the greateſt fertility are interſperſed. The principal rivers are the Parret, Ivel, Thone, Brent, and Avon. The Mendip Hills afford abundance of coal, lead, ca-

lamine, copper, manganefe, bole, and red ochre. Chedder is celebrated for its cheefes. Cattle nearly equal in fize to the Lincolnfhire are fed in fine meadows about the head of the Parret. The beft goofe feathers for beds come from the marfhes. Cider is a common product of this county, and it has a confiderable fhare in the woollen manufactures. Briftol is the capital of this county with refpect to fize, population, and commerce; but Bath is the great mart for health and pleafure.

SOMERTON, an antient town in Somerfetfhire, from whence the county derives its name. It is 123 miles from London; it has five ftreets, containing 251 houfes, which are moftly built of the blue ftone from the quarries in the neighbourhood. It is governed by conftabl s, and has a hall for petty feffions. The market for corn is confiderable, and it has feveral fairs for cattle. The church has, what is not very frequent, an *octangular* tower with fix bells. N. lat. 51. 4. W. lon. 1. 53.

SOMNAMBULI, perfons who walk in their fleep. See SLEEPWALKERS.

SOMNER (WILLIAM), an eminent Englifh antiquary, was born at Canterbury in 1606. His firft treatife was The Antiquities of Canterbury, which he dedicated to Archbifhop Laud. He then applied himfelf to the ftudy of the Saxon language; and having made himfelf mafter of it, he perceived that the old gloffary prefixed to Sir Roger Twifden's edition of the laws of King Henry I. printed in 1644, was faulty in many places; he therefore added to that edition notes and obfervations valuable for their learning, with a very ufeful gloffary. His Treatife of Gavelkind was finifhed about 1648, though not publifhed till 1660. Our author was zealoufly attached to King Charles I. and in 1648 he publifhed a poem on his fufferings and death. His fkill in the Saxon tongue led him to inquire into moft of the European languages antient and modern. He affifted Dugdale and Dodfworth in compiling the *Monafticon Anglicanum*. His Saxon Dictionary was printed at Oxford in 1659. He died in 1669.

SON, an appellation given to a male child confidered in the relation he bears to his parents. See PARENT and FILIAL *Piety*.

SONATA, in mufic, a piece or compofition, intended to be performed by inftruments only; in which fenfe it ftands oppofed to *cantata;* or a piece defigned for the voice. See CANTATA.

The fonata, then, is properly a grand, free, humorous compofition, diverfified with a great variety of motions and expreffions, extraordinary and bold ftrokes, figures, &c. And all this purely according to the fancy of the compofer; who, without confining himfelf to any general rules of counterpoint, or to any fixed number or meafure, gives a loofe to his genius, and runs from one mode, meafure, &c. to another, as he thinks fit. This fpecies of compofition had its rife about the middle of the 17th century; thofe who have moft excelled in it were Baffani and Corelli. We have fonatas of 1, 2, 3, 4, 5, 6, 7, and even 8 parts, but ufually they are performed by a fingle violin, or with two violins, and a thorough bafs for the harpfichord; and frequently a more figured bafs for the bafs viol, &c.

There are a thoufand different fpecies of fonatas; but the Italians ufually reduce them to two kinds. *Suonate de chiefa*, that is, fonatas proper for church mufic, which ufually begin with a grave folemn moti n, fuitable to the dignity and fanctity of the place and the fervice, after which they ftrike into a brifker, gayer, and richer manner, Thefe are what they more peculiarly call fonatas. *Suonate de camera*, or fonatas for the chamber, are properly feriefes of feveral little pieces, for dancing, only compofed to the fame tune. They ufually begin with a prelude or little fonata, ferving as an introduction to all the reft: afterwards come the allemand, pavane, courant, and other ferious dances; then jigs, gavots, minuets, chacons, paffecailles, and other gayer airs: the whole compofed in the fame tune or mode.

SONCHUS, SOW-THISTLE, in botany: A genus of plants belonging to the clafs of *fyngenefia*, and to the order of *polygamia æqualis*; and in the natural fyftem ranged under the 49th order, *Compofitæ*. The receptacle is naked; the calyx is imbricated, bellying and conical; the down of the feed is fimple, feffile, and very foft; the feed is oval and pointed. There are 13 fpecies; the maritimus, paluftris, fruticofus, arvenfis, oleraceus, tenerrimus, plumieri, alpinus, floridanus, fibiricus, tartaricus, tuberofus, and canadenfis. Four of thefe are natives of Britain.—1. *Paluftris*, marfh fow-thiftle. 2. *Arvenfis*, corn fow-thiftle. 3. *Oleraceus*, common fow-thiftle. 4. *Alpinus*, blue-flowered fow-thiftle. The ftem is erect, purplifh, branched, or fimple, from three to fix feet high: the leaves are large, fmooth, and finuated; the extreme fegment large and triangular: the flowers are blue, and grow on hairy vifcid pedicles, in long fpikes: the calyx is brown. This fpecies is found in Northumberland.

SONG, in poetry, a little compofition, confifting of eafy and natural verfes, fet to a tune in order to be fung. See POETRY.

SONG, in mufic, is applied in general to a fingle piece of mufic, whether contrived for the voice or an inftrument. See AIR.

SONG *of Birds*, is defined by the honourable Daines Barrington to be a fucceffion of three or more different notes, which are continued without interruption, during the fame interval, with a mufical bar of four crotchets in an adagio movement, or whilft a pendulum fwings four feconds. It is affirmed, that the notes of birds are no more innate than language in man, and that they depend upon imitation, as far as their organs will enable them to imitate the founds which they have frequent opportunities of hearing: and their adhering fo fteadily, even in a wild ftate, to the fame fong, is owing to the neftlings attending only to the inftruction of the parent bird, whilft they difregard the notes of all others that may perhaps be finging round them.

Birds in a wild ftate do not commonly fing above 10 weeks in the year, whereas birds that have plenty of food in a cage fing the greateft part of the year: and we may add, that the female of no fpecies of birds ever fings. This is a wife provifion of nature, becaufe her fong would difcover her neft. In the fame manner, we may rationally account for her inferiority in plumage. The faculty of finging is confined to the cock birds; and accordingly Mr. Hunter, in diffecting birds of feveral fpecies, found the mufcles of the larynx to be ftronger in the nightingale than in any other bird of the fame fize; and in all thofe inftances, where he diffected both cock and hen, the fame mufcles were ftronger in the cock. To the fame purpofe, it is an obfervation as antient as the time of Pliny, that a capon does not crow.

Some have afcribed the finging of the cock bird in the fpring folely to the motive of pleafing his mate during incubation; others, who allow that it is partly for this end, believe it is partly owing alfo to another caufe, viz. the great abundance of plants and infects in the fpring, which, as well as feeds, are the proper food of finging birds at that time of the year.

Mr. Barrington remarks, that there is no inftance of any finging bird which exceeds our blackbird in fize; and this, he fuppofes, may arife from the difficulty of its concealing itfelf, if it called the attention of its enemies, not only by its bulk, but by the proportionable loudnefs of its notes. This writer further obferves, that fome paffages of the fong in a few kinds of birds correfponds with the intervals of our mufical fcale, of which the cuckoo is a ftriking and known inftance; but the greater part of their fong cannot be reduced to a mufical fcale; partly, becaufe the rapidity is often fo great, and it is alfo fo uncertain when they may ftop, that we cannot reduce the

paſſages to form a muſical bar in any time whatſoever; partly alſo, becauſe the pitch of moſt birds is conſiderably higher than the moſt ſhrill notes of thoſe inſtruments which have the greateſt compaſs; and principally, becauſe the intervals uſed by birds are commonly ſo minute, that we cannot judge of them from the more groſs intervals into which we divide our muſical octave. This writer apprehends, that all birds ſing in the ſame key; and in order to diſcover this key, he informs us, that the following notes have been obſerved in different birds, A, B flat, C, D, F, and G; and therefore E only is wanting to complete the ſcale: now theſe intervals, he ſays, can only be found in the key of F with a ſharp third, or that of G with a flat third; and he ſuppoſes it to be the latter, becauſe, admitting that the firſt muſical notes were learned from birds, thoſe of the cuckoo, which have been moſt attended to, form a flat third, and moſt of our compoſitions are in a flat third, where muſic is ſimple, and conſiſts merely of melody. As a further evidence that birds ſing always in the ſame key, it has been found by attending to a nightingale, as well as a robin which was educated under him, that the notes reducible to our intervals of the octave were always preciſely the ſame.

Moſt people, who have not attended to the notes of birds, ſuppoſe, that every ſpecies ſing exactly the ſame notes and paſſages: but this is by no means true; though it is admitted that there is a general reſemblance. Thus the London bird-catchers prefer the ſong of the Kentiſh goldfinches, and Eſſex chaffinches; and ſome of the nightingale-fanciers prefer a Surry bird to thoſe of Middleſex.

Of all ſinging birds, the ſong of the nightingale has been moſt univerſally admired; and its ſuperiority (deduced from a caged bird) conſiſts in the following particulars: its tone is much more mellow than that of any other bird, though at the ſame time, by a proper exertion of its muſical powers, it can be very brilliant. Another point of ſuperiority is its continuance of ſong without a pauſe, which is ſometimes no leſs than 20 ſeconds; and when reſpiration becomes neceſſary, it takes it with as much judgment as an opera-ſinger. The ſkylark in this particular, as well as in compaſs and variety, is only ſecond to the nightingale. The nightingale alſo ſings (if the expreſſion may be allowed) with ſuperior judgment and taſte. Mr. Barrington has obſerved, that his nightingale, which was a very capital bird, began ſoftly like the antient orators; reſerving its breath to ſwell certain notes, which by theſe means had a moſt aſtoniſhing effect. This writer adds, that the notes of birds, which are annually imported from Aſia, Africa, and America, both ſingly and in concert, are not to be compared to thoſe of European birds.

The following table, formed by Mr. Barrington, agreeably to the idea of M. de Piles in eſtimating the merits of painters, is deſigned to exhibit the comparative merit of the Britiſh ſinging birds; in which 20 is ſuppoſed to be the point of abſolute perfection.

	Mellowneſs of tone.	Sprightly notes.	Plaintive notes.	Compaſs.	Execution.
Nightingale - -	19	14	19	19	19
Sky-lark - -	4	19	4	18	18
Wood-lark - -	18	4	17	12	8
Tit-lark - -	12	12	12	12	12
Linnet - -	12	16	12	16	18
Goldfinch - -	4	19	4	12	12
Chaffinch - -	4	12	4	8	8
Greenfinch - -	4	4	4	4	6
Hedge-ſparrow -	6	0	6	4	4
Aberdavine or ſiſkin	2	4	0	4	4
Red-poll - -	0	4	0	4	4
Thruſh - -	4	4	4	4	4
Blackbird - -	4	4	0	2	2
Robin - -	6	16	12	12	12
Wren - -	0	12	0	4	4
Reed ſparrow -	0	4	0	2	2
Black-cap, or Norfolk mock nightingale	14	12	12	14	14

SONNA, a book of Mahometan traditions, which all the orthodox muſſulmen are required to believe.

SONNERATIA, in botany; a genus of plants belonging to the claſs of *icoſandria*, and to the order of *monogynia*. The calyx is cut into ſix ſegments; the petals are ſix; the capſule is multilocular and ſucculent; and the cells contain many ſeeds. The only ſpecies is the *acida*.

SONNET, in poetry, a compoſition contained in 14 verſes, viz. two ſtanzas or meaſures of four verſes each, and two of three, the eight firſt verſes being all in three rhimes.

SONNITES, among the Mahometans, an appellation given to the orthodox muſſulmen or true believers; in oppoſition to the ſeveral heretical ſects, particularly the Shiites or followers of Ali.

SOOJU, or Soy. See Dolichos.

SOONTABURDAR, in the Eaſt Indies; an attendant, who carries a ſilver bludgeon in his hand about two or three feet long, and runs before the palanquin. He is inferior to the Chubdar; the propriety of an Indian newaury requiring two Soontaburdars for every Chubdar in the train. The Chubdar proclaims the approach of viſitors, &c. He generally carries a large ſilver ſtaff about five feet long in his hands: and among the Nabobs he proclaims their praiſes aloud as he runs before their palanquins.

SOOT, a volatile matter ariſing from wood and other fuel along with the ſmoke; or rather, it is the ſmoke itſelf condenſed and gathered to the ſides of the chimney. Though once volatile, however, ſoot cannot be again reſolved into vapour; but, if diſtilled by a ſtrong fire, yields a volatile alkali and empyreumatic oil, a conſiderable quantity of fixed matter remaining at the bottom of the diſtilling veſſel. If burnt in an open fire, it flames with a thick ſmoke, whence other ſoot is produced. It is uſed as a material for making ſal-ammoniac, and as a manure.

Soot-*Black*. See Colour-*Making*.

SOPHI, or Sofi, a title given to the emperor of Perſia; importing as much as wiſe, ſage, or philoſopher. The title is by ſome ſaid to have taken its riſe from a young ſhepherd named *Sopbi*, who attained to the crown of Perſia in 1370; others derive it from the *ſophoi* or ſages antiently called *magi*. Voſſius gives a different account of the word: Sophi in Arabic, he obſerves, ſignifies *wool;* and he adds, that it was applied by the Turks out of deriſion to the kings of Perſia ever ſince Iſhmael's time; becauſe, according to their ſcheme of religion, he is to wear no other covering on his head but an ordinary red woollen ſtuff; whence the Perſians are alſo called *bezelbaſchs*, q. d. *red-heads*. But Bochart aſſures us, that ſophi in the original Perſian language ſignifies one that is pure in his religion, and who prefers the ſervice of God in all things: and derives it from an order of religious called by the ſame name. The ſophis value themſelves on their illuſtrious extraction. They are deſcended in a right line from Houſſein, ſecond ſon of Ali, Mahomet's couſin, and Fatima, Mahomet's daughter.

Sophis, or *Sofees*, a kind of order of religious among the Mahometans in Persia, answering to what are otherwise called *dervises*, and among the Arabs and Indians *faquirs*. Some will have them called sophis from a kind of coarse camlet which they wear called *souf*, from the city Souf in Syria, where it is principally manufactured. The more eminent of those sophis are complimented with the title *schiek*, that is, *reverend*, much as in Romish countries the religious are called *reverend fathers*. Schiek sophi, who laid the foundation of the grandeur of the royal house of Persia, was the founder, or rather the restorer, of this order: Ishmael, who conquered Persia, was himself a sophi, and greatly valued himself on his being so. He chose all the guards of his person from among the religious of this order; and would have all the great lords of his court sophis. The king of Persia is still grand master of the order; and the lords continue to enter into it, though it be now fallen under some contempt.

SOPHISM, in logic, a specious argument having the appearance of truth, but leading to falsehood. Sophisms are reduced by Aristotle into eight classes, an arrangement so just and comprehensive, that it is equally proper in present as in former times. 1. *Ignoratio elenchi*, in which the sophist seems to determine the question, while he only does it in appearance. Thus the question, "Whether excess of wine be hurtful?" seems to be determined by proving, that wine revives the spirits and gives a man courage: but the principal point is here kept out of sight; for still it may be hurtful to health, to fortune, and reputation. 2. *Petitio principii*, a begging of the question, or taking for granted that which remains to be proved, as if any one should undertake to prove that the soul is extended through all the parts of the body, because it resides in every member. This is affirming the same thing in different words. 3. Reasoning in a circle; as when the Roman Catholics prove the Scriptures to be the word of God by the authority of the church, and the authority of the church from the Scriptures. 4. *Non causa pro causa*, or the assigning of a false cause to any effect. Thus the supposed principle, that nature abhors a vacuum, was applied to explain the rising of water in a pump before Galileo discovered that it was owing to the pressure of the atmosphere. In this way the vulgar ascribe accidents to divine vengeance, and the heresies and infidelity of modern times are said to be owing to learning. 5. *Fallacia accidentis*, in which the sophist represents what is merely accidental as essential to the nature of the subject. This is nearly allied to the former, and is committed by the Mahometans and Roman Catholics. The Mahometans forbid wine, because it is sometimes the occasion of drunkenness and quarrels; and the Roman Catholics prohibit the reading of the Bible, because it has sometimes promoted heresies. 6. By deducing an universal assertion from what is true only in particular circumstances, and the reverse; thus some men argue, "transcribers have committed many errors in copying the Scriptures, therefore they are not to be depended on." 7. By asserting any thing in a compound sense which is only true in a divided sense; so when the Scriptures assure us, that the worst of sinners may be saved, it does not mean that they shall be saved while they remain sinners, but that if they repent they may be saved. 8. By an abuse of the ambiguity of words. Thus Mr. Hume reasons in his Essay on Miracles: "Experience is our only guide in reasoning concerning matters of fact; now we know from experience, that the laws of nature are fixed and invariable. On the other hand, testimony is variable and often false; therefore, since our evidence for the reality of miracles rests solely on testimony which is variable, and our evidence for the uniformity of the laws of nature is invariable, miracles are not to be believed." The sophistry of this reasoning depends on the ambiguity of the word *experience*, which in the first proposition signifies the maxims which we form from our own observation and reflection; in the second it is confounded with testimony; for it is by the testimony of others, as well as our own observation, that we learn whether the laws of nature are variable or invariable. The Essay on Miracles may be recommended to those who wish to see more examples of sophistry; as we believe most of the eight species of sophisms which we have mentioned are well illustrated by examples in that essay.

SOPHIST, an appellation assumed in the early periods of Grecian history by those who devoted their time to the study of science. This appellation appearing too arrogant to Pythagoras, he declined it, and wished to be called a *philosopher*; declaring that, though he could not consider himself as a wise man, he was indeed a lover of wisdom. True wisdom and modesty are generally united. The example of Pythagoras was followed by every man of eminence; while the name *Sophist* was retained only by those who with a pomp of words made a magnificent display of wisdom upon a very slight foundation of knowledge. Those men taught an artificial structure of language, and a false method of reasoning, by which, in argument, the worse might be made to appear the better reason (see Sophism). In Athens they were long held in high repute, and supported, not only by contributions from their pupils, but by a regular salary from the state. They were among the bitterest enemies of the illustrious Socrates, because he embraced every opportunity of exposing to contempt and ridicule their vain pretensions to superior knowledge, and the pernicious influence of their doctrines upon the taste and morals of the Athenian youth.

SOPHISTICATION, the mixing of any thing with what is not genuine; a practice too common in the making up of medicines for sale; as also among vintners, distillers, and others, who are accused of sophisticating their wines, spirits, oils, &c. by mixing with them cheaper and coarser materials; and in many cases the cheat is carried on so artfully as to deceive the best judges.

SOPHOCLES, an antient Greek tragedian, was born at Athens the 2d year of the 71st Olympiad, that is, near 500 years before Christ. His father Sophilus, of whose condition nothing certain can be collected, educated him in all the politer accomplishments: he learned music and dancing of Lamprus, as Athenæus says, and had Æschylus for his master in poetry. He was about sixteen, at the time of Xerxes's expedition into Greece: and being at Salamis, where the Grecians were employed in fixing the monuments of the victory, after the flight of that prince, and the entire rout of all his generals, he is reported to have appeared at the head of a choir of noble boys (for he was very handsome) all naked and washed over with oil and essence; and, while they sung a pæan, to have guided the measures with his harp.

Cimon, the Athenian general, having found Theseus's bones, and bringing the noble reliques with solemn pomp into the city, a contention of tragedians was appointed; as was usual on extraordinary occasions. Æschylus and Sophocles were the two great rivals; and the prize was adjudged to Sophocles, although it was the first play he ever presented in public, and only five-and-twenty. This opinion of his extraordinary worth opened him a free passage to the highest offices in the state. We find him, in Strabo, going in joint commission with Pericles to reduce the rebellious Samians. This great man continued the profession of his art, even to his latest years; but, it seems, his sons resented this severe application to writing as a manifest neglect of his family and estate. On this account, they at last brought the business into court before the judges; and petitioned the guardianship of their father, as one that was grown delirious, and therefore incapable of managing his concerns. The old gentleman, being acquainted with the motion, in order to his defence, came presently into court, and recited his "Œdipus at Colonus," a tragedy he had just before finished; and then desired

to know, whether that piece looked like the work of a madman? There needed no other plea in his favour; for the judges, admiring and applauding his wit, not only acquitted him of the charge, but voted his sons madmen for accusing him. The general story of his death goes, that, having exhibited his last play, and getting the prize, he fell into such a transport of joy as carried him off; though Lucian affirms him to have been choked by a grape-stone, like Anacreon. He died at Athens in his 90th year, as some say; in his 95th, according to others.

Out of above 100 tragedies, which Sophocles wrote, only seven remain. They have been frequently published, separately and together; with the Greek Scholia and Latin versions, and without.

SOPHORA, in botany: A genus of plants belonging to the class of *decandria*, and to the order of *monogynia*; and in the natural system arranged under the 32d order, *Papilionaceæ*. The calyx is quinquedentate and gibbous above: the corolla is papilionaceous; the wings being of the same length with the vexillum: the seed is contained in a legumen. There are 16 species; the tetraptera, microphylla, flavescens, alopecuroides, tomentosa, occidentalis, capensis, aurea, japonica, genistoides, australis, tinctoria, alba, lupinoides, biflora, and hirsuta.

SOPORIFIC, or SOPORIFEROUS, a medicine that produces sleep. Such are opium, laudanum, the seed of poppies, &c. The word is formed from the Latin *sopor* "sleep." The Greeks in place of it use the word *hypnotic*.

SORBONNE, or SORBON, the house or college of the faculty of theology established in the university of Paris. It was founded in 1252 by St. Louis, or rather by Robert de Sorbon his confessor and almoner, first canon of Cambray, and afterwards of the church of Paris; who gave his own name to it, which he himself took from the village of Sorbon or Serbon, near Sens, where he was born. The foundation was laid in 1250; queen Blanche, in the absence of her husband, furnishing him with a house which had formerly been the palace of Julian the apostate, of which some remains are still seen. Afterwards the king gave him all the houses he had in the same place, in exchange for some others. The college has been since magnificently rebuilt by the cardinal de Richelieu. The design of its institution was for the use of poor students in divinity. There are lodgings in it for 36 doctors, who are said to be of the *society of the Sorbonne*; those admitted into it without being doctors were said to be of the *hospitality of the Sorbonne*. Six regent doctors formerly held lectures every day for an hour and a half each; three in the morning, and three in the afternoon.

SORBONNE, was also used in general for the whole faculty of theology at Paris; as the assemblies of the whole body were held in the house of the Sorbonne; and the bachelors of the other houses of the faculty, as the house of Navarre, &c. came thither to hold their *sorbonnique*, or act for being admitted doctor in divinity.

SORBUS, SERVICE-TREE, in botany; a genus of plants belonging to the class of *icosandria*, and to the order of *trigynia*. The calyx is quinquefid; the petals are five; the berry is below the flower, soft, and containing three seeds. There are three species; the aucuparia, domestica, and hebrida.

1. The *aucuparia*, mountain-ash, quicken tree, quick-beam, or roan-tree, rises with a straight upright stem and regular branching head, twenty or thirty feet high or more, covered with a smooth grayish brown bark; pinnated leaves of eight or ten pair of long, narrow, serrated folioles, and an odd one, smooth on both sides; and large umbellate clusters of white flowers at the sides and ends of the branches, succeeded by clusters of fine red berries, ripe in autumn and winter. There is a variety with yellow striped leaves. This species grows wild in many parts of this island, in mountainous places, woods, and hedge-rows, often growing to the size of timber; and is admitted into most ornamental plantations, for the beauty of its growth, foliage, flowers, and fruit; the latter, in particular, being produced in numerous red large bunches all over the tree, exhibit a fine appearance in autumn and winter, till devoured by the birds, especially the blackbird and thrush, which are so allured by this fruit as to flock from all parts and feed on it voraciously. In the island of Jura the juice of the berries is employed as an acid for punch. It is probable that this tree was in high esteem with the Druids; for it is more abundant than any other tree in the neighbourhood of those Druidical circles of stones so common in North Britain.

2. The *domestica*, or cultivated service-tree, with eatable fruit, grows with an upright stem, branching 30 or 40 feet high or more, having a brownish bark, and the young shoots in summer covered with a mealy down; pinnated leaves of eight or ten pair of broadish deeply serrated lobes and an odd one, downy underneath, and large umbellate clusters of white flowers at the sides and ends of the branches, succeeded by bunches of large, fleshy, edible red fruit, of various shapes and sizes. This tree is a native of the southern warm parts of Europe, where its fruit is used at table as a dessert, and it is cultivated here in many of our gardens, as a fruit-tree and as an ornament to diversify hardy plantations.

3. The *hebrida*, or mongrel service-tree of Gothland, grows twenty or thirty feet high; it has half-pinnated leaves, very downy underneath; and clusters of white flowers, succeeded by bunches of round reddish berries in autumn.

SORCERY, or MAGIC; the power which some persons were formerly supposed to possess of commanding the devil and the infernal spirits by skill in charms and invocations, and of soothing them by fumigations. Sorcery is therefore to be distinguished from witchcraft; an art which was supposed to be practised, not by commanding evil spirits, but by compact with the devil. As an instance of the power of bad smells over dæmons or evil spirits, we may mention the flight of the evil spirit mentioned in Tobit into the remote parts of Egypt, produced, it is said, by the smell of the burnt liver of a fish. Lilly informs us, that one Evans having raised a spirit at the request of Lord Bothwell and Sir Kenelm Digby, and forgetting a fumigation, the spirit, vexed at the disappointment, pulled him without the circle, and carried him from his house in the Minories into a field near Battersea Causeway. King James, in his *Dæmonologia*, has given a very full account of the art of sorcery.

Another mode of consulting spirits was by the beryl, by means of a speculator or seer; who, to have a complete sight, ought to be a pure virgin, a youth who had not known woman, or at least a person of irreproachable life and purity of manners. The method of such consultation is this: The conjuror having repeated the necessary charms and adjurations, with the litany or invocation peculiar to the spirits or angels he wishes to call (for every one has his particular form), the seer looks into a crystal or beryl, wherein he will see the answer, represented either by types or figures; and sometimes, though very rarely, will hear the angels or spirits speak articulately. Their pronunciation, is as Lilly says, like the Irish, much in the throat. Lilly describes one of these beryls or crystals. It was, he says, as large as an orange, set in silver, with a cross at the top, and round about engraved the names of the angels Raphael, Gabriel, and Uriel. A delineation of another is engraved in the frontispiece to Aubery's Miscellanies.

These sorcerers or magicians do not always employ their art to do mischief; but, on the contrary, frequently exert it to cure diseases inflicted by witches; to discover thieves; recover stolen goods; to foretel future events, and the state of absent friends. On this account they are frequently called *white witches*. See MAGIC, WITCHCRAFT, &c.

Our forefathers were strong believers when they enacted, by statute 33 Hen. VIII. c. 8. all witchcraft and sorcery to be

felony without benefit of clergy; and again, by ſtatute 1 Jac. I. c. 12. that all perſons invoking any evil ſpirit, or conſulting, covenanting with, entertaining, employing, feeding, or rewarding any evil ſpirit; or taking up dead bodies from their graves to be uſed in any witchcraft, ſorcery, charm, or inchantment; or killing or otherwiſe hurting any perſon by ſuch infernal arts; ſhould be guilty of felony without benefit of clergy, and ſuffer death. And if any perſon ſhould attempt by ſorcery to diſcover hidden treaſure, or to reſtore ſtolen goods, or to provoke unlawful love, or to hurt any man or beaſt, though the ſame were not effected, he or ſhe ſhould ſuffer impriſonment and pillory for the firſt offence, and death for the ſecond. Theſe acts continued in force till lately, to the terror of all antient females in the kingdom; and many poor wretches were ſacrificed thereby to the prejudice of their neighbours and their own illuſions, not a few having by ſome means or other confeſſed the fact at the gallows. But all executions for this dubious crime are now at an end; our legiſlature having at length followed the wiſe example of Louis XIV. in France, who thought proper by an edict to reſtrain the tribunals of juſtice from receiving informations of witchcraft. And accordingly it is with us enacted, by ſtature 9 Geo. II. c. 5. that no proſecution ſhall for the future be carried on againſt any perſon for conjuration, witchcraft, ſorcery, or inchantment: But the miſdemeanor of perſons pretending to uſe witchcraft, tell fortunes, or diſcover ſtolen goods, by ſkill in the occult ſciences, is ſtill deſervedly puniſhed with a year's impriſonment, and ſtanding four times in the pillory.

SOREX, the SHREW, in natural hiſtory; a genus of animals belonging to the claſs of *mammalia*, and order of *feræ*. It has two long fore-teeth in the upper jaw, which are divided into two points; in the lower jaw are two or four fore-teeth, the two middle ones, in the latter caſe, being ſhorter than the others: On each ſide in both jaws are two or more tuſks: the grinders are knobbed. The animals of this genus have in general thick clumſy bodies, and five toes on each of their feet; the head reſembles that of the mole, being thick at the fore-head, much elongated, and ending in a conical ſnout, and having very ſmall eyes; in other circumſtances of general figure they reſemble the murine tribe of quadrupeds. They burrow in the ground, ſome ſpecies living moſtly about the ſides of waters; and moſt of them feeding on worms and inſects. There are 16 ſpecies; of which the moſt remarkable are,

1. The *araneus*, or field ſhrew-mouſe, with ſhort rounded ears; eyes ſmall, and almoſt hid in the fur; noſe long and ſlender, upper part the longeſt; head and upper part of the body of a browniſh red; belly of a dirty white; length from noſe to tail, two inches and a half; tail one and a half. Inhabits Europe: lives in old walls and heaps of ſtones, or holes in the earth; is frequently near hay-ricks, dung-hills, and neceſſary-houſes; lives on corn, inſects, and any filth; is often obſerved rooting in ordure like a hog; from its food, or the places it frequents, has a diſagreeable ſmell; cats will kill, but not eat it: it brings four or five young at a time. The antients believed it was injurious to cattle; an error now detected. There ſeems to be an annual mortality of theſe animals in Auguſt, numbers being then found dead in the paths.

2. The *fodiens*, or water-ſhrew, has a long ſlender noſe; very minute ears; very ſmall eyes, hid in the fur; colour of the head and upper part of the body black; throat, breaſt and belly, of a light aſh-colour; beneath the tail, a triangular duſky ſpot; much larger than the laſt; length, from noſe to tail, three inches three quarters; tail, two inches. Inhabits Europe: long ſince known in England, but loſt till May 1768, when it was diſcovered in the fens near Reveſley Abbey, Lincolnſhire; burrow[illegible] banks near the water; is called by the fenmen the *b.* [illegible]

3. The *minutus*, or minute ſhrew, has a head near as big as the body: very ſlender noſe; broad ſhort naked ears; whiſkers reaching to the eyes; eyes ſmall, and capable of being drawn in; hair very fine and ſhining; gray above, white beneath; no tail; the leaſt of quadrupeds, according to Linnæus. Inhabits Siberia; lives in a neſt made of lichens, in ſome moiſt place beneath the roots of trees; feeds on ſeeds, digs, and runs ſwiftly, and has the voice of a bat.

4. The *tucan* or Mexican ſhrew, has a ſharp noſe; ſmall round ears; without ſight; two long fore-teeth above and below; thick, fat, and fleſhy body; ſhort legs, ſo that the belly almoſt touches the ground; long crooked claws; tawny hair; ſhort tail; length, from noſe to tail, nine inches. Inhabits Mexico; burrows, and makes ſuch a number of cavities, that travellers can ſcarce tread with ſafety; if it gets out of its hole does not know how to return, but begins to dig another; grows very fat, and is eatable; feeds on roots, kidney-beans, and other ſeeds. M. de Buffon thinks it a mole; but it ſeems more properly to belong to the genus of ſorex.

SORITES, in logic, a ſpecies of reaſoning in which a great number of propoſitions are linked together, that the predicate of the one becomes continually the ſubject of the next following, till at laſt a concluſion is formed by bringing together the ſubject of the firſt propoſition and the predicate of the laſt. Such was that merry argument of Themiſtocles, to prove that his little ſon under ten years old governed the whole world. Thus: *My ſon governs his mother; his mother me; I the Athenians; the Athenians the Greeks; Greece commands Europe; Europe the whole world: therefore my ſon commands the whole world.* See LOGIC.

SORREL, in botany, a ſpecies of the RUMEX, which grows in paſtures and meadows, and is well known. The natives of Lapland boil large quantities of the leaves in water, and mix the juice when cold with the milk of their rein-deers, which they eſteem an agreeable and wholeſome food. The Dutch are ſaid to cultivate this plant for its uſefulneſs in the dyeing of woollen cloths black; and we know that by means of the common broad-leaved ſorrel an excellent black colour is in many places of Scotland given to woollen ſtuffs without the aid of copperas. As this mode of dyeing does not in the ſmalleſt degree injure the texture of the cloth, which continues to the laſt ſoft and ſilky, without that hardneſs to the touch which it acquires when dyed black by means of copperas, our readers will probably thank us for the following receipt, with which we have been favoured by a learned phyſician:

Let the ſtuff to be dyed be well waſhed with ſoap and water, and afterwards completely dried. Then of the common broad-leaved ſorrel boil as much as ſhall make an acid decoction of ſufficient quantity to let the ſtuff to be dyed lie in it open and eaſy to be ſtirred. The greater quantity of ſorrel that is uſed, the better will the colour be; and therefore if the pot or cauldron will not hold enough at once, when part has been ſufficiently boiled, it muſt be taken out and wrung, and a freſh quantity be boiled in the ſame juice or decoction. When the liquor is made ſufficiently acid, ſtrain it from the ſorrel through a ſieve, put the cloth or yarn into it, and let it boil for two hours, ſtirring it frequently. If ſtockings be among the ſtuff to be dyed, it will be expedient, after they have been an hour in the boiling liquor, to turn them inſide out, and at the end of the ſecond hour let the whole be poured into a tub or any other veſſel. The pot or cauldron muſt then be waſhed, and water put into it, with half a pound of logwood chips for every pound of dry yarn or cloth. The logwood and water ſhould boil ſlowly for four hours; and then the cloth or yarn being wrung from the ſour liquor, and put into the logwood decoction, the whole muſt be ſuffered to boil ſlowly for four hours, ſtockings, if there be any, being turned inſide out at the end of two hours. Of this laſt decoction there muſt as

of the former be enough to let the cloth lie open and easy to be stirred while boiling. At the end of the four hours the cloth must be taken out, and among the boiling liquor, first removed from the fire, must be poured a Scotch pint or English gallon of stale urine for every pound of dry cloth or other stuff to be dyed. When this compound liquor has been stirred and become cold, the cloth must be put into it and suffered to remain well covered for 12 hours, and then dried in the shade; after which, to divest it of smell or any other impurity, it may be washed in cold water, and dried for use.

Wood-Sorrel, in botany. See Oxalis.

Sorrel-*Colour*, in the manege, is a reddish colour, generally thought to be a sign of a good horse.

SORRENTO, a sea-port town of the kingdom of Naples, with an archbishop's see. It is seated in a peninsula, on the bay of Naples, at the foot of a mountain of the same name, 17 miles south-east of Naples. It is the birth-place of Torquato Tasso. E. long. 14. 24. N. lat. 40. 36.

SORTILEGE (*Sortilegium*), a species of divination performed by means of *sortes* or lots. The *sortes Prenestinæ*, famous in antiquity, consisted in putting a number of letters, or even whole words, into an urn; and then, after shaking them together, they were thrown on the ground; and whatever sentences could be made out from them, constituted the answer of the oracle. To this method of divination succeeded that which has been called the *sortes Homerianæ* and *sortes Virgilianæ*, a mode of inquiring into futurity, which undoubtedly took its rise from a general custom of the oracular priests of delivering their answers in verse; it subsisted a long time among the Greeks and Romans; and being from them adopted by the Christians, it was not till after a long succession of centuries that it became exploded. Among the Romans it consisted in opening some celebrated poet at random, and among the Christians the Scriptures, and drawing, from the first passage which presented itself to the eye, a prognostic of what would befall one's self or others, or direction for conduct when under any exigency. There is good evidence that this was none of the vulgar errors; the greatest persons, philosophers of the best repute, admitted this superstition. Socrates, when in prison, hearing this line of Homer, "*Within three days I Phthia's shore shall see,*" immediately said, Within three days I shall be out of the world; gathering it from the double meaning of the word *Phthia*, which in Greek is both the name of a country and signifies corruption or death. This prediction, addressed to Æschines, was not easily forgotten, as it was verified.

When this superstition passed from Paganism into Christianity, the Christians had two methods of consulting the divine will from the Scriptures; the one, casually, to open the divine writings, and take their direction, as above mentioned; the other, to go to church with a purpose of receiving, as a declaration of the will of heaven, the words of the Scripture which were singing at the instant of one's entrance. This whimsical practice of inquiring into futurity prevailed very generally in England till the beginning of the present century; and sometimes the books of Scripture, and sometimes the poems of Virgil, were consulted for oracular responses.

SOTERIA, in antiquity, sacrifices offered to the gods for delivering a person from danger; as also poetical pieces composed for the same purpose.

SOUBISE, a town of France, in the department of Lower Charente, and late territory of Saintonge. It is seated on the river Charente, 22 miles south of Rochelle, in W. long. 1. 2. N. lat. 45. 57.

SOUGH, among miners, denotes a passage dug under ground, to convey off waters from mines. See Mine.

SOVEREIGN, in matters of government, is applied to the supreme magistrate or magistrates of an independent government or state: because their authority is only bounded by the laws of God and the laws of the state: such are kings, princes, &c. See Prerogative, &c.

Sovereign *Power*, or *Sovereignty*, is the power of making laws; for, wherever that power resides, all others must conform to it, and be directed by it, whatever appearance the outward form and administration of the government may put on. For it is at any time in the option of the legislature to alter that form and administration by a new edict or rule, and to put the execution of the laws into whatever hands it pleases: and all the other powers of the state must obey the legislative power in the execution of their several functions, or else the constitution is at an end. In our constitution the law ascribes to the king the attribute of sovereignty; but that is to be understood in a qualified sense, *i. e.* as supreme magistrate, not as sole legislator; as the legislative power is vested in the king, lords, and commons, not in any of the three estates alone.

SOU. See Sol.

SOUL, the principle of perception, memory, intelligence, and volition, in man; which, since the earliest era of philosophy, has furnished questions of difficult investigation, and materials of keen and important controversy (see Metaphysics, and Resurrection). In the 4th volume of the Memoirs of the Literary and Philosophical Society of Manchester, the reader will find a very valuable paper by Dr. Farrier, proving, by evidence apparently complete, that every part of the brain has been injured without affecting the act of thought. An abridgment of that memoir would weaken its reasoning; which, built on matters of fact and experience, appears to us to have shaken the modern theory of the Materialists from its very foundation.

Soul of Brutes. See Brutes.

SOUND, in physics, is a term of which it would be preposterous to offer any definition, as it may almost be said to express a simple idea: But when we consider it as a sensation, and still more when we consider it as a perception, it may not be improper to give a description of it; because this must involve certain relations of external things, and certain trains of events in the material world, which make it a proper object of philosophical discussion. Sound is that primary information which we get of external things by means of the sense of hearing. This, however, does not explain it: for, were we in like manner to describe our sense of hearing, we should find ourselves obliged to say, that it is the faculty by which we perceive sound. Languages are not the invention of philosophers; and we must not expect precision, even in the simplest cases.

To discover the state of external body by which, without any further intermedium of substance or of operation, it affects our sensitive faculties, must be considered as a great step in science. It will show us at least one way by which mind and body may be connected. It is supposed that we have attained this knowledge with respect to sound. Our success, therefore, is a very pleasing gratification to the philosophic mind. It is still more important in another view: it has encouraged us to make similar attempts in other cases, and has supplied us with a fact to which an ingenious mind can easily fancy something analogous in many abstruse operations of nature, and thus it enables us to give some sort of explanation of them. Accordingly, this use has been most liberally made of the mechanical theory of sound; and there is now scarcely any phenomenon, either of matter or mind, that has not been explained in a manner somewhat similar, But we are sorry to say that these explanations have done no credit to philosophy. They are, for the most part, strongly marked with that precipitate and self-conceited impatience which has always characterised the investigations conducted solely by ingenious fancy. The consequences of this procedure have been no less fa-

tal to the progrefs of true knowledge in modern times than in the fchools of antient Greece; and the ethereal philofophers of this age, like the followers of Ariftotle of old, have filled ponderous volumes with nonfenfe and error. It is ftrange, however, that this fhould be the effect of a great and a fuccefsful ftep in philofophy: But the fault is in the philofophers, not in the fcience. Nothing can be more certain than the account which Newton has given of the propagation of a certain clafs of undulations in an elaftic fluid. But this procedure of nature cannot be feen with diftinctnefs and precifion by any but well informed mathematicians. They alone can reft with unfhaken confidence on the conclufions legitimately deduced from the Newtonian theorems; and even they can infure fuccefs only by treading with the moft fcrupulous caution the fteps of this patient philofopher. But few have done this; and we may venture to fay, that not one in ten of thofe who employ the Newtonian doctrines of elaftic undulations for the explanation of other phenomena have taken the trouble, or indeed were able, to go through the fteps of the fundamental propofition (Prin. II. 50., &c.) But the *general* refults are fo plain, and admit of fuch impreffive illuftration, that they draw the affent of the moft carelefs reader; and all imagine that they underftand the explanation, and perceive the whole procedure of nature. Emboldened therefore by this fuccefsful ftep in philofophy, they, without hefitation, *fancy* fimilar intermediums in other cafes; and as air has been found to be a vehicle for found, they have fuppofed that fomething which they call ether, fomehow refembling air, is the vehicle of vifion. Others have proceeded further, and have held that ether, or another fomething like air, is the vehicle of fenfation in general, from the organ to the brain: nay, we have got a great volume called A Theory of man, where all our fenfations, emotions, affections, thoughts, and purpofes of volition, are faid to be fo many vibrations of another fomething equally unfeen, gratuitous, and incompetent; and, to crown all, this exalted doctrine, when logically profecuted, muft terminate in the difcovery of thofe vibrations which pervade all others, and which conftitute what we have been accuftomed to venerate by the name Deity. Such *muft* be the termination of this philofophy; and a truly philofophical differtation on the attributes of the Divine Being *can be nothing elfe* than an accurate defcription of thefe vibrations!

This is not a needlefs and declamatory rhapfody. If the explanation of found can be legitimately transferred to thofe other claffes of phenomena, thefe are certain refults; and if fo, all the difcoveries made by Newton are but the glimmerings of the morning, when compared with this meridian fplendor. But if, on the other hand, found logic forbids us to make this transference of explanation, we muft continue to believe, for a little while longer, that mind is fomething different from vibrating matter, and that no kind of ofcillations will conftitute infinite wifdom.

It is of immenfe importance therefore to underftand thoroughly this doctrine of found, that we may fee clearly and precifely in what it confifts, what are the phenomena of found that are fully explained, what are the data and the affumptions on which the explanations proceed, and what is the *precife mechanical fact* in which it terminates. For this, or a fact perfectly fimilar, muft terminate every explanation which we derive from this by analogy, however perfect the analogy may be. This *previous* knowledge muft be completely poffeffed by every perfon who pretends to explain other phenomena in a fimilar manner. Then, and not till then, he is able to fay what claffes of phenomena will admit of the explanation: and, when all this is done, his explanation is ftill an *hypothefis*, till he is able to prove, from other indifputable fources, the exiftence and agency of the fame thing analogous to the elaftic fluid, from which all is borrowed.

Such confiderations would juftify us for confidering with great attention the nature of found. But a work like this will not give room for a full difcuffion; and we muft refer our readers to the writers who treat it more at large. Much curious information may be got from the pains-taking authors of the laft century; fuch as Lord Bacon; Kircher; Merfennus; Cafferius in his great work *De Voce et Auditu*; Perrault in his *Differtation du Bruit*; Muffenbroek in his great Syftem of Natural Philofophy, in 3 vols. 4to; and in his *Effais de Phyfique*; and the writings of the celebrated phyfiologifts of the prefent age. We alfo refer to what has been faid in the article Acoustics.

At prefent therefore we muft content ourfelves with giving a fhort hiftory of the fpeculations of philofophers on this fubject, tracing out the fteps by which we have arrived at the knowledge which we have of it. We apprehend this to be of great importance; becaufe it fhows us what kind of evidence we have for its truth, and the paths which we muft fhun if we wifh to proceed further: and we truft that the progrefs which we have made will appear to be fo real, and the object to be attained fo alluring to a truly philofophical mind, that men of genius will be incited to exert their utmoft efforts to pafs the prefent boundaries of our real progrefs.

In the infancy of philofophy, found was held to be a feparate exiftence, fomething which would be, although no hearing animal exifted. This was conceived as wafted through the air to our organ of hearing, which it was fuppofed to affect in a manner refembling that in which our noftrils are affected when they give us the fenfation of fmell. It was one of the Platonic species, fitted for exciting the intellectual fpecies, which is the immediate object of the foul's contemplation.

Yet, even in thofe early years of fcience, there were fome, and, in particular, the celebrated founder of the Stoic fchool, who held that found, that is, the caufe of found, was only the particular motion of external grofs matter, propagated to the ear, and there producing that agitation of the organ by which the foul is immediately affected with the fenfation of found. Zeno, as quoted by Diogenes Laertius, fays, "Hearing is produced by the air which intervenes between the thing founding and the ear. The air is agitated in a fpherical form, and moves off in waves, and falls on the ear, in the fame manner as the water in a ciftern undulates in circles when a ftone has been thrown into it." The antients were not remarkable for precifion, either of conception or argument, in their difcuffions, and they were contented with a general and vague view of things. Some followed the Platonic notions, and many the opinion of Zeno, but without any further attempts to give a diftinct conception of the explanation, or to compare it with experiment.

But in later times, during the ardent refearches in the laft century into the phenomena of nature, this became an interefting fubject of inquiry. The invention of the air pump gave the firft opportunity of deciding by experiment whether the elaftic undulations of air were the caufes of found: and the trial fully eftablifhed this point; for a bell rung *in vacuo* gave no found, and one rung in condenfed air gave a very loud one. It was therefore received as a doctrine in general phyfics, that air was the vehicle of found.

The celebrated Galileo, the parent of mathematical philofophy, difcovered the nature of that connection between the lengths of mufical cords and the notes which they produced, which had been obferved by Pythagoras, or learned by him in his travels in the eaft, and which he made the foundation of a refined and beautiful fcience, the theory of mufic. Galileo fhowed, that the real connection fubfifted between the tones and the vibrations of thefe cords, and that their different degrees of acutenefs correfponded to the different frequency of their vibrations. The very elementary and familiar demonftration which he gave of this connection did not fatisfy the curious mathematicians of that inquifitive age, and the mechanical theory of mufical cords was profecuted to a great degree of refinement. In the courfe of this inveftigation, it appeared

that the cord vibrated in a manner precifely fimilar to a pendulum vibrating in a cycloid. It muft therefore agitate the air contiguous to it in the fame manner; and thus there is a particular kind of agitation which the air *can* receive and maintain, which is very interefting.

Sir Ifaac Newton took up this queftion as worthy of his notice; and endeavoured to afcertain with mathematical precifion the mechanifm of this particular clafs of undulations, and gave us the fundamental theorems concerning the undulations of elaftic fluids, which make the 47. &c. propofitions of Book II of his Principles of Natural Philofophy. They have been (perhaps haftily) confidered as giving the fundamental doctrines concerning the propagation of found. They are therefore given in this work in the article ACOUSTICS; and a variety of facts are narrated in the article PNEUMATICS, to fhow that fuch undulations *actually obtain* in the air of our atmofphere, and are accompanied by a fet of phenomena of found which precifely tally or correfpond to all the mechanical circumftances of thefe undulations. In the mean time, the anatomifts and phyfiologifts were bufily employed in examining the ftructure of our organs of hearing. Impreffed with the validity of this doctrine of aërial undulations being the caufes of found, their refearches were always directed with a view to difcover thofe circumftances in the ftructure of the ear which rendered it an organ fufceptible of agitations from this caufe; and they difcovered many which appeared as contrivances for making it a drum, on which the aërial undulations from without muft make very forcible impulfes, fo as to produce very fonorous undulations in the air contained in it. Thefe therefore they confidered as the *immediate* objects of fenfation, or the immediate caufes of found.

But fome anatomifts faw that this would not be a full account of the matter: for after a drum is agitated it has done all that it can do; it has produced a noife. But a further procefs goes on in our ear: There is behind the membrane, which is the head of this drum, a curious mechanifm, which communicates the agitations of the membrane (the only thing acted on by the undulating air) to another chamber of moft fingular conftruction, where the auditory nerve is greatly expanded. They conceive, therefore, that the organ called the *drum* does not act as a drum, but in fome other way. Indeed it feems bad logic to fuppofe that it acts as a drum merely by producing a noife. This is in no refpect different from the noife produced out of the ear; and if it is to be heard as a noife, we muft have another ear by which it may be heard, and this ear muft be another *fuch* drum; and this muft have another, and fo on for ever. It is like the inaccurate notion that vifion is the contemplation of the picture on the retina. Thefe anatomifts attended therefore to the ftructure. Here they obferved a prodigious unfolding of the auditory nerve of the ear, which is curioufly diftributed through every part of this cavity, lining its fides, hung acrofs it like a curtain, and fending off fibres in every direction, fo as to leave hardly a point of it unoccupied. They thought the machinery contained in the drum peculiarly fitted for producing undulations of the air contained in this labyrinth, and that by thefe agitations of the air the contiguous fibres of the auditory nerve are impelled, and that thus we get the fenfation of found.

The cavity intervening between the external air and this inner chamber appeared to thefe anatomifts to have no other ufe than to allow a very free motion to the *ftapes* or little pifton that is employed to agitate the air in the labyrinth. This pifton condenfes on a very fmall furface the impulfe which it receives from a much larger furface, ftrained by the malleus on the entry of the tympanum, on purpofe to receive the gentle agitations of the external air and the outer canal. This membranous furface could not be agitated, unlefs completely detached from every thing round it; therefore all animals which have this mechanifm have it in a cavity containing only air. But they held, that nature had even taken precautions to prevent this cavity from acting as a drum by making it of fuch an irregular rambling form; for it is by no means a cavity of a fymmetrical fhape, like a veffel, but rather refembles the rambling holes and blebs which are often feen in a piece of bread, fcattered through the fubftance of the cranium, and communicating with each other by fmall paffages. The whole of thefe cavernulæ are lined with a foftifh membrane, which ftill further unfits this cavity for producing found. This reafoning is fpecious, but not very conclufive. We might even affert, that this anfractuous form, with narrow paffages, is well fitted for producing noife. If we place the ear clofe to the fmall hole in the fide of a military drum, we fhall hear the fmalleft tap of the drumftick like a violent blow. The lining of the cavernulæ is nervous, and may therefore be ftrongly affected in the numerous narrow paffages between the cells.

While thefe fpeculations were going on with refpect to the ear of the breathing animals, obfervations were occafionally made on other animals, fuch as reptiles, ferpents, and fifhes, which give undoubted indications of hearing; and many very familiar facts were obferved or recollected, where founds are communicated through or by means of folid bodies, or by water; therefore, without inquiring how or by what kind of mechanifm it is brought about, it became a very general belief among phyfiologifts, that all fifhes and perhaps all animals hear, and that water in particular is a vehicle of found. In 1767 or 1768 the writer of this article, at the fuggeftion of the late profeffor of aftronomy in the univerfity of Glafgow, made an experiment in a lake in that neighbourhood by ftriking a large hand-bell under water, and heard it very diftinctly and ftrongly when his head was plunged in the water at the diftance of more than 1200 feet. Many experiments are mentioned by Kircher and others on the communication of found through folid bodies, fuch as mafts, yards, and other long beams of dry fir, with fimilar refults. Dr. Monro has publifhed a particular account of very curious experiments on the propagation of found through water in his Differtation on the Phyfiology of Fifhes; fo that it now appears that air is by no means the only vehicle of found.

In 1760 Cotunni publifhed his important difcovery, that the labyrinth or inmoft cavity of the ear in animals is completely filled with water. This, after fome conteft, has been completely demonftrated (fee in particular Meckel Junior *de Labyrinthi Auris Contentis*, Argentor. 1777), and it feems now to be admitted by all.

This being the cafe, our notions of the immediate caufe of found muft undergo a great revolution, and a new refearch muft be made into the way in which the nerve is affected: for it is not enough that we fubftitute the undulations of water for thofe of air in the labyrinth. The well-informed mechanician will fee at once, that the vivacity of the agitations of the nerve will be greatly increafed by this fubftitution; for, if water be perfectly elaftic through the whole extent of the undulatory agitation which it receives, its effect will be greater in proportion to its fpecific gravity: and this is confirmed by an experiment very eafily made. Immerfe a table-bell in water contained in a large thin glafs veffel. Strike it with a hammer. The found will be heard as if the bell had been immediately ftruck on the fides of the veffel. The filling of the labyrinth of the ear with water is therefore an additional mark of the wifdom of the Great Artift. But this is not enough for informing us concerning the ultimate mechanical event in the procefs of hearing. The manner in which the nerve is expofed to thefe undulations muft be totally different from,

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what was formerly imagined. The filaments and membranes, which have been defcribed by former anatomifts, muft have been found by them in a ftate quite unlike to their fituation and condition in the living animal. Accordingly the moft eminent anatomifts of Europe feem at prefent in great uncertainty as to the ftate of the nerve, and are keenly occupied in obfervations to this purpofe. The defcriptions given by Monro, Scarpa, Camper, Comparetti, and others, are full of moft curious difcoveries, which make almoft a total change in our notions of this fubject, and will, we hope, be productive of moft valuable information.

Scarpa has difcovered that the folid cavity called the *labyrinth* contains a threefold expanfion of the auditory nerve. One part of it, the cochlea, contains it in a fibrillous ftate, ramified in a moft fymmetrical manner through the whole of the *zona mollis* of the *lamina fpiralis,* where it anaftomofes with another production of it diffufed over the general lining of that cavity. Another department of the nerve, alfo in a fibrous ftate, is fpread over the external furface of a membranaceous bag, which nearly fills that part of the veftibule into which the femicircular canals open, and alfo that orifice which receives the impreffions of the ftapes. This bag fends off tubular membranaceous ducts, which, in like manner, nearly fill thefe femicircular canals. A third department of the nerve is fpread over the external furface of another membranaceous bag, which lies between the one juft now mentioned and the cochlea, but having no communication with either, almoft completely filling the remainder of the veftibule. Thus the veftibule and canals feem only a cafe for protecting this fenfitive membranaceous veffel, which is almoft, but not altogether, in contact with the offeous cafe, being feparated by a delicate and almoft fluid cellular fubftance. The fibrillous expanfion of the nerve is not indifcriminately diffufed over the furface of thefe facculi, but evidently directed to certain foci, where the fibres are conftipated. And this is the laft appearance of the fibrous ftate of the nerve; for, when the infide of thefe facculi is infpected, no fibres appear, but a pulp (judged to be nervous from its fimilarity to other pulpy productions of the brain) adhering to the membranaceous coat, and not feparable from it by gently wafhing it. It is more abundant, that is, of greater thicknefs, oppofite to the external fibrous foci. No organical ftructure could be difcovered in this pulp, but it probably is organifed; for, befides this adhering pulp, the water in the facculi was obferved to be clammy or mucous; fo that in all probability the vafcular or fibrous ftate of the nerve is fucceeded by an uninterrupted production (perhaps columnar like bafalt, though not cohering); and this at laft ends in fimple diffemination, fymmetrical, however, where water and nerve are alternate in every direction.

To thefe obfervations of Scarpa, Comparetti adds the curious circumftances of another and regular tympanum in the foramen rotundum, the cylindric cavity of which is inclofed at both ends by a fine membrane. The membrane which feparates it from the cochlea appears to be in a ftate of variable tenfion, being drawn up to an umbo by a cartilaginous fpeck in its middle, which he thinks adheres to the lamina fpiralis, and thus ferves to ftrain the drumhead, as the malleus ftrains the great membrane known to all.

Thefe are moft important obfervations, and muft greatly excite the curiofity of a truly philofophical mind, and deferve the moft careful inquiry into their juftnefs. If thefe are accurate defcriptions of the organ, they feem to conduct us further into the fecrets of nature than any thing yet known.

We think that they promife to give us the greateft ftep yet made in phyfiology, viz. to fhow us the laft mechanical fact which occurs in the long train interpofed between the external body and the incitement of our fenfitive fyftem. But there is, as yet, great and effential difference in the defcription given by thofe celebrated naturalifts. It cannot be otherwife. The containing labyrinth can be laid open to our view in no other way than by deftroying it; and its moft delicate contents are the firft fufferers in the fearch. They are found in very different fituations and conditions by different anatomifts, according to their addrefs or their good fortune. Add to this, that the natural varieties are very confiderable. Faithful defcriptions muft therefore give very different notions of the ultimate action and reaction between the unorganifed matter in the labyrinth and the ultimate expanfion of the auditory nerve.

We muft therefore wait with patience. The progrefs which has been made in many parts of natural fcience has been great and wonderful; and perhaps ere long, we may be furnifhed with fuch a collection of facts refpecting the ftructure and the contents of the organ of hearing, as might enable us to give a jufter theory of found than is yet to be found in the writings of philofophers. There feems to be no abatement of ardour in the refearches of the phyfiologifts; and they will not remain long ignorant of the truth or miftake in the accounts given by Scarpa and Comparetti.

Sound, in geography, denotes in general any ftrait or inlet of the fea between two headlands. It is given by way of eminence to the ftrait between Sweden and Denmark, joining the German ocean to the Baltic, being about three miles over. See Denmark, and Elsinore.

SOUNDING, the operation of trying the depth of the fea, and the nature of the bottom, by means of a plummet funk from a fhip to the bottom.

There are two plummets ufed for this purpofe in navigation; one of which is called the *hand lead,* weighing about 8 or 9 pounds; and the other the *deep fea-lead,* which weighs from 25 to 30 pounds; and both are fhaped like the fruftum of a cone or pyramid. The former is ufed in fhallow waters, and the latter at a great diftance from the fhore; particularly on approaching the land after a fea-voyage. Accordingly the lines employed for this purpofe are called the *deep-fea lead-line,* and the *hand lead line.*

The hand lead line, which is ufually 20 fathoms in length, is marked at every two or three fathoms; fo that the depth of the water may be afcertained either in the day or night. At the depth of two or three fathoms, there are marks of black leather; at 5 fathoms, there is a white rag; at 7, a red rag; at 10, black leather; at 13, black leather; at 15, a white rag; and at 17, a red ditto.

Sounding with the hand lead, which is called *heaving the lead* by feamen, is generally performed by a man who ftands in the main-chains to windward. Having the line quite ready to run out without interruption, he holds it nearly at the diftance of a fathom from the plummet; and having fwung the latter backwards and forwards three or four times, in order to acquire the greater velocity, he fwings it round his head, and thence as far forward as is neceffary; fo that, by the lead's finking whilft the fhip advances, the line may be almoft perpendicular when it reaches the bottom. The perfon founding then proclaims the depth of the water in a kind of fong refembling the cries of hawkers in a city. Thus, if the mark of five fathoms is clofe to the furface of the water, he calls, 'By the mark five!' and as there is no mark at four, fix, eight, &c. he eftimates thofe numbers, and calls, 'By the dip four,' &c. If he judges it to be a quarter or a half more than any particular number, he calls, 'And a quarter five! and a half four,' &c. If he conceives the depth to be three quarters more than a particular number, he calls it a quarter lefs than the next: thus, at four fathoms and three fourths he calls 'A quarter lefs five!' and fo on.

The deep fea-lead is marked with two knots at 20 fathoms, three at 30, four at 40, and fo on to the end. It is alfo marked with a fingle knot in the middle of each interval, as at 25, 35, 45 fathoms, &c. To ufe this lead more effectually at fea, or in deep water on the fea-coaft, it is ufual previoufly to bring-to

the ſhip, in order to retard her courſe: the lead is then thrown as far as poſſible from the ſhip on the line of her drift, ſo that, as it ſinks, the ſhip drives more perpendicularly over it. The pilot, feeling the lead ſtrike the bottom, readily diſcovers the depth of the water by the mark on the line neareſt its ſurface. The bottom of the lead being alſo well rubbed over with tallow, retains the diſtinguiſhing marks of the bottom, as ſhells, ooze, gravel, &c. which naturally adhere to it.

The depth of the water, and the nature of the ground, which is called the *ſoundings*, are carefully marked in the log-book, as well to determine the diſtance of the place from the ſhore, as to correct the obſervations of former pilots.

SOUP, a ſtrong decoction of fleſh or other ſubſtances. *Portable* or dry ſoup is a kind of cake formed by boiling the gelatinous parts of animal ſubſtances till the watery parts are evaporated. This ſpecies of ſoup is chiefly uſed at ſea, and has been found of great advantage. The following receipt will ſhow how it is prepared. Of calves feet take 4; leg of beef 12 lbs.; knuckle of veal 3 lbs.; and leg of mutton 10 lbs. Theſe are to be boiled in a ſufficient quantity of water, and the ſcum taken off as uſual; after which the ſoup is to to be ſeparated from the meat by ſtraining and preſſure. The meat is then to be boiled a ſecond time in other water; and the two decoctions, being added together, muſt be left to cool, in order that the fat may be exactly ſeparated. The ſoup muſt then be clarified with five or ſix whites of eggs, and a ſufficient quantity of common ſalt added. The liquor is then ſtrained through flannel, and evaporated on the water-bath to the conſiſtence of a very thick paſte; after which it is ſpread rather thin upon a ſmooth ſtone, then cut into cakes, and laſtly dried in a ſtove until it becomes brittle: theſe cakes are kept in well cloſed bottles. The ſame proceſs may be uſed to make a portable ſoup of the fleſh of poultry; and aromatic herbs may be uſed as a ſeaſoning, if thought proper. Theſe tablets or cakes may be kept four or five years. When intended to be uſed, the quantity of half an ounce is put into a large glaſs of boiling water, which is to be covered, and ſet upon hot aſhes for a quarter of an hour, or until the whole is entirely diſſolved. It forms an excellent ſoup, and requires no addition but a ſmall quantity of ſalt.

SOUR CROUTE. See CROUTE.

SOUR *Gourd*, or *African Calabaſh-tree*. See ADANSONIA.

SOUTH (Dr. ROBERT), an eminent divine, was the ſon of Mr. William South, a merchant of London, and was born at Hackney near that city in 1633. He ſtudied at Weſtminſter ſchool, and afterwards in Chriſt church college, Oxford. In 1654, he wrote a copy of Latin verſes to congratulate Cromwell upon the peace concluded with the Dutch; and the next year a Latin poem, intitled *Muſica Incantans*. In 1660 he was elected public orator of the univerſity; and the next year became domeſtic chaplain to Edward earl of Clarendon, lord-high chancellor of England. In 1663 he was inſtalled prebendary of Weſtminſter, admitted to the degree of doctor of divinity, and had a ſinecure beſtowed on him in Wales by his patron the earl of Clarendon; after whoſe retirement into France in 1667 he became chaplain to the duke of York. In 1670 he was inſtalled canon of Chriſt-church in Oxford; and in 1676 attended as chaplain to Laurence Hyde, Eſq. ambaſſador extraordinary to the king of Poland. In 1678 he was preſented to the rectory of Iſlip in Oxfordſhire; and in 1680 rebuilt the chancel of that church, as he afterwards did the rectory houſe belonging to it. After the Revolution he took the oath of allegiance to king William and queen Mary, though he excuſed himſelf from accepting a great dignity in the church, vacated by the perſonal refuſal of that oath. His health began to decline ſeveral years before his death, which happened in 1716. He was interred in Weſtminſter Abbey, where a monument is erected to his memory. He publiſhed, 1. Animadverſions on Dr. Sherlock's Vindication of the Holy and ever Bleſſed Trinity. 2. A Defence of his Animadverſions. 3. Sermons, 8 vols. 8vo. And after his deceaſe were publiſhed his *Opera Poſthuma Latina*, and his poſthumous Engliſh works. Dr. South was remarkable for his wit, which abounds in all his writings, and particularly in his ſermons; but at the ſame time they equally abound in ill-humour, ſpleen, and ſatire. He was remarkable for being a time-ſerver. During the life of Cromwell he was a ſtaunch Preſbyterian, and then railed againſt the Independents: at the Reſtoration he exerted his pulpit-eloquence againſt the Preſbyterians; and in the reign of Queen Anne, was a warm advocate for Sacheverel.

SOUTH, one of the four cardinal points from which the winds blow.

SOUTH *Sea*, or *Pacific Ocean*, is that vaſt body of water interpoſed between Aſia and America. It does not however, ſtrictly ſpeaking, reach quite to the continent of Aſia, excepting to the northward of the peninſula of Malacca: for the water interpoſed between the eaſtern coaſt of Africa and the peninſula juſt mentioned has the name of the *Indian Ocean*. The South Sea then is bounded on one ſide by the weſtern coaſt of America, through its whole extent, from the unknown regions in the north to the ſtraits of Magellan and Terra del Fuego, where it communicates with the ſouthern part of the Atlantic. On the other ſide, it is bounded by the coaſt of Aſia, from the northern promontory of Tſchukotſkoi Noſs, to the peninſula of Malacca already mentioned. Thence it is bounded to the ſouthward by the northern coaſts of Borneo, Celebes, Macaſſar, New Guinea, New Holland, and the other iſlands in that quarter, which divide it from the Indian ocean. Then, waſhing the eaſtern coaſt of the great iſland of New Holland, it communicates with that vaſt body of water encompaſſing the whole ſouthern part of the globe, and which has the general name of the *Southern Ocean* all round. Thus does this vaſt ocean occupy almoſt the ſemicircumference of the globe, extending almoſt from one pole to the other, and about the equatorial parts extending almoſt 180° in longitude, or 12,500 of our miles.

The northern parts of the Pacific Ocean are entirely deſtitute of land; not a ſingle iſland having yet been diſcovered in it from the latitude of 40° north and upwards, excepting ſuch as are very near the coaſt either of Aſia or America; but in the ſouthern part there are a great number.

Till very lately the South Sea was in a great meaſure unknown. From the great extent of ice which covers the ſouthern part of the globe, it was imagined that much more land exiſted there than in the northern regions: but this could not be juſtly inferred merely from that circumſtance, and the ſouthern continent, long known by the name of TERRA AUSTRALIS, has eluded the ſearch of the moſt expert navigators ſent out from Britain and France by royal authority.

SOUTHAMPTON, a handſome ſea-port town of Hampſhire. It is commodiouſly ſeated on an arm of the ſea; is a place of good trade, and well inhabited. It is ſurrounded by walls and ſeveral watch-towers, and had a ſtrong caſtle to defend the harbour, now in ruins. It is a corporation and a county of itſelf, with the title of an earldom, and ſends two members to parliament. W. lon. 1. 26. N. lat. 50. 55.

SOUTHERN (THOMAS), an eminent dramatic writer, was born at Dublin in 1660, and received his education in the univerſity there. He came young to London to ſtudy law; but inſtead of that devoted himſelf to poetry and the writing of plays. His Perſian Prince, or Loyal Brother, was introduced in 1682, when the Tory intereſt was triumphant in England; and the character of the loyal brother being intended to compliment James duke of York, he rewarded the author when he came to the throne with a commiſſion in the army. On the Revolution taking place, he retired to his ſtudies, and wrote ſeveral plays, from which he is ſuppoſed to have derived a very handſome ſub-

ſiſtence, being the firſt who raiſed the advantage of play-writing to a ſecond and third night. The moſt finiſhed of all his plays is Oroonoko, or the Royal Slave, which is built on a true ſtory related in one of Mrs. Behn's novels. Mr. Southern died in 1746, in the 86th year of his age; the latter part of which he ſpent in a peaceful ſerenity, having, by his commiſſion as a ſoldier, and the profits of his dramatic works, acquired a handſome fortune; and being an exact economiſt, he improved what fortune he gained to the beſt advantage. He enjoyed the longeſt life of all our poets; and died the richeſt of them, a very few excepted. His plays are printed in two vols. 12mo.

Southern *Continent*. See America, and Terra *Auſtralis*.

SOUTHERNWOOD, in botany. See Artemisia.

SOUTHWARK, a borough in Surry, which may be conſidered as part of the metropolis, being ſeated on the oppoſite ſide of the Thames, and under the juriſdiction of the corporation of London, who have an officer here called the bailiff of Southwark. It is called the Borough, by way of diſtinction, and is a populous place, participating conſiderably in the commerce of London. It ſends two members to parliament. It contains ſix churches, a Roman Catholic chapel, many places of worſhip for diſſenters, and ſeveral charitable foundations, particularly St. Thomas's Hoſpital, Guy's Hoſpital, and the Magdalen Hoſpital; alſo the King's Bench and Marſhalſea priſons, and a county gaol. See London.

SOW, in zoology. See Sus.

Sow, in the iron works, the name of the block or lump of metal they work at once in the iron furnace.

Sow-*Thiſtle*. See Sonchus.

SOWING, in agriculture and gardening, the depoſiting any kind of ſeed in the earth for a future crop. See Husbandry.

Drill-Sowing. See Drill-*Sowing* and Husbandry.

SOY. See Dolichos.

SOZOMENUS (Hermias), an eccleſiaſtical hiſtorian of the 5th century, was born in Bethelia, a town of Paleſtine. He was educated for the law, and became a pleader at Conſtantinople. He wrote an Abridgement of Eccleſiaſtical Hiſtory, in two books, from the aſcenſion of our Saviour to the year 323. This compendium is loſt; but a continuation of it in nine books, written at a greater length, down to the year 440, is ſtill extant. He ſeems to have copied Socrates, who wrote a hiſtory of the ſame period. The ſtyle of Sozomenus is perhaps more elegant; but in other reſpects he falls ſhort of that writer, diſplaying throughout his whole book an amazing credulity and a ſuperſtitious attachment to monks and the monaſtic life. The beſt edition of Sozomenus is that of Robert Stephen in 1544. He has been tranſlated and publiſhed by Valeſius, and republiſhed with additional notes by Reading at London, 1720, in 3 vols. folio.

SPACE. See Metaphysics.

Space, in geometry, denotes the area of any figure, or that which fills the interval or diſtance between the lines that terminate it.

SPADIX, in botany, antiently ſignified the receptacle of the palms. It is now uſed to expreſs every flower-ſtalk that is protruded out of a ſpatha or ſheath. The ſpadix of the palms is branched; that of all other plants ſimple. This laſt caſe admits of ſome variety: in calla, dracontium, and pothos, the florets cover it on all ſides: in arum, they are diſpoſed on the lower part only; and in zoſtera on one ſide.

SPAGIRIC art, a name given by authors to that ſpecies of chemiſtry which works on metals, and is employed in the ſearch of the philoſopher's ſtone.

SPAHIS, horſemen in the Ottoman army, chiefly raiſed in Aſia. The great ſtrength of the grand ſeignior's army conſiſts in the janiſaries, who are the foot; and the ſpahis, who are the horſe.

SPAIN, a country of Europe, bounded on the north by the Atlantic Ocean, on the eaſt by France, from which it is ſeparated by the Pyrennees; on the ſouth-eaſt aud ſouth by the Mediterranean, the Straits of Gibraltar and the Atlantic; and on the weſt by Portugal and the Atlantic. Its greateſt extent from north to ſouth, 460 miles; from eaſt to weſt, in the northern part, about 520 miles; towards the centre 300, and near the ſouth-eaſt rather more than 200. Spain is at preſent divided into fourteen provinces, which are Navarre, Biſcay, and Aſturias to the north; of which Biſcay is ſubdivided into the provinces of Alva, Guipuſcoa, and Biſcay, properly ſo called: to the weſt are Galicia and Eſtremadura: to the ſouth Upper and Lower Andaluſia, containing Granada, Jaen, Cordova and Seville, and the kingdom of Murcia: to the eaſt that of Valencia, Arragon and Catalonia; and in the middle of the monarchy, the kingdom of Leon and Old and New Caſtiles. The number of rivers is ſaid to be above 150, but the principal are the Ebro, Guadalquivir, Tagus, Duero, Guadiana, Guadalaviar, and Segura. The air in moſt of the provinces is pure and dry, but in June, July and Auguſt, the days are inſufferably hot, eſpecially in the middle of the country; while in the night a traveller often ſhivers with cold. Towards the north, and in the mountainous parts, the air, as uſual, is cooler than in the ſouth, and near the ſea contracts a moiſture. It ſeldom rains, and the winter froſts are never ſuch as to bind up the ground; want of temperature in the heat and coolneſs of the air is the reaſon that ſeed lies a long time in the ground before it ſhoots up: ſometimes, indeed, a cool breeze, by the Spaniards called gallego, iſſues from the mountains of Galicia; and this, without great precaution, occaſions violent and frequently fatal colds. The country in general labours under a great ſcarcity of corn, which is chiefly owing to their neglect of agriculture; for though the ſoil is in many places extremely dry, and the growth of grain and other fruits very much obſtructed in the day-time by the exceſſive heats, and in the night by an intenſe cold; yet, from the hiſtorians and geographers, Spain appears to have formerly enjoyed a great plenty of corn, ſo that the preſent ſcarcity of that commodity muſt proceed from the neglect of tillage: on the other hand, it abounds in the moſt delicious fruits, ſuch as pears, peaches, olives, figs, grapes, almonds, cheſnuts, lemons, oranges, pomegranates, &c. It produces alſo very good ſaffron. The Spaniſh wines are greedily bought up by foreign nations. The value of the wine and grapes annually exported out of the country, about Malaga alone, amounts to one million and a half of piaſtres. Several parts of the country alſo produce ſugar canes. Spain enjoys likewiſe great plenty of exquiſite honey, and ſilk in abundance, but little flax and hemp; ſalt, eſpecially towards the ſea coaſt, is ſo plentifully procured, that conſiderable quantities thereof are exported; a great deal of ſea ſalt in particular is made in the maritime parts of Andaluſia, Catalonia, and Valencia; likewiſe on the iſlands of Majorca, Ivica, and Formentera; where the ſun ſerves inſtead of fire. But the principal ſalt-works are in Valencia; the kind of ſalt procured from the plant kali, which grows on the ſea ſhore, and is called ſoude de Barilde, and de Bourdine, it being uſed alſo in the making of ſoap and glaſs, is produced in ſuch plenty in Murcia and part of Granada, that Alicant alone has exported in one year 4,111,664 pounds of ſoude de Barille; and 770,960 pounds of the ſoude de Bourdine, excluſive of a better kind of ſalt called agua azul; beſides no inconſiderable quantities exported from other ports. In this country are alſo to be ſeen innumerable flocks of fine ſheep, part of which during winter feed in the levels, and in ſummer are driven up again into the mountains; from theſe ſheep, called Ovejas Merines, is procured the beſt wool: others are kept always in one place: and the third kind make the fat ſheep. Uſtariz computes the number of ſhepherds at forty thouſand. The beſt wool is that of Old Caſtile; though the Spaniſh wool in general is extremely fine and valuable. Andaluſia and Aſturia are particularly famous for their horſes; there are alſo great numbers of mules, and but few horned cattle. In Andaluſia are caught the wild bulls for the bull-fights. Among the many mountains in

Spain, the Pyrennees are the moſt remarkable, which ſeparate Spain from France. The mountains of Spain, according to antient writers, are very rich in gold and ſilver; but the Spaniards rather chooſe that theſe metals ſhould be imported from America, than that they ſhould have the trouble of ſearching for thoſe of their own country; and thus theſe treaſures lie buried in the mountains: but the iron mines are worked here with great ſkill and induſtry. Spain wants not alſo other minerals, ſuch as lead, tin, cinnabar, quick ſilver, alum, vitriol, copperas, lapis calaminaris, &c. and likewiſe cryſtal, diamonds, amethyſts, and other gems: mineral ſprings are found in many parts. The kingdom of Spain is eſtimated to contain about ſeven millions and a half of inhabitants, though it would ſupport twice that number if properly cultivated, if its manufactures were encouraged, and its mines worked. In the times of the Goths and the Moors, it contained between twenty and thirty millions of people. The uſual reaſon aſſigned for this difference is the expulſion of the Moors. It is ſaid, that when Ferdinand the Pious took Seville from them, in the year 1248, the ſeveral diſtricts of the kingdom contained 100,000 towns and villages, all very populous; and when Ferdinand the Catholic reduced the kingdom of Granada, it conſiſted of fifty fortified towns, beſides an infinite number of leſſer places, the greater part of which were afterwards demoliſhed: this extirpation of the Moors was indiſputably one principal cauſe of the preſent thinneſs of its inhabitants. But this affected Andaluſia and Granada only, and yet the other provinces are not much more populous than theſe. That America has ſtripped the kingdom of its inhabitants, Uſtariz will not allow, who ſays, that the greateſt part of thoſe who went to America were of Biſcay, Navarre, Aſturia, the mountainous parts of Old Caſtile and Galicia, and yet that theſe countries are ſtill the beſt peopled. Amidſt the great decreaſe of the inhabitants of Spain, the body of the clergy has ſuffered no diminution, but has rather been gradually increaſing; inſomuch that Uſtariz computes the number of eccleſiaſtics, and their ſervants, at 250,000. In this country there is a want even of the moſt neceſſary trades; and of the few to be met with here, the greateſt part are in the hands of the French, who are very numerous in Spain; the natives themſelves, beſides their averſion to work, diſdaining to ſtoop to handicrafts. They are not, however, wholly without manufactures, eſpecially of ſilk and wool; but theſe fall far ſhort of that flouriſhing condition they might be brought to. Spain was antiently called Iberia, Heſperia, and afterwards Hiſpania. A modern traveller ſays, it is by nature placed in the moſt happy ſituation; ſurrounded by ſeas and mountains, and enjoying a temperature of climate the moſt conducive to health, and the moſt favourable to pleaſure. The kingdom contains immenſe riches; gold, precious ſtones, and iron, ſtill more uſeful, wait but for the hand of the workman to recompenſe his labours. The ſoil, without requiring a fatiguing cultivation, is naturally fertile, and produces every neceſſary of life: the men who inhabited it were, according to hiſtorians, robuſt and warlike. By what means, then, has this vaſt monarchy, which could never be ſubjugated by want, ſo often become the prey of its neighbours? The ſolution of this curious problem muſt be ſought in the inteſtine wars of the coloniſts and the native inhabitants. This country, unfortunate by the beneficence of nature, was long a ſcene of bloodſhed, and ever diſputed and envied: theſe ſeem to have been the unhappy conſequences of its mild and fertile climate, which became the nurſery of rival and inimical nations. Spain, from its poſition, climate, and fertility, has been the victim of hoſtile nations. The Phœnicians are the firſt of which we find traces in hiſtory; this people landed upon the coaſts of Spain, and their firſt ſettlement was, it is ſaid, at Cadiz. The natives did not think themſelves ſufficiently powerful to repel the new comers, or theſe at firſt treated them with mildneſs, and thereby gained their eſteem and admiration, and were even aided by them in ſome of their firſt enterpriſes. The Phœnicians founded a colony upon that coaſt, which nature had marked out to become the centre of commerce. The Phœnicians, at firſt, made ſeveral voyages, with the conſent of the natives: they acquired, in exchange for their merchandiſe, certain portions of land, which they were deſirous to occupy, and the firſt years of this alliance were for them equally peaceful and lucrative; but becoming more avaricious, and the old inhabitants better underſtanding their true intereſts, they ſoon ſtained with blood a country inhabited by people whom they were come to civilize. Their ſettlements extended to the ſouthern coaſts, and into the country as far as Cordova. Much about the ſame time, the Greeks, or Phœnicians, after having founded Marſeilles, went to Spain, and planted there ſeveral colonies; they poſſeſſed a part of the kingdoms of Valencia and Catalonia; their ſettlements were afterwards extended to Arragon; and, according to Strabo, as far as Galicia. The Carthaginians, not leſs deſirous of profit and of plunder, and being merchants and navigators as well as their rivals, thought proper to diſpute with them a ſoil leſs ſcorched, and more fertile, than that of Africa; they alſo founded colonies, but not without firſt having ſhed much blood. The antient inhabitants having but few other wants than thoſe of nature, and not diſcovering their future tyrants in the new coloniſts, and poſſeſſing but little knowledge of commerce and navigation, they left the care and profits of theſe, and with them all diſputes, to the Greeks and the Carthaginians. The Romans took the firſt opportunity of driving the Carthaginians from Spain. This kingdom became the theatre of two of the moſt famous wars of antiquity: by the firſt, which laſted twenty-four years, Rome obliged Carthage to cede to her a part of her conqueſts; and by the ſecond, which continued but for ſeventeen years, Carthage was entirely ſtripped of her poſſeſſions and her power. Under the Romans, Spain was divided into Bætica, Luſitania, and Tarraconenſis. Bætica, ſo called from the Bætis, now the Guadalquivir, comprehended all the country between Granada and the mouth of the Guadiana, properly ſpeaking, Upper and Lower Andaluſia, and a part of New Caſtile; Luſitania extended from the Guadiana to the Douro; and Tarraconenſis, as extenſive as the other two diviſions, comprehended the reſt of the kingdom. The Romans poſſeſſed this rich and extenſive peninſula about 600 years. Towards the fifth century, a ſwarm of barbarians fell upon the fine provinces of the empire; the Vandals, Alans and Suevi, invaded Spain, after having paſſed through Gaul, conquered a part of it, and divided their conqueſts amongſt them. The Vandals inhabited Andaluſia, and gave it their name; the Alans had Portugal; and the Suevi, Galicia. Theſe barbarians, thus eſtabliſhed, and war becoming one of the number of their wants, turned their arms againſt themſelves. The Suevi, having ſubjugated the Alans, would have ſought to conquer the reſt of Spain, had not the Viſigoths, who had eſtabliſhed their throne in Narbonne, and held the ſovereignty of Rouſſillon, Catalonia, and Arragon, oppoſed their attempt, and driven them back to Galicia. Theſe Goths found no difficulty in driving the Romans almoſt entirely out of Spain: they ruined the little kingdom of the Suevi alſo, and remained undiſturbed poſſeſſors of a monarchy there 130 years. Roderic was the laſt of their kings; the famous battle of Xeres, in 712, put the Moors in poſſeſſion of the greateſt and fineſt part of Spain. Other Moors, Arabs, Saracens, or Africans, ſucceeded to the firſt, and conquered without difficulty all the fine provinces of Spain, except thoſe of the north, where ſteep and barren mountains were always an aſylum of liberty for the inhabitants, and ſerved as a nurſery to that race of kings who were one day to be the avengers of Spain and religion for the invaſion and oppreſſion of the Moors. Nothing can be more confuſed than the dynaſties of the Moors, or Arabs, who reigned in Spain. That of the Chriſtian monarchs who diſputed with them the kingdom, and, taking advantage of their diviſions, drove them out of it, is not leſs ſo; their glory was at its greateſt height, when civil wars, treaſons, and frequent aſſaſſinations, diſturbed the peace of theſe powerful kingdoms

jealous of each other. The Christian monarchs, long accustomed to conquer the Moors, thus divided, had, within a little more than a century, taken from them Toledo, Cordova, Seville, and Murcia. Granada still flourished, and was become their only strong hold, when Castile and Arragon, united in the persons of Ferdinand and Isabella, formed too great a power to be resisted by a kingdom enfeebled by intestine commotions: Granada was reduced in the year 1492, after a siege of two years. The Moors had reigned in Spain about eight centuries, and were totally ruined by this defeat; persecuted, despoiled, burned, or converted and baptised by thousands, they were at length driven from the kingdom in the reign of Philip III. The religion of Spain is that of the church of Rome, and the king is nearly absolute.

New SPAIN. See MEXICO.

SPALATRO, or SPALATTO, a populous and strong town, capital of Venetian Dalmatia, with a good harbour, and an archbishop's see. Here are the ruins of the palace of Dioclesian, of which, in 1764, Mr. Robert Adam published a splendid account. In 1784, Spalatro was nearly depopulated by the plague. It is seated on a peninsula, in the gulph of Venice, 35 miles S. E. of Sebenico, and 102 N.W. of Ragusa. E. lon. 17. 31. N. lat. 44. 4.

SPAN, a measure taken from the space between the thumb and the tip of the little finger when both are stretched out. The span is estimated at three hand's breadths or nine inches.

SPANDRELL, the solid work on each haunch of an arch, to keep it from spreading.

SPANHEIM (EZEKIEL), a learned writer in the 17th century, was born at Geneva in 1629; and in 1642 went to Leyden to study. Here he distinguished himself to great advantage; and his reputation spreading, Charles Louis elector palatine sent for him to be tutor to his only son. This task our author discharged to the entire satisfaction of the elector; by whom he was also employed in divers negotiations at foreign courts. He afterwards entered into the service of the elector of Brandenburg, who in 1680 sent him envoy-extraordinary to the court of France, and soon after made him a minister of state. After the peace of Ryswic, he was again sent on an embassy to France, where he continued from the year 1697 to 1702. The elector of Brandenburg having during that interval assumed the title of *King of Prussia*, conferred on him the title and dignity of a baron. In 1702 he left France; and went ambassador to England, where he had been several times. Here he died in 1710, aged 81 years. It is surprising, that in discharging the duties of a public minister with so much exactness, and amidst so many different journeys, he could find time enough to write the several books published by him. It may be said of him, that he acquitted himself in his negotiations like a person who had nothing else in his thoughts; and that he wrote like a man who had spent his whole time in his study. The principal of his works are, 1. *De præstantia et usu numismatum antiquorum*; the best edition of which is in two volumes folio. 2. Several letters or dissertations on scarce and curious medals. 3. A preface and notes to the edition of the emperor Julian's works, printed at Leipsic in 1696, folio.

SPANIEL, in zoology. See CANIS.

SPAR, in mineralogy, a name given to those earths which break easily into rhomboidal, cubical, or laminated fragments with polished surfaces. As the term *spar* is thus applied to stones of different kinds, without any regard to the ingredients of which they are composed, some additional term must be used to express the constituent parts as well as the figure; for instance, calcareous spar, gypseous spar, &c. The spars found in Britain and Ireland are of four different species; opaque, refracting, diaphanous, and stalactitical. 1. The opaque spar is rhomboidal, hexangular, and triangular, of various colours, and is found in mines in Wales, Derbyshire, &c. and at Ovens near Cork. 2. The refracting spar is rhomboidal, shows objects seen through it double, and sometimes 8, 12, or 16 images at once. It is frequent in the lead mines of Derbyshire, Yorkshire, &c. 3. Diaphanous spar is rhomboidal, triangular, hexangular, pyramidal or columnar; and is found in mines, quarries, and caverns, in many different places. 4. Stalactitical spar, icicle or drop-stone, is formed by the running or dropping of water, containing a large proportion of calcareous earth. It is opaque, generally laminated, but from accidental circumstances assumes various forms. It occurs at Knaresborough in Yorkshire, and at Ovens near Cork.

A new species of spar has lately been found in the East Indies, which, from its extreme hardness, approaching to that of a diamond, is called *adamantine spar*. It was discovered by Dr. Black of Edinburgh to be a distinct species. Happening one day to visit a lapidary, it was shown to him among other specimens as a stone that was used in the East Indies for polishing gems, and grinding other hard substances. Dr. Black immediately singled out a specimen which he sent to Mr. Greville, who requested M. Klaproth to analyse it.

There are two varieties of this spar; one of them comes from China, and crystallizes in hexagonal prisms without pyramids, the length of the sides varying from six to twelve lines; their breadth being about nine, of a gray colour with different shades. Though the entire pieces are opaque, the thin laminæ are transparent, and, when broken, its surface appears slightly striated. Its crystals are covered with a very fine and strongly-adhering crust, composed of scales of silvery mica, mixed with particles of red feld spar. Sometimes the surface has martial pyrites or yellow sulphuret of iron adhering to it. Its hardness is so great, that it not only cuts glass as easily as the diamond, but even scratches rock crystal and other very hard stones. Its specific gravity is to that of water as 3710 to 1000. Sometimes it contains crystallized grains of magnetic oxyd of iron, which may be separated from the stone when pulverized by means of the loadstone.

The other kind found in Hindostan is of a whiter colour, and of a more laminated texture than the former: the grains of iron contained in it are likewise of a smaller size than those of the former; they are not diffused through its substance, but only adhere to its surface.

This spar is exceedingly difficult to analyse. To do so, M. Klaproth was obliged to melt it no less than 12 times with 15 parts of soda or mineral alkali, in a silver crucible; the heat being each time continued for five hours as strong as the crucible could bear. After each fusion the mass was softened by boiling distilled water, filtering and precipitating by acids the small quantity of earth which the alkali had dissolved; and lastly, that portion which had not been decomposed was digested at different times with concentrated and boiling acids. By this tedious process he at length found, that the spar consisted of alumine and another kind of earth, in the proportion of 2 to 1, the nature of which is not understood. It is not siliceous earth, as it does not combine with fixed alkalis in a melting heat; and for want of opportunities to make a sufficient number of experiments, our author was unable to determine whether it be a sixth simple earth, or a composition of two or more earths which he was not able to separate.

From a letter of M. Morveau to Mr. Crell, it appears that this stone is also found in France. A small bit of this was tried by him in presence of Mr. Wedgewood, and he found that its specific gravity was superior to the spar of China, being no less than 4,1803, and the true adamantine spar of China gave 3,8222.

SPARGANIUM, BUR-REED, in botany: A genus of plants belonging to the class of *monœcia*, and to the order of *triandria*; and in the natural system ranged under the 3d order, *Calamariæ*. The amentum of the male flower is roundish, the calyx is triphyllous, and there is no corolla. The amentum of the female

flower reſembles that of the male. The ſtigma is bifid; the fruit is a dry berry containing one ſeed. There are two ſpecies, the erectum and natans, both of them natives of Great Britain and Ireland. 1. The *erectum*, great bur-reed, has a ſtem two or three feet high, erect, firm and branched; the lower leaves are triangular, the upper ones plain. The male heads are much ſmaller than the female. This ſpecies flowers in July, and is frequent on the banks of rivers and lakes and near ſtagnant waters. 2. The *natans*, floating or little bur-reed, has a ſtalk about two feet long. The leaves float, are about a foot long, one-fourth of an inch wide at the baſe, and one-eighth in the middle, and end in a point. The male ſphærules are generally three, and all ſeſſile; the female are commonly three, the two lower being ſupported on peduncles, the uppermoſt ſeſſile. It flowers in July, and grows in pools and lakes, but is rare.

SPARMANNIA, in botany; a genus of plants belonging to the claſs of *polyandria*, and to the order of *monogynia*. The corolla conſiſts of four petals, and is bent back; the nectaria are numerous, and ſwell a little; the calyx is quadriphyllous; the capſule is angulated, quinquelocular and echinated. There is only one ſpecies, the *Africana*.

SPARROW, in ornithology. See Fringilla.

Sparrow-*Hawk*, in ornithology. See Falco.

SPARRY-acid. See Fluor-*Acid*, and Chemistry.

SPARTA, or Lacedæmon, the capital of the country of Laconia in Greece, an antient and moſt renowned ſtate, the inhabitants of which have been in all ages celebrated for the ſingularity of their laws and character.—The hiſtory of Sparta for many ages is entirely fabulous; and the authentic accounts commence only with the celebrated lawgiver Lycurgus, who flouriſhed about 870 B. C.

SPARTIANUS (Ælius), a Latin hiſtorian, who wrote the lives of Adrian, Caracalla, and four other Roman emperors. He lived under the reign of Diocleſian, about the year 290.

SPARTIUM, Broom, in botany: A genus of plants belonging to the claſs of *diadelphia*, and order of *decandria*; and in the natural ſyſtem arranged under the 32d order, *Papilionaceæ*. The ſtigma is longitudinal and woolly above, the filaments adhere to the germen. The calyx is produced downwards. There are 16 ſpecies, the ſcoparium, contaminatum, ſepiarium, junceum, monoſpermum, ſphærocarpon, purgans, aphyllum, ſcorpius, angulatum, patens, ſupranulium, complicatum, radiatum, cytiſoides, and ſpinoſum. All theſe, except the ſcoparium, are exotics, chiefly from Spain, Portugal, Italy, &c.—The *ſcoparium*, or common broom, has ternate ſolitary leaves; the branches angular, and without prickles.

The common broom is uſed for a variety of purpoſes. It has been of great benefit ſometimes in dropſical complaints. The manner in which Dr. Cullen adminiſtered it was this: He ordered half an ounce of freſh broom tops to be boiled in a pound of water till one half of the water was evaporated. He then gave two table-ſpoonfuls of the decoction every hour till it operated both by ſtool and urine. By repeating theſe doſes every day, or every ſecond day, he ſays ſome dropſies have been cured. Dr. Mead relates, that a dropſical patient, who had taken the uſual remedies, and been tapped three times without effect, was cured by taking half a pint of the decoction of queen broom tops, with a ſpoonful of whole muſtard ſeed every morning and evening. "An infuſion of the ſeeds drunk freely (ſays Mr. Withering) has been known to produce ſimilar happy effects; but whoever expects theſe effects to follow in every dropſical caſe will be greatly deceived. I knew them ſucceed in one caſe that was truly deplorable; but out of a great number of caſes in which the medicine had a fair trial, this proved a ſingle inſtance."

The flower buds are in ſome countries pickled, and eaten as capers; and the ſeeds have been uſed as a bad ſubſtitute for coffee. The branches are uſed for making beſoms, and tanning leather. They are alſo uſed inſtead of thatch to cover houſes. The old wood furniſhes the cabinet-maker with beautiful materials for vaneering. The tender branches are in ſome places mixed with hops for brewing, and the macerated bark may be manufactured into cloth.

SPARUS, Gilthead, in natural hiſtory; a genus of animals belonging to the claſs of *piſces*, and the order of *thoracici*. The fore-teeth and dog-teeth are very ſtrong: the grinders are obtuſe and thick ſet; the lips are folded over; there are five rays in the gill membrane; and the opercula are ſcaly: the body is compreſſed; the lateral line is crooked behind; and the pectoral fins are roundiſh. Gmelin enumerates 39 ſpecies, of which only three are found in the Britiſh ſeas, the pagrus, auratus, and dentatus. 1. The *pagrus*, or ſea-bream, is of a reddiſh colour. The ſkin forms a ſinus at the roots of the dorſal and anal fins. The body is broad; the back and belly ridged. There is only one dorſal fin. 2. The *auratus*, or gilt-bream. The head and ſides of it are gilt, and there is a golden ſpot between the eyes ſhaped like a half-moon: there is alſo a black purple ſpot on the gills; and it weighs from eight lbs. to ten lbs. It is one of the *piſces ſaxatiles*, or fiſh that haunts deep waters on bold rocky ſhores. They feed chiefly on ſhell-fiſh, which they comminute with their teeth before they ſwallow; the teeth of this genus in particular being adapted for that purpoſe: the grinders are flat and ſtrong, like thoſe of certain quadrupeds: beſides which there are certain bones in the lower part of the mouth that aſſiſt in grinding their food. They are but a coarſe fiſh: they were known to the Romans, who did not eſteem them unleſs they were fed with Lucrine oyſters, as Martial informs us. 3. The *dentatus*, toothed ſea-bream, is black above, and of a ſilvery appearance below. The eyes and gills are very large. There are nine rows of teeth in the lower jaw, and one in the upper. In the account of Captain Cook's voyage publiſhed by Mr. Forſter, we are informed, that the giltheads are ſometimes poiſonous, owing to their feeding on certain ſpecies of the raja, which have an extremely acrid and ſtimulating property.

SPASM, a convulſion. See Medicine.

SPATHA, in botany, a ſheath; a ſpecies of calyx which burſts lengthwiſe, and protrudes a ſtalk ſupporting one or more flowers, which commonly have no perianthium or flower-cup.

SPATHACEÆ (from *ſpatha*, "a ſheath"), the name of the ninth order in Linnæus's Fragments of a Natural Method, conſiſting of plants whoſe flowers are protruded from a ſpatha or ſheath. See Botany.

SPATHELIA, in botany; a genus of plants belonging to the claſs of *pentandria*, and to the order of *trigynia*. The calyx is pentaphyllous; the petals are five; the capſule is three-edged and trilocular; the ſeeds ſolitary. There is only one ſpecies, the *ſimplex*, which is a native of Jamaica, and was introduced into the botanic gardens of this country in 1778 by Dr. Wright, late of Jamaica.

SPAWN, in natural hiſtory, the eggs of fiſhes or frogs. See Fish and Rana.

SPAVENTO. See Scanto.

SPAVIN, in the manege, a diſeaſe in horſes, being a ſwelling or ſtiffneſs, uſually in the ham, occaſioning a lameneſs. See Farriery.

SPAYING, or Spading, the operation of caſtrating the females of ſeveral kinds of animals, as ſows, bitches, &c. to prevent any further conception, and promote their fattening. It is performed by cutting them in the mid flank, on the left ſide, with a ſharp knife or lancet, taking out the parts neceſſary to conception, and cutting them off, and ſo ſtitching up the wound, keeping the animal warm for two or three days. The uſual way is to make the inciſion aſlope, two inches and a half long, that the fore-finger may be put in towards the back, to feel for the ovaries, which are two kernels as big as acorns on both ſides

of the uterus, which are alternately drawn to the wound, and taken off.

SPEAKER *of the House of Commons*, a member of the house elected by a majority of votes thereof to act as chairman or president in putting questions, reading briefs, or bills, keeping order, reprimanding the refractory, adjourning the house, &c. See PARLIAMENT.

SPEAKING, the art or act of expressing one's thoughts in articulate sounds or words. See GRAMMAR, LANGUAGE, READING, and ORATORY.

SPEAKING-*Trumpet*. See TRUMPET.

SPEAR-MINT, in botany. See MENTHA.

SPEAR-*Wort*. See RANUNCULUS.

SPECIAL, something that is particular, or has a particular designation; from the Latin *species*, in opposition to the *general*, from *genus*.

SPECIES, in logic, a relative term, expressing an idea which is comprised under some general one called a *genus*. See LOGIC.

SPECIES, in commerce, the several pieces of gold, silver, copper, &c. which having passed their full preparation and coinage, are current in public. See MONEY.

SPECIFIC, in philosophy, that which is peculiar to any thing, and distinguishes it from all others.

SPECIFICS, in medicine. By specifics is not meant such as infallibly and in all patients produce salutary effects. Such medicines are not to be expected, because the operations and effects of remedies are not formally inherent in them, but depend upon the mutual action and reaction of the body and medicine upon each other; hence the various effects of the same medicine in the same kind of disorders in different patients, and in the same patient at different times. By specific medicines we understand such medicines as are more infallible than any other in any particular disorder.

SPECIFIC *Gravity*, is a term much employed in the discussions of modern physics. It expresses the weight of any particular kind of matter, as compared with the weight of the same bulk of some other body of which the weight is supposed to be familiarly known, and is therefore taken for the standard of comparison. The body generally made use of for this purpose is pure water. See HYDROSTATICS. The specific gravity of bodies is a very interesting question both to the philosopher and to the man of business. The philosopher considers the weights of bodies as measures of the number of material atoms, or the quantity of matter which they contain. This he does on the supposition that every atom of matter is of the same weight, whatever may be its sensible form. This supposition, however, is made by him with caution, and he has recourse to specific gravity for ascertaining its truth in various ways. This shall be considered by and by. The man of business entertains no doubt of the matter, and proceeds on it as a sure guide in his most interesting transactions. We measure commodities of various kinds by tons, pounds, and ounces, in the same manner as we measure them by yards, feet, and inches, or by bushels, gallons, and pints; nay, we do this with much greater confidence, and prefer this measurement to all others, whenever we are much interested to know the exact proportions of matter that bodies contain. The weight of a quantity of grain is allowed to inform us much more exactly of its real quantity of useful matter than the most accurate measure of its bulk. We see many circumstances which can vary the bulk of a quantity of matter, and these are frequently such as we cannot regulate or prevent; but we know very few indeed that can make any sensible change in this weight without the addition or abstraction of other matter. Even taking it to the summit of a high mountain, or from the equator to the polar region, will make no change in its weight as it is ascertained by the balance, because there is the same real diminution of weight in the pounds and ounces used in the examination.

Notwithstanding the unavoidable change which heat and cold make in the bulk of bodies, and the permanent varieties of the same kind of matter which are caused by different circumstances of growth, texture, &c. most kinds of matter have a certain constancy in the density of their particles, and therefore in the weight of a given bulk. Thus the purity of gold, and its degree of adulteration, may be inferred from its weight, it being purer in proportion as it is more dense. The density, therefore, of different kinds of tangible matter becomes characteristic of the kind, and a test of its purity; it marks a particular appearance in which matter exists, and may therefore be called, with propriety, SPECIFIC.

But this density cannot be directly observed. It is not by comparing the distances between the atoms of matter in gold and in water that we say the first is 19 times denser than the last, and that an inch of gold contains 19 times as many material atoms as an inch of water; we reckon on the equal gravitation of every atom of matter, whether of gold or of water; therefore the weight of any body becomes the indication of its material density, and the weight of a given bulk becomes specific of that kind of matter, marking its kind, and even ascertaining its purity in this form.

It is evident that, in order to make this comparison of general use, the standard must be familiarly known, and must be very uniform in its density, and the comparison of bulk and density must be easy and accurate. The most obvious method would be to form, with all nicety, a piece of the standard matter of some convenient bulk, and to weigh it very exactly, and keep a note of its weight; then, to make the comparison of any other substance, it must be made into a mass of the same precise bulk, and weighed with equal care; and the most convenient way of expressing the specific gravity would be to consider the weight of the standard as unity, and then the number expressing the specific gravity is the number of times that the weight of the standard is contained in that of the other substance. This comparison is most easily and accurately made in fluids. We have only to make a vessel of known dimensions equal to that of the standard which we employ, and to weigh it when empty, and then when filled with the fluid. Nay, the most difficult part of the process, the making a vessel of the precise dimensions of the standard, may be avoided, by using some fluid substance for a standard. Any vessel will then do; and we may ensure very great accuracy by using a vessel with a slender neck, such as a phial or matrass; for when this is filled to a certain mark in the neck, any error in the estimation by the eye will bear a very small proportion to the whole. The weight of the standard fluid which fills it to this mark being carefully ascertained, is kept in remembrance. The specific gravity of any other fluid is had by weighing the contents of this vessel when filled with it, and dividing the weight by the weight of the standard. The quotient is the specific gravity of the fluid. But in all other cases this is a very difficult problem; it requires very nice hands, and an accurate eye, to make two bodies of the same bulk. An error of one hundredth part in the linear dimensions of a solid body makes an error of a 30th part in its bulk; and bodies of irregular shapes and friable substance, such as the ores of metals, cannot be brought into convenient and exact dimensions for measurement.

From all these inconveniences and difficulties we are freed by the celebrated Archimedes, who, from the principles of hydrostatics discovered or established by him, deduced the accurate and easy method which is now universally practised for discovering the specific gravity and density of bodies. (See ARCHIMEDES and HYDROSTATICS.) Instead of measuring the bulk of the body by that of the displaced fluid (which would have been impossible for Archimedes to do with any thing like the necessary precision), we have only to observe the loss of weight sustained by the solid. This can be done with great ease

and exactnefs. Whatever may be the bulk of the body, this lofs of weight is the weight of an equal bulk of the fluid; and we obtain the fpecific gravity of the body by fimply dividing its whole weight by the weight loft; the quotient is the fpecific gravity when this fluid is taken for the ftandard, even though we fhould not know the abfolute weight of any given bulk of this ftandard. It alfo gives us an eafy and accurate method of afcertaining even this fundamental point. We have only to form any folid body into an exact cube, fphere, or prifm, of known dimenfions, and obferve what weight it lofes when immerfed in this ftandard fluid. This is the weight of the fame bulk of the ftandard to be kept in remembrance; and thus we obtain, by the by, a moft eafy and accurate method for meafuring the bulk or folid contents of any body, however irregular its fhape may be. We have only to fee how much weight it lofes in the ftandard fluid; we can compute what quantity of the ftandard fluid will have this weight. Thus, fhould we find that a quantity of fand, or a furze bufh, lofes 250 ounces when immerfed in pure water, we learn by this that the folid meafure of every grain of the fand, or of every twig and prickle of the furze, when added into one fum, amounts to the fourth part of a cubic foot, or to 432 cubic inches.

To all thefe advantages of the Archimedean method of afcertaining the fpecific gravity of bodies, derived from his hydroftatical doctrines and difcoveries, we may add, that the immediate ftandard of comparifon, namely, water, is, of all the fubftances that we know, the fitteft for the purpofe of an univerfal ftandard of reference. In its ordinary natural ftate it is fufficiently conftant and uniform in its weight for every examination where the utmoft mathematical accuracy is not wanted; all its variations arife from impurities, from which it may at all times be feparated by the fimple procefs of diftillation: and we have every reafon to think, that, when pure, its denfity, when of the fame temperature, is invariable.

Water is therefore univerfally taken for the unit of that fcale on which we meafure the fpecific gravity of bodies, and its weight is called 1. The fpecific gravity of any other body is the real weight in pounds and ounces, when of the bulk of one pound or one ounce of water. It is therefore of the firft importance, in all difcuffions refpecting the fpecific gravity of bodies, to have the precife weight of fome known bulk of pure water. We have taken fome pains to examine and compare the experiments on this fubject, and fhall endeavour to afcertain this point with the precifion which it deferves. We fhall reduce all to the Englifh cubic foot and averdupois ounce of the Exchequer ftandard, on account of a very convenient circumftance peculiar to this unit, viz. that a cubic foot contains almoft precifely a thoufand ounces of pure water, fo that the fpecific gravity of bodies expreffes the number of fuch ounces contained in a cubic foot.

We begin with a trial made before the houfe of commons in 1696 by Mr. Everard. He weighed 2145,6 cubic inches of water by a balance, which turned fenfibly with fix grains, when there were 30 pounds in each fcale. The weights employed were the troy weights, in the depofit of the Court of Exchequer, which are ftill preferved, and have been moft fcrupuloufly examined and compared with each other. The weight was 1131 ounces 14 pennyweights. This wants juft 11 grains of a thoufand avoirdupois ounces for 1728 cubic inches, or a cubic foot; and it would have amounted to that weight had it been a degree or two colder. The temperature indeed is not mentioned; but as the trial was made in a comfortable room, we may prefume the temperature to have been about 55° of Fahrenheit's thermometer. The dimenfions of the veffel were as accurate as the nice hand of Mr. Abraham Sharp, Mr. Flamftead's affiftant at Greenwich, could execute, and it was made by the Exchequer ftandard of length.

This is confided in by the naturalifts of Europe as a very accurate ftandard experiment, and it is confirmed by many others both private and public. The ftandards of weight and capacity employed in the experiment, are ftill in exiftence, and publicly known, by the report of the Royal Society to parliament in 1742, and by the report of a Committee of the Houfe of Commons in 1758. This gives it a fuperiority over all the meafures which have come to our knowledge.

The firft experiment, made with proper attention, that we meet with, is by the celebrated Snellius, about the year 1615, and related in his *Eratofthenes Batavus*. He weighed a Rhinland cubic foot of diftilled water, and found it 62,79 Amfterdam pounds. If this was the ordinary weight of the fhops, containing 7626 Englifh troy grains, the Englifh cubic foot muft be 62 pounds 9 ounces, only one ounce more than by Everard's experiment. If it was the Mint pound, the weight was 62 pounds 6 ounces. The only other trials which can come into competition with Mr. Everard's, are fome made by the Academy of Sciences at Paris. Picart, in 1691, found the Paris cubic foot of the water of the fountain d'Arcueil to weigh 69,588 pounds, *poids de Paris*. Du Hamel obtained the very fame refult; but M. Monge, in 1783, fays that filtered rain water of the temperature 12° (Reaumur) weighs 69,3792. Both thefe meafures are confiderably below Mr. Everard's, which is 62,5; the former giving 62,053, and the latter 61,868. M. Lavoifier ftates the Paris cubic foot at 70 pounds, which makes the Englifh foot 62,47. But there is an inconfiftency among them which makes the comparifon impoffible. Some changes were made in 1688, by royal authority, in the national ftandards, both of weight and length; and the academicians are exceedingly puzzled to this day in reconciling the differences, and cannot even afcertain with perfect affurance the lineal meafures which were employed in their moft boafted geodetical operations.

Such variations in the meafurements made by perfons of reputation for judgment and accuracy engaged the writer of this article fome years ago to attempt another. A veffel was made of a cylindrical form, as being more eafily executed with accuracy, whofe height and diameter were fix inches, taken from a moft accurate copy of the Exchequer ftandard. It was weighed in diftilled water of the temperature 55° feveral times without varying two grains, and it loft 42895 grains. This gives for the cubic foot 998,74 ounces, deficient from Mr. Everard's an ounce and a quarter; a difference which may be expected, fince Mr. Everard ufed the New River water without diftillation.

We hope that thefe obfervations will not be thought fuperfluous in a matter of fuch continual reference, in the moft interefting queftions both to the philofopher and the man of bufinefs; and that the determination which we have given will be confidered as fufficiently authenticated.

Let us, therefore, for the future take water for the ftandard, and fuppofe that, when of the ordinary temperature of fummer, and in its ftate of greateft natural purity, viz. in clean rain or fnow, an Englifh cubic foot of it weighs a thoufand avoirdupois ounces of 437,5 troy grains each. Divide the weight of any body by the weight of an equal bulk of water, the quotient is the fpecific gravity of that body: and if the three firft figures of the decimal be accounted integers, the quotient is the number of avoirdupois ounces in a cubic foot of the body. Thus, the fpecific gravity of the very fineft gold which the refiner can produce is 19365, and a cubic foot of it weighs 19,365 ounces.

But an important remark muft be made here. All bodies of homogeneous or unorganifed texture expand by heat, and contract by cooling. The expanfion and contraction by the fame change of temperature is very different in different bodies. Thus water, when heated from 60° to 100°, increafes its volume nearly $\frac{1}{16}$ of its bulk, and mercury only $\frac{1}{143}$, and many fub-

ſtances much leſs. Hence it follows, that an experiment determines the ſpecific gravity only in that very temperature in which the bodies are examined. It will therefore be proper always to note this temperature; and it will be convenient to adopt ſome very uſeful temperature for ſuch trials in general: perhaps about 60° of Fahrenheit's thermometer is as convenient as any. It may always be procured in theſe climates without inconvenience. A temperature near to freezing would have ſome advantages, becauſe water changes its bulk very little between the temperature 32° and 45°. But this temperature cannot always be obtained. It will much conduce to the facility of the compariſon to know the variation which heat produces on pure water. The following table, taken from the obſervations of Dr. Blagden and Mr. Gilpin (Phil. Tranſ. 1792), will anſwer this purpoſe.

Temperature of Water.	Bulk of Water.	Specific Gravity.
30		
35	99910	1,00090
40	99070	1,00094
45	99914	1,00086
50	99932	1,00068
55	99962	1,00038
60	100000	1,00000
65	100050	0,99950
70	100106	0,99894
75	100171	0,99830
80	100242	0,99759
85	100320	0,99681
90	100404	0,99598
95	100501	0,99502
100	100602	0,994[illegible]2

Thoſe gentlemen obſerved the expanſion of water to be very anomalous between 32° and 45°. This is diſtinctly ſeen during the gradual cooling of water to the point of freezing. It contracts for a while, and then ſuddenly expands. But we ſeldom have occaſion to meaſure ſpecific gravities in ſuch temperature.

The reader is now ſufficiently acquainted with the principles of this hydroſtatical method of determining the ſpecific gravity of bodies, and can judge of the propriety of the forms which may be propoſed for the experiment.

SPECTACLES, in dioptrics, a machine conſiſting of two lenſes ſet in ſilver, horn, &c. to aſſiſt the defects of the organ of ſight. Old people, and others who have flat eyes, uſe convex ſpectacles, which cauſe the rays of light to converge ſo as to meet upon the retina: whereas myopes, or ſhort-ſighted people, uſe concave lenſes for ſpectacles, which cauſe the rays to diverge, and prevent their meeting ere they reach the retina. See OPTICS.

OCULAR SPECTRA, images preſented to the eye after removing them from a bright object, or cloſing them. When any one has long and attentively looked at a bright object, as at the ſetting ſun, on cloſing his eyes, or removing them, an image, which reſembles in form the object he was attending to, continues ſome time to be viſible. This appearance in the eye we ſhall call the ocular ſpectrum of that object. Theſe ocular ſpectra are of four kinds: 1ſt, Such as are owing to a leſs ſenſibility of a defined part of the retina or ſpectra from defect of ſenſibility. 2d, Such as are owing to a greater ſenſibility of a defined part of the retina or ſpectra from exceſs of ſenſibility. 3d, Such as reſemble their object in its colour as well as form; which may be termed direct ocular ſpectra. 4th, Such as are of a colour contrary to that of their object, which may be termed reverſe ocular ſpectra.

SPECULARIS LAPIS, in natural hiſtory, a genus of talcs, compoſed of large plates viſibly ſeparate, and of extreme thinneſs; and each fiſſile again ſeparated into a number of plates ſtill finer. (See TALC.) Of this genus there are three ſpecies: 1. The white ſhining ſpecularis, with large and broad leaves, commonly called *iſinglaſs* and *Muſcovy glaſs*; its lamellæ, or leaves, are extremely thin, elaſtic, and tranſparent; it makes ſometimes not the leaſt effervеſcence with aquafortis, and is not eaſily calcined in the fire. It is imported in great quantities; the miniature-painters cover their pictures with it; the lantern-makers uſe it inſtead of horn; and minute objects are uſually preſerved between two plates of it, for examination by the microſcope. 2. The bright brown ſpecularis, with broad leaves; a very valuable ſpecies, though inferior to the former. 3. The purple bright ſpecularis, with broad leaves, the moſt elegant of all the talcs, and as beautifully tranſparent as the firſt kind.

SPECULUM for reflecting teleſcopes, is made of a kind of white copper conſiſting of 32 parts fine red copper, 1 of braſs, 15 of grain-tin, and 3 of white arſenic. The proceſs given by the late J. Edwards, who was rewarded by the Board of Longitude for diſcloſing it to the public, was publiſhed in the Nautical Almanack for 1787, and is as follows: Melt the copper in a large crucible, employing ſome black flux, compoſed of two parts of tartar and one of nitre; when melted, add to it the braſs and the ſilver. Let the pure tin be melted in another crucible, alſo with ſome black flux. Take them both from the fire, and pour the melted tin into the fuſed maſs in the large crucible. Stir the whole well with a dry ſpatula of birch; and pour off the fuſed metal immediately into a large quantity of cold water. The ſudden chill of the water will cauſe the fluid metal to divide into an infinite number of ſmall particles, which will cool inſtantly. 2. If the copper be completely ſaturated, the fracture of one piece of this mixed metal will appear bright, and of a gloſſy look, reſembling the face of pure quickſilver. But if it is of a brown reddiſh colour, it wants a little more tin. To aſcertain the required proportion, melt a ſmall quantity, known by weight, of the mixed metal, with a known very ſmall part of tin; and, if neceſſary, repeat the trial with different doſes, till the fracture of the new mixture looks as already deſcribed. Having now aſcertained the neceſſary addition of tin that is required, proceed to the laſt melting of the whole metal, together with the additional proportional doſe of tin; fuſe the whole, obſerving the ſame cautions as before; and you will find that the mixture will melt with a much leſs heat than that for the firſt fuſion. Have ready as many ounces of white arſenic in coarſe powder as there are pounds in the weight of metal; wrap up the arſenic in a ſmall paper, and put it, with a pair of tongs, into the crucible; ſtir it well with the ſpatula, retaining the breath to avoid the arſenical fumes or vapours (which however are not found to be hurtful to the lungs) till they diſappear; take the crucible off the fire, clear away the droſs from the top of the metal, pour in about one ounce of powdered roſin, with as much nitre, in order to give the metal a clean ſurface, and pour out the metal into the moulded flaſks. 3. The ſpeculum ſhould be moulded with the concave ſurface downwards, and many ſmall holes ſhould be made through the ſand upwards, to diſcharge the air. The moulding ſand from Highgate near London, uſed by the founders, is as good as any for caſting theſe metallic mirrors. The caſt metal ſhould be taken out from the ſand of the flaſks whilſt it is hot, or elſe it may happen to crack if left to cool within. See TELESCOPE.

SPECULUM, a looking-glaſs or mirror, capable of reflecting the rays of the ſun.

SPECULUM, in ſurgery, an inſtrument for dilating a wound, or the like, in order to examine it attentively. See SURGERY.

SPEECH, in general, the art or act of expreſſing a perſon's thoughts by means of articulate ſounds, which we call words. See LANGUAGE, GRAMMAR, READING, and ORATORY.

SPEED (JOHN), an eminent Engliſh hiſtorian, was born at

Farington, in Cheſhire, in 1542. He was by profeſſion a taylor, and freeman of the company of merchant-taylors in the city of London. In 1606, he publiſhed his Theatre of Great Britain, which was afterwards reprinted in folio. under the title of the *Theatre of the Empire of Great Britaine.* His Genealogies of Scripture were firſt bound up with the Bible in 1611, when the firſt edition of the preſent tranſlation was printed. In 1614 appeared his *Hiſtory of Great Britaine*, which has been tranſlated into Latin; and in 1616 he publiſhed his *Cloud of Witneſſes*, in octavo. He lived in marriage 57 years with his wife, by whom he had twelve ſons and ſix daughters; and died in 1629. He was interred in the church of St. Giles's, Cripplegate, London, where a monument was erected to his memory.

SPEEDWELL, in botany. See VERONICA.

SPELLING, in grammar, that part of orthography which teaches the true manner of reſolving words into their ſyllables. All words are either ſimple or compound, as *uſe*, *diſuſe*, *done*, *undone*; and the rules for dividing each muſt be ſuch as are derived from the analogy of language in general, or from the eſtabliſhed cuſtom of ſpeaking; which, for the Engliſh language, are reduced to the following rules: 1. A conſonant between two vowels muſt be joined with the latter in ſpelling, as *nature*, *ve-ri-ly*, *ge ne-rous*; except, however, the letter *x*, which is joined to the firſt, as in *flax-en*, *ox en*, &c. and compound words, as in *up-on*, *un-uſed*, &c. 2. A double conſonant muſt be divided, as in *let-ter*, *man-ner*, &c. 3. Thoſe conſonants which can begin a word muſt not be parted in ſpelling, as in *de-fraud*, *re-prove*, *di-ſtinct*; however, this rule is found ſometimes to fail; for though *gn* begins a word, as *gnaw*, *gnat*, &c. yet it muſt be divided in ſpelling, as in *cog-ni zance*, *ma-lig-nity*, &c. 4. Thoſe conſonants which cannot begin a word muſt be divided, as *ld* in *ſel-dom*, *lt* in *mul-ti-tude*, *mp* in *tem-per*, *rd* in *ardent*; but in final ſyllables there are exceptions, as *tl* in *ti-tle*, *dl* in *han-dle*, &c. 5. When two vowels come together, and are both of them diſtinctly ſounded, they muſt be ſeparated in ſpelling, as in *co-e val*, *mu tu-al*, &c. 6. The grammatical terminations or endings muſt be ſeparated in ſpelling, as *ed* in *wing-ed*, *edſt* in *de-li-ver-edſt*, *ing* in *bear-ing*, *ance* in *de-li-ver-ance*, &c. 7. Compound words muſt be reſolved into their ſimple or component words, as *in-to*, *up-on*, *ne-ver-the leſs*, *not with-ſtand-ing*, &c.

SPELMAN (Sir HENRY), an eminent Engliſh antiquarian, was deſcended from an antient family, and born at Cengham, near Lynn, in Norfolk, about the year 1561. He was knighted by king James I. who had a particular eſteem for him on account of his known capacity for buſineſs; and he employed him ſeveral times in Ireland on public affairs. When he was about 50 years of age, he went to reſide in London; where falling into a ſtudy to which his own genius had always inclined him, he collected all ſuch books and MSS. as concerned the ſubject of antiquities, either foreign or domeſtic. In 1626, he publiſhed the firſt part of his well-known Gloſſary, which he never carried beyond the letter L; becauſe, as ſome have ſuggeſted, he had ſaid things under "Magna charta," and "Maximum conſilium," that could not then have appeared without giving offence. Upon his death all his papers came into the hands of his ſon Sir John Spelman, a gentleman who had abilities to have completed his father's deſign if death had not prevented him. The ſecond part was afterwards publiſhed by Sir William Dugdale; but with all the marks of a ſcanty unfiniſhed performance. The next work he entered upon was an edition of the Engliſh Councils, of which he publiſhed the firſt volume about two years before his death, leaving the ſecond volume, as well of this as of his Gloſſary, to be publiſhed by Sir William Dugdale. Sir Henry wrote ſeveral other things, all relating to antient laws and cuſtoms, and died in 1641. His Poſthumous Works were publiſhed in folio, 1698, under the inſpection of Mr. Gibſon, afterwards biſhop of London.

SPELTER, in metallurgy, the ſame with ZINC.

SPENCE (JOSEPH), was fellow of New College, Oxford where he took the degree of A. M. in 1727. About that time he became firſt known as an author, by an *Eſſay on Pope's Odyſſey in which ſome particular beauties and blemiſhes of that work are conſidered*; a work of great merit, and which for ſound criticiſm and candid diſquiſition is almoſt without a parallel. He was elected profeſſor of poetry by the univerſity in 1728, and held that office ten years, which is as long as the ſtatutes will allow. His Hiſtory of Stephen Duck was firſt publiſhed in 1731; but it was afterwards much altered, and prefixed to an edition of Duck's poems.

About this time he travelled into Italy as tutor to the earl of Lincoln, afterwards duke of Newcaſtle.—In 1736 he republiſhed Gorboduc, at Mr. Pope's deſire, with a preface giving an account of the author, the earl of Dorſet. He quitted his fellowſhip in 1742, upon being preſented by the Society of New College to the rectory of Great Harwood in Buckinghamſhire.—He never reſided in his living; but paid it an annual viſit, diſtributing large ſums of money among the poor, and providing for many of their children. The ſame year he was made profeſſor of modern hiſtory at Oxford. In 1747 he publiſhed *Polymetis*; or an inquiry concerning the agreement between the works of the Roman poets and the remains of antient artiſts, being an attempt to illuſtrate them mutually from each other. This work was treated by Gray with a contempt which it it did not deſerve. He raiſes objections becauſe the author did not illuſtrate his ſubject from Greek writers; that is, becauſe he failed to execute what he never undertook. He was inſtalled prebendary of the ſeventh ſtall at Durham the 24th of May 1754. He publiſhed the ſame year, "An Account of the Life, Character, and Poems, of Mr Blacklock, ſtudent of philoſophy at Edinburgh;" which was afterwards prefixed to his Poems. The proſe pieces which he printed in the Muſeum he collected and publiſhed, together with ſome others, in a pamphlet called *Moralities*, by Sir Harry Beaumont. Under the ſame name he publiſhed "Crito, or a dialogue on beauty," and "A particular Account of the Emperor of China's Gardens near Pekin, in a Letter from F. Attiret, a French Miſſionary now employed by that Emperor to paint the apartments in thoſe gardens, to his Friend at Paris." Both theſe treatiſes are printed in Dodſley's fugitive pieces, as is alſo "A Letter from a Swiſs Officer to his Friend at Rome;" which Mr. Spence firſt publiſhed in the Muſeum. In 1758 he publiſhed "A parallel, in the manner of Plutarch, between a moſt celebrated man of Florence and one ſcarce ever heard of in England." This was alſo inſerted in the fugitive pieces. The ſame year he made a journey into Scotland, which he deſcribed in an affectionate letter to Mr. Shenſtone, publiſhed in Hall's Collection of Letters, 1778. In 1764 he was very well deſcribed by Mr. James Ridley, in his admirable Tales of the Genii, under the name of *Pheſoj Ecneps* (his name read backwards), derviſe of the groves. A letter from Mr. Spence to that ingenious moraliſt, under the ſame ſignature, is preſerved in the 3d volume of "Letters of Eminent Perſons." In 1768 he publiſhed "Remarks and Diſſertations on Virgil, with ſome other claſſical obſervations, by the late Mr. Holdſworth." On the 20th of Auguſt the ſame year he was unfortunately drowned in a canal in his garden at Byfleet in Surrey. He was found flat upon his face at the edge of the canal, where the water was ſo ſhallow as not even to cover his head. The accident, it was ſuppoſed, for he was quite alone, was owing to a fit.

The duke of Newcaſtle poſſeſſes ſome manuſcript volumes of anecdotes collected by Mr. Spence, from which Dr. Johnſon was permitted to inſert many extracts in his Lives of the Poets.

SPENCER (Dr. JOHN), an eminent divine, was born in Kent in 1630, and educated at Cambridge. He was choſen fellow of his college, and took a doctor's degree in 1663. In 1667 he was

chosen master of Corpus Christi College, and preferred to the deanery of Ely in 1677. He died on the 20th of May 169.. His works are, 1. The Righteous Ruler; a sermon on Proverbs xxix. 2. preached June 28, 1660. 2. A Discourse concerning Prodigies, wherein the vanity of presages by them is reprehended, and their true and proper ends asserted and vindicated. To this excellent work was afterwards added, A Discourse concerning vulgar prophecies, wherein the vanity of receiving them as the certain indications of any future event is exposed; and some marks of distinction between true and pretended prophets are laid down. 3. A Latin Dissertation concerning Urim and Thummim. 4. His famous treatise *De legibus Hebræorum ritualibus et earum rationibus*. The intention of this book, as he informs us himself, was to vindicate the Deity from the imputation of acting from arbitrary and fantastical motives. It has been highly and justly esteemed both for the elegance of style and the uncommon erudition and sound sense which it displays. It has, however, (that part of it particularly which endeavours to deduce some of the Jewish ceremonics from the practices of their heathen neighbours,) alarmed many persons, as if such a doctrine, if it could be proved, would derogate from the Divine wisdom, and undermine revelation. But this is so far from being the case, that Dr. Spencer's attempt, whether successful or not, deserves the gratitude of Christians, because it has a tendency to throw light on an important and difficult subject.

SPENSER (Edmund), the poet, was born in London in the year 1553, and descended from an antient family of the Spensers in Northamptonshire. All we know concerning his education is, that he was admitted a sizar of Pembroke-hall in Cambridge, and matriculated in 1569. At this time began his intimacy with Mr. Gabriel Harvey, a man of genius and a poet. In 1576, having completed his degrees in arts, he left the university, as it is conjectured, for want of subsistence, and retired to the north of England. Here he had the misfortune to become enamoured of his Rosalind, who, after flattering his passion for a time, at length preferred his happier rival. Spenser continued in the country till the year 1578, when at the persuasion of his friend Mr. Harvey he removed to London, where that gentleman introduced him to Mr. Sidney (afterwards Sir Philip Sidney). Concerning his first introduction to Sir Philip, there is indeed a different story, which was first told by the writer of his life, prefixed to his works in 1679, and transcribed by Hughes, Cibber, and several others; which, nevertheless, is certainly not true. The purport of it is, that Spenser, being unknown to this Mecænas of the age, went to Leicester-house, and sent in the 9th canto of the first book of the Fairy Queen; that, on reading part of it, Sir Philip ordered his steward to give the bearer 50l.; on reading a little further 50l. more; then 200l. bidding him to make haste and pay the money, lest he should give the poet his whole estate. The story tells prettily enough; but it is very certain, that the Fairy Queen was begun long after his acquaintance with Sir Philip. By this universal patron of genius, however, he was presented to queen Elizabeth, who honoured him with the place of poet laureat. About this time he finished his Shepherd's Calendar, which was first printed in 1579; and in the following year, being recommended by his patron to the earl of Leicester, he went to Ireland as secretary to the lord Grey of Wilton, then appointed lord-lieutenant of that kingdom. Lord Grey was recalled in 1582, and with him Spenser returned to London, where he continued till after the death of Sir Philip Sidney in 1586; a loss which he bewailed to the end of his life. The following year, our poet, having obtained a royal grant of 3000 acres of forfeited lands in the county of Cork in Ireland, set out for that kingdom, took possession of his estate, and fixed his residence in the castle of Kilcolman, which had belonged to the earl of Desmond. In this retirement he resumed his great work of the Fairy Queen; and continued in Ireland till, being visited by his old friend Sir Walter Raleigh in 1589, he came over with him to England, but returned to Ireland the year following, where he fell in love with a country girl, and married her. Soon after his marriage, he paid another visit to his native country, where we also find him in 1596. In the following year he returned once more to Kilcolman; but on the rebellion of lord Tyrone, who ravaged the whole county of Cork, he was obliged to fly for safety with his family to England, where, in the year 1599, he died in extreme poverty *. He was buried in Westminster Abbey, according to his request, near Chaucer. A monument was erected to his memory by Ann countess of Dorset. We know but little of his character as a man; as a poet, considering the age in which he lived, he deserves our utmost veneration. He wrote various pieces besides those above mentioned. His whole works, with his life by Hughes, were published in six volumes 12mo, in 1715 and 1750.

SPERGULA, Spurrey, in botany: A genus of plants belonging to the class of *decandria*, and the order of *pentagynia*; and in the natural system arranged under the 22d order, *caryophylleæ*. The calyx is pentaphyllous; the petals five, and undivided; the capsule oval, unilocular, and containing five valves. There are five species, the arvensis, nodosa, pentandra, laricina, and saginoides; all of which are British: 1. The *arvensis*, corn-spurrey, has linear furrowed leaves, from eight to twenty in a whorl. The flowers are small, white, and terminal. It is frequent in corn-fields. In Holland it is cultivated as food for cattle, and has the advantage of growing on the very poorest soils; but does not afford a great deal of food. Poultry are fond of the seeds; and the inhabitants of Finland and Norway make bread of them when their crops of corn fail. Horses, sheep, goats, and swine, eat it. Cows refuse it. 2. The *nodosa*, knotted spurrey. Several stalks arise from one root, sometimes reclining and sometimes erect; and from three to five inches high. The leaves are smooth, of a fine green, narrow, pointed, and opposite. The flowers are white, terminal, with yellow antheræ. 3. *Pentandra*, small spurrey. The leaves are very narrow, and grow in whorls at the joints. The seeds are black with a white circle. It flowers in July. 4. *Laricina*, larch-leaved spurrey. Several stalks arise from one root, from an inch to an inch and a half high; the leaves are linear, subulate, and acuminated, somewhat hairy on the edges, and their points turned to one side of the stalk. The petals are white and about the length of the calyx. Lightfoot found this species on a hill in the isle of Bute. He is doubtful whether the *sagina procumbens*, var. β of Linnæus, be not the same plant with this. It flowers in July. 5. *Saginoides*, pearlwort spurrey, has smooth, linear, opposite leaves: the peduncles are solitary and very long. Aiton says it is a native of England, and flowers from June to August.

SPERM, the seed whereof an animal is formed. See Physiology.

SPERMACETI, a whitish, unctuous, flaky substance, prepared from oil, but chiefly from the brains of a species of whale called *physeter macrocephalus*.

The method of preparing spermaceti is kept a secret; but the process is said to be this: The brains being taken out of the animal, are then thoroughly purified by steeping them in a ley of alkaline salt and quicklime; being previously washed;

* This is Camden's account, and it has been generally believed; but Mr. Malone, the last editor of Shakespeare's works, by examining the patent roll. 33 Eliz. p. 3. has discovered, that in February 1590-1 Spenser obtained from Queen Elizabeth an annuity or pension of 50l. during his life; a sum equivalent to 200l. at present.

and cut into thin flakes or flices with wooden knives. One fifh is faid to afford fome tons of brains. Good fpermaceti is gloffy and femitranfparent, in fine white flakes; foft and unctuous to the touch, yet dry and friable; in tafte, fomewhat like butter, and of a faint fmell like that of tallow. Some adulterate it with wax; but the deceit is difcovered, either by the fmell of the wax or by the dulnefs of the colour. Some alfo fell a preparation of oil taken from the tail of the whale inftead of that from the brain; but this kind turns yellow as foon as expofed to the air. Indeed it is apt in general to grow yellowifh, and to contract a rancid fifhy fmell if not carefully fecured from the air. The more perfectly it has been purified at firft, the lefs fufceptible it is of thefe alterations; and after it has been changed, it may be rendered white and fweet again by fteeping it afrefh in a ley of alkaline falt and quicklime. It melts in a fmall degree of heat, and congeals again as it cools.

Spermaceti is of little ufe in difeafes, except in linctuses for the cure of flight coughs. Spermaceti candles are of modern manufacture: they are made fmooth, with a fine glofs, free from rings and fcars, fuperior to the fineft wax-candles in colour and luftre; and, when genuine, leave no fpot or ftain on the fineft filk, cloth, or linen.

A method has lately been propofed by Mr. Smith Gibbes of Magdalen college, Oxford, to convert animal mufcle into a fubftance much refembling fpermaceti. (See *Phil. Tranf.* 1794.) The procefs is remarkably fimple: Nothing more is neceffary than to take a dead carcafe and expofe it to a ftream of running water: it will in a fhort time be changed to a mafs of fatty matter. To remove the offenfive fmell, a quantity of nitrous acid may then be poured upon it, which uniting with the fetid matter, the fat is feparated in a pure ftate. This acid indeed turns it yellow, but it may be rendered white and pure by the action of the oxygenated muriatic acid. Mr. Gibbes brought about the fame change in a much fhorter time. He took three lean pieces of mutton and poured on them the three mineral acids, and he perceived that at the end of three days each was much altered; that in the nitrous acid was much foftened, and on feparating the acid from it, he found it to be exactly the fame with that which he had before got from the water; that in the muriatic acid was not in that time fo much altered; the vitriolic acid had turned the other black.

SPERMACOCE, BUTTON-WOOD, in botany: A genus of plants belonging to the clafs of *tetrandria*, and order of *monogynia*; and in the natural fyftem arranged under the 47th order, *ftellatæ*. The corolla is monopetalous and funnel-fhaped, and there are two bidentate feeds. The fpecies are eight, tenuior, verticillata, hirta, articularis, ftricta, hifpida, procumbens, and fpinofa.

SPERMATIC, in anatomy, fomething belonging to the fperm or feed.

SPEUSIPPUS, an Athenian philofopher, the nephew and fucceffor of Plato. Contrary to the practice of Plato, Speufippus required from his pupils a ftated gratuity. He placed ftatues of the graces in the fchool which Plato had built. On account of his infirm ftate of health, he was commonly carried to and from the academy in a vehicle. On his way thither he one day met Diogenes, and faluted him; the furly philofopher refufed to return the falute, and told him, that fuch a feeble wretch ought to be afhamed to live; to which Speufippus replied, that he lived not in his limbs, but in his mind. At length, being wholly incapacitated, by a paralytic ftroke, for the duties of the chair, he refigned it to Xenocrates. He is faid to have been of a violent temper, fond of pleafure, and exceedingly avaricious. Speufippus wrote many philofophical works, which are now loft, but which Ariftotle thought fufficiently valuable to purchafe at the expenfe of three talents. From the few fragments which remain of his philofophy, it appears that he adhered very ftrictly to the doctrine of his mafter.

SPEY, a river of Scotland, which iffues from a lake in the centre of Invernefsfhire, divides Murray from Banffhire for more than 20 miles, and enters the German Ocean at the village of Speymouth, eight miles weft of Cullen.

SPHACELUS, in furgery, an abfolute and perfect corruption or death of the parts.

SPHÆRANTHUS, in botany: A genus of plants belonging to the clafs of *fyngenefia*, and to the order of *polygamia fegregata*; and in the natural fyftem arranged under the 49th order, *Compofitæ*. Each partial calyx contains eight florets; the florets are tubulated, the female being fcarcely diftinguifhable. The receptacle is fcaly; and there is no pappus. The fpecies are three, the indicus, africanus, and chinenfis.

SPHAGNUM, BOG-MOSS, in botany; a genus of plants belonging to the clafs of *cryptogamia* and order of *mufci*. The antheræ are globofe; the mouth entire, and clofed by an operculum; the calyptra is wanting. There are three fpecies, the paluftre, alpinum, and arboreum. 1. The *paluftre*, common bog-mofs, grows on our bogs in wide patches, fo as frequently to cover a large portion of their furface. The ftalks are from two inches to two feet long, irregularly furrounded with numerous, conical, pendent branches, and terminated with a rofaceous clufter of erect fhort ones. It is generally believed, that the roots and decayed ftalks of this mofs conftitute a principal part of that ufeful bituminous fubftance called *peat*, which is the chief fuel of the northern regions.—The Lapland matrons are well acquainted with this mofs. They dry and lay it in their cradle, to fupply the place of bed, bolfter, and every covering; and, being changed night and morning, it keeps the infant remarkably clean, dry, and warm. It is fufficiently foft of itfelf; but the tender mother, not fatisfied with this, frequently covers the mofs with the downy hairs of the rein-deer; and by that means makes a moft delicate neft for the young babe. 2. The *alpinum*, green bog-mofs. Its branches are fubulate and erect; the antheræ are oval. It grows in mountain bogs in South Britain. 3. The *arboreum*, creeping bog-mofs, is branched; the antheræ are numerous, feffile, hairy, and grow along the branches chiefly on one fide. It is found on the trunks of trees.

Os SPHENOIDES, the feventh bone of the cranium or fkull. See ANATOMY.

SPHERE, is a folid contained under one uniform round furface, every point of which is equally diftant from a certain point in the middle called its *centre*; and is formed by the revolution of a femicircle about its diameter. See GEOMETRY.

Projection of the SPHERE. See PROJECTION.

SPHERE, in aftronomy, that concave orb or expanfe which invefts our globe, and in which the heavenly bodies appear to be fixed, and at an equal diftance from the eye. The better to determine the places of the heavenly bodies in the fphere, feveral circles are fuppofed to be defcribed on the furface thereof, hence called the *circles of the fphere*: of thefe fome are called *great circles*, as the equinoctial, ecliptic, meridian, &c. and others *fmall circles*, as the tropics, parallels, &c. See GEOGRAPHY, and ASTRONOMY, *paffim*.

Armillary SPHERE. See GEOGRAPHY.

SPHERE *of Activity of a Body*, is that determinate fpace or extent to which, and no further, the effluvia continually emitted from that body reach; and where they operate according to their nature.

SPHERES, in optics, the fame with metalline mirrors, for telefcopes or other purpofes. See MIRROR.

SPHEROID, in geometry, a folid approaching to the figure of a fphere. It is generated by the entire revolution of a femi-ellipfis about its axis. When the revolution is made round

the largeſt axis, the ſpheroid is called *prolate*; and when round the ſhorteſt, *oblate*. This laſt is the figure of the earth, and probably of all the planets.

SPHEX, Ichneumon Wasp, or *Savage*; a genus of inſects belonging to the order of *hymenopteræ*. The mouth is armed with entire jaws, but contains no tongue; the mandibles are horny, crooked, dentated; the lip horny, the apex membranaceous. The palpi or feelers are four. The antennæ have from 10 to 16 joints. The wings of both ſexes are extended without folds, and laid horizontally on the back. The ſting is ſharp, and concealed within the abdomen. There are 97 ſpecies, of which two only are natives of Britain and Ireland, the viatica and cribraria. 1. The *viatica* is black: the antennæ are ſhort and thick: the three firſt ſegments of the abdomen red-brown: the pedicle is ſhort: the length half an inch. 2. The *cribraria* is black, with yellow ringlets on the abdomen: the antennæ are ſhort, and turned backwards: the fore-legs are broad, with an appendix like a ſhield. The manner of living is different in the various ſpecies, and ſo is the general form of the body and their haunts; but though the method of life be utterly different, yet the ſame manners appear innate and inherent in all. They agree in being the fierceſt of all flies: they will attack inſects much larger than themſelves, and this whether they be defenceleſs or armed, as they are provided with a ſting. The ſtrength in all this ſavage kind is great; their jaws are hard and ſharp, and in their ſting lies a poiſon ſuddenly fatal to the creatures with whom they engage. The ſavage ſeizes hardily on the animal he attacks, and gives a ſtroke of amazing force; after which he falls down as if himſelf were killed, but it is to reſt from his fatigue, and enjoy his victory. He keeps a ſteady eye on the creature he has ſtruck till it dies, which happens in a few minutes, and then drags it to the neſt to feed the young. The number of other inſects they deſtroy is ſcarce to be conceived; the mouth of their cave is like that of a giant in the days of yore, ſtrewed with the remains of prey. The eyes, the filament that ſerves as a brain, and a ſmall part of the contents of the body, are all the ſavage eats, and he will kill 50 for a meal.

SPHINCTER, in anatomy, a term applied to a kind of circular muſcle, or muſcles in form of rings, which ſerve to cloſe and draw up ſeveral orifices of the body, and prevent the excretion of the contents.

SPHINX, in ſculpture, &c. a figure or repreſentation of a monſter of that name, famed among the antients, now moſtly uſed as an ornament in gardens, terraces, &c. It is repreſented with the head and breaſts of a woman, the wings of a bird, the claws of a lion, and the reſt of the body like a dog. It is ſuppoſed to have been engendered by Typhon, and ſent by Juno to be revenged on the Thebans. Its office, they ſay, was to propoſe dark enigmatical queſtions to all paſſers-by; and if they did not give the explication thereof, to devour them. It made horrible ravages, as the ſtory goes, on a mountain near Thebes; and could not by any means be deſtroyed, till after Œdipus had ſolved the following riddle, "What animal is it that in the morning walks on four legs, at noon on two, and at night on three?" The anſwer was "Man." Among the Egyptians, the ſphinx was the ſymbol of religion, by reaſon of the obſcurity of its myſteries: and on the ſame account the Romans placed a ſphinx in the porch of their temples.

Sphinx, Hawk-*Moth*, in natural hiſtory; a genus of inſects belonging to the order of *lepidopteræ*. The antennæ are ſhaped ſomewhat like a priſm, and are more ſlender at each end than at the middle. The tongue is generally thruſt out: the two palpi are bent back, and the wings deflexed. There are about 165 ſpecies already diſcovered, of which 10 are found in Great Britain and Ireland. The name *ſphinx* is given to this genus on account of the ſingular attitudes of their caterpillars, which apply the hinder part of their body to a branch of a tree, holding the reſt of it erect, like the fabulous ſphinx. Moſt of them ſpin their cod under ground, making them up with ſmall parcels of earth and grains of corn interwoven with threads. The ſphinges fly either early in the morning, or after ſunſet in the evening. They fly heavily and ſluggiſhly, often emitting a kind of ſound.

SPICE, any kind of aromatic drug that has hot and pungent qualities: ſuch are pepper, nutmeg, ginger, cinnamon, cloves, &c.

Spice-*Iſlands*, in the Eaſt Indies. See Banda, Molucca-*Iſlands*, and Ceylon.

SPIDER, in zoology. See Aranea.

SPIDERWORT, in botany. See Phalangium.

SPIGELIA, Worm grass, in botany: A genus of plants belonging to the claſs of *pentandria*, and order of *monogynia*; and in the natural ſyſtem arranged under the 47th order, *Stellatæ*. The corolla is funnel-ſhaped; the capſule is didymous, bilocular, and polyſpermous. There are two ſpecies, the anthelmia and marilandica. 1. The *anthelmia* has a herbaceous ſtem, and its higheſt leaves are fourfold. This plant is generally found in low dry lands, after they have been turned up ſome months, and after great rains; its taſte is herbaceous, and ſomewhat clammy, its growth is ſoft and ſudden, its ſtalk hollow, ſmooth, and roundiſh. Its medical qualities are highly ſpoken of by Dr. Browne. 2. The *marilandica*, perennial worm-graſs, or *Indian pink*. The beſt deſcription of this plant is given by Dr. Woodville, in his medical Botany. Its ſtem is four-cornered; all the leaves oppoſite. Dr. Garden, in his letter to the late Dr. Hope, profeſſor of botany in the univerſity of Edinburgh, dated 1763, gives an account of the virtues of this plant. He gave it in what he calls continued or remitting low worm fevers, and found its efficacy promoted by the addition of *rad. ſerpentar. virg.*

SPIGNEL, in botany. See Athamanta.

SPIKE, or *Oil of* Spike, a name given to eſſential oil of turpentine, and much uſed by the varniſh-makers and painters.

SPIKENARD, in botany. See Nardus.

SPILANTHUS, in botany; a genus of plants belonging to the claſs of *ſyngeneſia*, and to the order of *polygamia æqualis*. The common calyx is erect; the leaflets numerous, ſub-equal, and oblong, the two exterior being longer than the reſt. The compound corolla is uniform and tubular; the florets are hermaphrodite and equal; the proper corolla is funnel-ſhaped. The filaments are five in number, and ſhort. The antheræ cylindrical and tubular. The ſeeds are vertical, oblong, flat, and covered with chaff. The receptacle is paleaceous and conical. There are ſeven ſpecies, the urens, pſeudo-acmella, acmella, ſalivaria, atriplicifolia, inſipida, and oleracea.

SPINA cervina, the ſame as the rhamnus catharticus. See Rhamnus.

Spina *Ventoſa*, in ſurgery, that ſpecies of corruption of the bones which takes its riſe in the internal parts, and by degrees enlarges the bone, and raiſes it into a tumor. See Surgery.

SPINACIA, spinage, in botany: A genus of plants belonging to the claſs of *diœcia*, and to the order of *pentandria*; and in the natural ſyſtem arranged under the 12th order, *Holeraceæ*. The male calyx is quinquepartite; there is no corolla: the female calyx is quadrifid; no corolla; there are four ſtyles, and one ſeed within the indurated calyx. There are only two ſpecies, the oleracea and fera. 1. The *oleracea*, common ſpinage, has ſeſſile fruits and ſagittated leaves. It has been cultivated in Britain ſince 1568, but it is not known from what country it was originally brought. When intended for winter uſe, it ſhould be ſown on an open ſpot of ground in the latter end of July; obſerving to do it if poſſible when the weather is rainy. When the young plants are come up, the weeds muſt

be deſtroyed, and the plants left at about five inches aſunder. The ground being kept clear of weeds, the ſpinage will be fit for uſe in October. The way of gathering it to advantage is only to take off the longeſt leaves, leaving thoſe in the centre to grow bigger; and at this rate a bed of ſpinage will furniſh the table for a whole winter, till the ſpinage ſown in ſpring is become fit for uſe, which is common in April. 2. The *fera*, wild ſpinage, produces its fruit on footſtalks.

SPINÆ, in botany, thorns, rigid prickles: a ſpecies of *arma*, growing on various parts of certain plants for their defence; *ſpinæ ramorum arcent pecora.* On the branches we find examples in the pyrus, prunus, citrus, hippophaes, gmelina, rhamnus, lycium, &c.; on the leaves in the aloe, agave, yucca, ilex, hippomane, theophraſta, carlina, &c.; on the calyx, in the carduus, cnicus, centauria, moluccella, galeopſis, &c.; on the fruit, in the trapa, tribulus, murex, ſpinacia, agrimonia, datura, &c.

SPINAGE, or SPINACH. See SPINACIA.

SPINAL MARROW. See ANATOMY.

SPINALIS, in anatomy, the name of ſeveral muſcles, &c. of the ſpine.

SPINDLE-TREE, in botany. See EUONYMUS.

SPINE, SPINA DORSI. See ANATOMY.

SPINE, in botany. See SPINÆ.

SPINELLO, a Tuſcan painter, of great repute in his time. He painted a picture of the fallen angels, in which he drew ſo horrid a picture of Lucifer, that it frightened him ſo much as to affect his ſenſes ever after. He flouriſhed about the year 1380.

SPINET, or SPINNET, a muſical inſtrument ranked in the ſecond or third place among harmonious inſtruments. It conſiſts of a cheſt or belly made of the moſt porous and reſinous wood to be found, and a table of fir glued on ſlips of wood called *ſummers*, which bear on the ſides. On the table are raiſed two little prominences or bridges, wherein are placed ſo many pins as there are chords or ſtrings to the inſtrument. It is played on by two ranges of continued keys, the former range being the order of the diatonic ſcale, and that behind the order of the artificial notes or ſemitones. The keys are ſo many flat pieces of wood, which, touched and preſſed down at the end, make the other raiſe a jack, which ſtrikes and ſounds the ſtrings by means of the end of a crow's quill, wherewith it is armed. The 30 firſt ſtrings are of braſs, the other more delicate ones of ſteel or iron-wire; they are all ſtretched over the two bridges already mentioned. The figure of the ſpinet is a long ſquare or parallelogram; ſome call it a *harp couched,* and the harp an *inverted ſpinet.* See the article HARP.

This inſtrument takes its name from the ſmall quill ends which touch the ſtrings, reſembling *ſpinæ* or thorns.

SPINIFEX, in botany; a genus of plants belonging to the claſs of *polygamia* and order of *monœcia.* The hermaphrodite flowers have a calyx with bivalved biflorous glumes, the valvelets being parallel to the rachis; the corolla is bivalved and awnleſs; there are three ſtamina and two ſtyles. In the male flowers the calyx is common with the hermaphrodite; the corolla and ſtamina are ſimilar. There is only one ſpecies, the ſquarroſus.

SPINNING, in commerce, the act or art of reducing ſilk, flax, hemp, wool, hair, or other matters, into thread. Spinning is either performed on the wheel, or with a diſtaff and ſpindle, or with other machines proper for the ſeveral kinds of working. Hemp, flax, nettle-thread, and other like vegetable matters, are to be wetted in ſpinning: ſilks, wools, &c. are ſpun dry, and do not need water; yet there is a way of ſpinning or reeling ſilk as it comes off the caſes or balls, where hot and even boiling water is to be uſed (ſee SILK). The vaſt variety and the importance of thoſe branches of our manufactures which are produced from cotton, wool, and flax, ſpun into yarn, together with the cheapneſs of proviſions and the low price of labour in many foreign countries which are our rivals in trade, have occaſioned many attempts at home to render ſpinning more eaſy, cheap, and expeditious. For which ſee COTTON *Spinning* and COTTON *Mills.*

Theſe contrivances have in ſome parts of Scotland been applied to the ſpinning of flax; but a very conſiderable improvement has lately been made by Mr. Antis of Fulneck near Leeds of the common ſpinning wheel. It is well known, that hitherto much time has been loſt by ſtopping the wheel in order to ſhift the thread from one ſtaple on the flyer to another; but in Mr. Antis's wheel the bobbin is made to move backwards and forwards, ſo as to prevent the neceſſity of this perpetual interruption, as well as to obviate the danger of breaking the thread and loſing the end. This is effected by the axis of the great wheel being extended through the pillar next the ſpinner, and formed into a pinion of one leaf A, pl. 19, which takes into a wheel B, ſeven inches diameter, having on its periphery 97 teeth; ſo that 97 revolutions of the great wheel cauſe one of the leſſer wheel. On this leſſer wheel is fixed a ring of wire *c c c*; which, being ſupported on ſix legs, ſtands obliquely to the wheel itſelf, touching it at one part, and projecting nearly three quarters of an inch at the oppoſite one: near the ſide of this wheel is an upright lever C, about 15 inches long, moving on a centre, three inches from its lower extremity, and connected at the top to a ſliding bar D; from which riſes an upright piece of braſs E, which working in the notch of a pulley drives the bobbin F backward and forward, according as the oblique wire forces a pin G in or out, as the wheel moves round. To regulate and aſſiſt the alternate motion, a weight H hangs by a line to the ſliding bar, and paſſing over a pulley I riſes and falls as the bobbin advances or recedes, and tends conſtantly to keep the pin in contact with the wire. It is evident, from this deſcription, that one ſtaple only is wanted to the flyer; which, being placed near the extremity K, the thread paſſing through it is by the motion of the bobbin laid regularly thereon. For this invention the Society inſtituted at London for the Encouragement of Arts, &c. gave the author a premium.

SPINOSUS CAULIS, in botany; a ſtem covered with ſtrong woody prickles, whoſe roots are not ſuperficial, but proceeding from the body of the ſtem. When applied to a leaf, *ſpinoſum folium,* it indicates the margin running out into rigid points or prickles, *quod margine exit in acumina duriora, rigida, pungentia.*

SPINOUS, in botany. See SPINOSUS.

SPINOUS *Fiſhes,* ſuch as have ſome of the rays of the back-fins running out into thorns or prickles, as the perch, &c.

SPINOZA (BENEDICT de), the ſon of a Portugueſe Jew ſettled at Amſterdam, where he was born in 1633. He commenced philoſopher early in life; publicly embraced Chriſtianity, for which the Jews attempted to aſſaſſinate him; and in the end made a great noiſe in the world by his atheiſtical principles and writings. He was probably the firſt who reduced Atheiſm to a ſyſtem; but in other reſpects his doctrine was the ſame with that of ſeveral philoſophers both antient and modern. He retired into the country that he might not be interrupted in his ſpeculations, and was ſometimes three months without going out of his lodgings. This retired life did not hinder his name from ſpreading. The free-thinkers came to him from all parts. The palatine count offered him the place of profeſſor of philoſophy at Heidelberg; but he refuſed it. He died at the Hague in 1677, aged about 44 years. He is ſaid to have been honeſt, obliging, and very regular in his morals; which we need not be more ſurpriſed at than to ſee people live an irregular life though fully perſuaded of the truths of the Goſpel.

SPINOZISM, or SPINOSISM, the doctrine of Spinoza, or Atheiſm and Pantheiſm propoſed after the manner of Spinoza.

See SPINOZA. The great principle of Spinozism is, That there is nothing properly and absolutely existing besides matter and the modifications of matter; among which are even comprehended thought, abstract and general ideas, comparisons, relations, combinations of relations, &c. The chief articles in Spinoza's system are reducible to these: That there is but one substance in nature, and that this only substance is endued with an infinite number of attributes, among which are extension and cogitation: that all the bodies in the universe are modifications of this substance considered as it is extended; and that all the souls of men are modifications of the same substance considered as cogitative: that God is a necessary and infinitely perfect being, and is the cause of all things that exist, but not a different being from them: that there is but one being and one nature, and that this nature produces within itself, by an immanent act, all those which we call *creatures*; and that this being is at the same time both agent and patient, efficient cause and subject; but that he produces nothing but modifications of himself.

SPIRÆA, in botany: A genus of plants belonging to the class of *icosandria*, and to the order of *pentagynia*; and in the natural system arranged under the 26th order, *Pomaceæ*. The calyx is quinquefid; there are five petals; and the capsule is polyspermous. There are 18 species; of which two only are British, the filipendula and ulmaria. 1. The *filipendula*, dropwort, has pinnated leaves; the leaflets are serrated; the stalk is herbaceous, about a foot and a half high, terminated with a loose umbel of white flowers, often tinged with red. The petals are generally six, and the segments of the calyx are reflexed: the stamina are 30 or more; the germina 12 or upwards. It grows in mountainous pastures. 2. The *ulmaria*, meadow-sweet. The leaves have only two or three pair of pinnæ, with a few smaller ones intermixed; the extreme one being larger than the rest, and divided into three lobes. The calyx is reddish; the petals white, and the number of capsules from six to ten twisted in a spiral. The tuberous pea-like roots of the filipendula, dried and reduced to powder, have been used instead of bread in times of scarcity. Hogs are very fond of these roots. Cows, goats, sheep, and swine, eat the plant; but horses refuse it. The flowers of the ulmaria have a fragrant scent, which rises in distillation. The whole plant indeed is extremely fragrant, so that the common people of Sweden strew their floors with it on holidays. It has also an astringent quality, and has been found useful in dysenteries, ruptures, and in tanning of leather.

SPIRAL, in geometry, a curve line of the circular kind, which in its progress recedes from its centre.

SPIRE, in architecture, was used by the antients for the base of a column, and sometimes for the astragal or tore; but among the moderns it denotes a steeple that continually diminishes as it ascends, whether conically or pyramidally.

SPIRIT, in metaphysics, an incorporeal being or intelligence; in which sense God is said to be a spirit, as are angels and the human soul. See METAPHYSICS.

SPIRIT, in chemistry and pharmacy, a name applied to every volatile liquid which is not insipid like phlegm or water; and hence the distinction into acid, alkaline, and vinous spirits. See PHARMACY.

SPIRIT *of Wine*. See CHEMISTRY, DISTILLATION, and PHARMACY.

SPITHEAD, a road between Portsmouth and the Isle of Wight, where the royal navy of Great Britain frequently rendezvous.

SPITTLE, in physiology. See SALIVA.

SPITZBERGEN, the most northern country of Europe, being to the north of Norway, between Greenland to the west and Nova Zembla to the east. The coast is beset with craggy mountains, and in the winter it is continual night for four months. The animals are large white bears and white foxes. There are no settled inhabitants, and it is known only to those who go on the coast to fish for whales. See GREENLAND.

SPLACHNUM, in botany: A genus of plants belonging to the class of *cryptogamia*, and order of *musci*. The antheræ are cylindrical, and grow on a large coloured apophysis or umbraculum. The calyptra is caducous. The female star grows on a separate stem. There are six species, the rubrum, luteum, sphæricum, ampullaceum, vasculosum, angustatum. Two of these are natives of Britain. 1. The *ampullaceum*, or crewet splachnum, is found in bogs and marshes, and often upon cow-dung. It grows in thick tufts, and is about two inches high. The leaves are oval-lanceolate, terminated with a long point or beard. The top of the filament or peduncle swells into the form of an inverted cone, which Linnæus terms an *apophysis* or *umbraculum*; upon the top of which is placed a cylindrical anthera, like the neck of a crewet. The calyptra is conical, and resembles a small extinguisher. 2. The *vasculosum*, or acorn-shaped splachnum, is found upon bogs and cow-dung, and upon the points of rocks on the top of the Highland mountains, as on Ben-Lomond, and in the Isle of Sky, and elsewhere. This differs little from the preceding, and perhaps is no more than a variety. The filaments are about an inch high. The leaves oval-acute, not so lanceolate and bearded as the other. The apophysis, and the anthera at the top of it, form together nearly an oval figure, not unlike an acorn in its cup, the apophysis being transversely semi-oval, and of a blood-red colour, the anthera short and conical. The calyptra is the same as that of the other. The operculum is short and obtuse, and the rim of the anthera has eight large horizontal cilia. The anthera of the other is also ciliated, but not so distinctly. It is an elegant moss, and very distinguishable on account of its orange-coloured filaments and dark-red capsules.

SPLEEN, in anatomy. See ANATOMY.

SPLEEN *Wort*. See ASPLENIUM.

SPLENT, or SPLINT, among farriers, a callous insensible excrescence, apt to grow on the shank-bone of horses. See FARRIERY.

SPLICING, in the sea language, is the untwisting the ends of two cables or ropes, and working the several strands into one another by a fidd, so that they become as strong as if they were but one rope.

SPOILS, whatever is taken from the enemy in time of war. Among the antient Greeks, the spoils were divided among the whole army; only the general's share was largest: but among the Romans, the spoils belonged to the republic.

SPOLETTO, a duchy of Italy, bounded on the north by the marquisate of Ancona and duchy of Urbino, on the east by Farther Abruzzo, on the south by Sabina and the patrimony of St. Peter, and on the west by Orvietano and Perugino. It is about 55 miles in length and 40 in breadth. It was antiently a part of Umbria, and now belongs to the Pope.—The name of the capital city is also *Spoletto*. It was formerly a large place, but in 1703 was ruined by an earthquake; from whence it has never recovered itself.

SPOLIATION, in ecclesiastical law, is an injury done by one clerk or incumbent to another, in taking the fruits of his benefice without any right thereunto, but under a pretended title. It is remedied by a decree to account for the profits so taken. This injury, when the *jus patronatus*, or right of advowson, doth not come in debate, is cognizable in the spiritual court: as if a patron first presents A to a benefice, who is instituted and inducted thereto; and then, upon pretence of a vacancy, the same patron presents B to the same living, and he also obtains institution and induction. Now if A disputes the fact of the vacancy, then that clerk who is kept out of the profits of the living, whichever it be, may sue the other in the spiritual court

for ſpoliation, or taking the profits of his benefice. And it ſhall there be tried, whether the living were or were not vacant; upon which the validity of the ſecond clerk's pretenſions muſt depend. But if the right of patronage comes at all into diſpute, as if one patron preſented A, and another patron preſented B, there the eccleſiaſtical court hath no cognizance, provided the tithes ſued for amount to a fourth part of the value of the living, but may be prohibited at the inſtance of the patron by the king's writ of *indicavit*. So alſo if a clerk, without any colour of title, ejects another from his parſonage, this injury muſt be redreſſed in the temporal courts: for it depends upon no queſtion determinable by the ſpiritual law (as plurality of benefices or no plurality, vacancy or no vacancy), but is merely a civil injury.

SPONDEE, in antient poetry, a foot conſiſting of two long ſyllables, as *omnes*.

SPONDIAS, Brasilian or Jamaica Plum, in botany; a genus of plants belonging to the claſs of *decandria*, and order of *pentagynia*. The calyx is quinquedentate. The corolla pentapetalous. The fruit contains a quinquelocular kernel. There are only two ſpecies, the mombin and myrobalanus, which appear ſo much confounded in the deſcriptions of different botaniſts, that we do not venture to preſent them to our readers.

SPONGIA, Sponge, in natural hiſtory; a genus of animals belonging to the claſs of *vermes*, and order of *zoophyta*. It is fixed, flexible, and very torpid, growing in a variety of forms, compoſed either of reticulated fibres, or maſſes of ſmall ſpines interwoven together, and clothed with a living gelatinous fleſh, full of ſmall mouths or holes on its ſurface, by which it ſucks in and throws out the water.

Fifty ſpecies have already been diſcovered, of which 10 belong to the Britiſh coaſts. 1. *Oculata*, or branched ſponge, is delicately ſoft and very much branched; the branches are a little compreſſed, grow erect, and often united together. They have rows of cells on each margin, that project a little. This ſpecies is of a pale yellow colour, from five to ten inches high. The fibres are reticulated, and the fleſh or gelatinous part is ſo tender, that when it is taken out of the water it ſoon dries away. It is very common round the ſea coaſt of Britain and Ireland. This deſcription will be better underſtood by conſulting Plate 20, fig. 1. At *b*, *b*, along the edges and on the ſurface of the branches, are rows of ſmall papillary holes, through which the animal receives its nouriſhment. 2. *Criſtata*, or cock's comb ſponge, is flat, erect, and ſoft, growing in the ſhape of cock's combs, with rows of little holes along the tops, which project a little. It abounds on the rocks to the eaſtward of Haſtings in Suſſex, where it may be ſeen at low-water. It is commonly about three inches long, and two inches high, and of a pale yellowiſh colour. When put into a glaſs veſſel of ſea-water, it has been obſerved to ſuck in and ſquirt out the water through little mouths along the tops, giving evident ſigns of life. 3. *Stupoſa*, tow-ſponge, or downy branched ſponge, is ſoft like tow, with round branches and covered with fine pointed hairs. It is of a pale yellow colour, and about three inches high. It is frequently thrown on the ſhore at Haſtings in Suſſex. Fig. 2. repreſents this ſponge; but it is ſo cloſely covered with a fine down, that the numerous ſmall holes in its ſurface are not diſcernible. 4. *Dichotoma*, dichotomous or forked ſponge, is ſtiff, branched, with round, upright, elaſtic branches, covered with minute hairs. It is found on the coaſt of Norway, and alſo, according to Berkenhout, on the Corniſh and Yorkſhire coaſts. It is of a pale yellow colour, and full of very minute pores, guarded by minute ſpines. 5. *Urens* or *tomentoſa*, ſtinging ſponge, or crumb of bread ſponge, is of many forms, full of pores, very brittle and ſoft, and interwoven with very minute ſpines. It is full of ſmall protuberances, with a hole in each, by which it ſucks in and throws out the water. It is very common on the Britiſh coaſt, and is frequently ſeen ſurrounding fucuses. It is found alſo on the ſhores of North America, Africa, and in the Eaſt Indies. When newly taken out of the ſea, it is of a bright orange colour, and full of gelatinous fleſh; but when dry it becomes whitiſh, and when broken has the appearance of crumb of bread. If rubbed on the hand, it will raiſe bliſters; and if dried in an oven, its power of ſtinging is much increaſed, eſpecially that variety of it which is found on the ſea-coaſt of North America. 6. *Palmata*, palmated ſponge, is like a hand with fingers a little divided at the top. The mouths are a little prominent, and irregularly diſpoſed on the ſurface. It is found on the beach at Brighthelmſtone. It is of a reddiſh colour, inclining to yellow, and of the ſame ſoft woolly texture with the ſpongia oculata, fig. 4. 7. *Coronata*, coronet ſponge, is very ſmall, conſiſting of a ſingle tube ſurrounded at top by a crown of little ſpines. The tube is open at the top. The rays that compoſe the little crown are of a bright, ſhining pearl colour; the body is of a pale yellow. It has been found in the harbour of Emtworth, between Suſſex and Hampſhire. 8. *Botryoides*, grape ſponge, is very tender and branched, as if in bunches: the bunches are hollow, and are made up of oblong oval figures having the appearance of grapes; and each bunch is open at top. This ſpecies is of a bright, ſhining colour. The openings at the top are evidently the mouths by which the animal imbibes and diſcharges moiſture. When the ſurface is very much magnified, it appears covered with little maſſes of triple, equidiſtant, ſhining ſpines. 9. *Lacuſtris*, creeping ſponge, has erect, cylindrical, and obtuſe branches. It is found in lakes in Sweden and England. 10. *Fluviatilis*, river ſponge, is green, erect, brittle, and irregularly diſpoſed in numerous branches. It abounds in many parts of Europe, in the freſh rivers of Ruſſia and England, but particularly in the river Thames. It ſcarcely exhibits any ſymptoms of life, is of a fiſhy ſmell: its pores or mouths are ſometimes filled with green gelatinous globules. It differs very little from the lacuſtris.

So early as the days of Ariſtotle ſponges were ſuppoſed to poſſeſs animal life; the perſons employed in collecting them having obſerved them ſhrink when torn from the rocks, thus exhibiting ſymptoms of ſenſation. The ſame opinion prevailed in the time of Pliny: But no attention was paid to this ſubject till Count Marſigli examined them, and declared them vegetables. Dr. Peyſonell, in a paper which he ſent to the Royal Society in the year 1752, and in a ſecond in 1757, affirmed they were not vegetables, but the production of animals; and has accordingly deſcribed the animals, and the proceſs which they performed in making the ſponges. Mr. Ellis, in the year 1762, was at great pains to diſcover theſe animals. For this purpoſe he diſſected the ſpongia urens, and was ſurpriſed to find a great number of ſmall worms of the genus of nereis or ſea-ſcolopendra, which had pierced their way through the ſoft ſubſtance of the ſponge in queſt of a ſafe retreat. That this was really the caſe, he was fully aſſured of, by inſpecting a number of ſpecimens of the ſame ſort of ſponge, juſt freſh from the ſea. He put them into a glaſs filled with ſea-water; and then, inſtead of ſeeing any of the little animals which Dr. Peyſonell deſcribed, he obſerved the papillæ or ſmall holes with which the papillæ are ſurrounded contract and dilate themſelves. He examined another variety of the ſame ſpecies of ſponge, and plainly perceived the ſmall tubes inſpire and expire the water. He therefore concluded, that the ſponge is an animal, and that the ends or openings of the branched tubes are the mouths by which it receives its nouriſhment, and diſcharges its excrements.

SPONSORS, among Chriſtians, are thoſe perſons who, in the office of baptiſm, anſwer or are ſureties for the perſons baptiſed.

SPONTANEOUS, a term applied to ſuch motions of the body and operations of the mind as we perform of ourſelves without any conſtraint.

SPOON-bill, in ornithology. See Platalea.

SPOONING, in the ſea-language, is ſaid of a ſhip, which

being under ſail in a ſtorm at ſea, is unable to bear it, and conſequently forced to go right before the wind.

SPORADES, among antient aſtronomers, a name given to ſuch ſtars as were not included in any conſtellation.

SPORADIC DISEASES, among phyſicians, are ſuch as ſeize particular perſons at any time or ſeaſon, and in any place; in which ſenſe they are diſtinguiſhed from epidemical and endemical diſeaſes.

SPOTS, in aſtronomy, certain places of the ſun's or moon's diſk, obſerved to be either more bright or dark than the reſt; and accordingly called *faculæ & maculæ*. See ASTRONOMY-*Index*.

SPOUT, or *Water*-SPOUT. See *Water-Spout*.

SPOUT-*Fiſh*. See SOLEN.

SPRAT (Dr. THOMAS), biſhop of Rocheſter, was born in 1636. He had his education at Oxford, and after the Reſtoration entered into holy orders. He became fellow of the Royal Society, chaplain to George duke of Buckingham, and chaplain in ordinary to king Charles II. In 1667 he publiſhed the Hiſtory of the Royal Society, and a Life of Mr. Cowley; who, by his laſt will, left to his care his printed works and MSS. which were accordingly publiſhed by him. In 1668 he was inſtalled prebendary of Weſtminſter; in 1680, was appointed canon of Windſor; in 1683, dean of Weſtminſter; and in 1684, conſecrated to the biſhopric of Rocheſter. He was clerk of the cloſet to king James II.; in 1685, was made dean of the chapel royal; and the year following, was appointed one of the commiſſioners for eccleſiaſtical affairs. In 1692 his lordſhip, with ſeveral other perſons, was charged with treaſon by two men, who drew up an aſſociation, in which they whoſe names were ſubſcribed declared their reſolution to reſtore king James; to ſeize the princeſs of Orange, dead or alive: and to be ready with 30,000 men to meet king James when he ſhould land. To this they put the names of Sancroft, Sprat, Marlborough, Saliſbury, and others. The biſhop was arreſted, and kept at a meſſenger's, under a ſtrict guard, for eleven days. His houſe was ſearched, and his papers ſeized, among which nothing was found of a treaſonable appearance, except one memorandum, in the following words: *Thorough paced doctrine*. Being aſked at his examination the meaning of the words, he ſaid that, about 20 years before, curioſity had led him to hear Daniel Burgeſs preach; and that being ſtruck with his account of a certain kind of doctrine, which he ſaid *entered at one ear, and pacing through the head went out at the other*, he had inſerted the memorandum in his table-book, that he might not loſe the ſubſtance of ſo ſtrange a ſermon. His innocence being proved, he was ſet at liberty, when he publiſhed an account of his examination and deliverance; which made ſuch an impreſſion upon him, that he commemorated it through life by an yearly day of thankſgiving. He lived to the 79th year of his age, and died May 20, 1713. His works, beſides a few poems of little value, are, "The Hiſtory of the Royal Society;" "The Life of Cowley;" "The Anſwer to Sorbiere;" "The Hiſtory of the Rye-houſe Plot;" "The Relation of his own Examination;" and a volume of "Sermons." Dr. Johnſon ſays, "I have heard it obſerved, with great juſtneſs, that every book is of a different kind, and that each has its diſtinct and characteriſtical excellence."

SPRAT, in ichthyology. See CLUPEA.

SPRAY, the ſprinkling of the ſea, which is driven from the top of a wave in ſtormy weather. It differs from ſpoon-drift, as being only blown occaſionally from the broken ſurface of a high wave; whereas the latter continues to fly horizontally along the ſea, without intermiſſion, during the exceſs of a tempeſt or hurricane.

SPRING, in natural hiſtory, a fountain or ſource of water riſing out of the ground. Many have been the conjectures of philoſophers concerning the origin of fountains.

But the true cauſe remained undiſcovered till Dr. Halley, in making his celeſtial obſervations upon the tops of the mountains at St. Helena, about 800 yards above the level of the ſea, found that the quantity of vapour which fell there (even when the ſky was clear) was ſo great, that it very much impeded his obſervations, by covering his glaſſes with water every half quarter of an hour; and upon that he attempted to determine by experiment the quantity of vapour exhaled from the ſurface of the ſea, as far as it riſes from heat, in order to try whether that might be a ſufficient ſupply for the water continually diſcharged by fountains. The proceſs of his experiment was as follows: He took a veſſel of water ſalted to the ſame degree with that of ſea water, in which he placed a thermometer; and by means of a pan of coals brought the water to the ſame degree of heat which is obſerved to be that of the air in our hotteſt ſummer; this done, he fixed the veſſel of water with the thermometer in it to one end of a pair of ſcales, and exactly counterpoiſed it with weights on the other; then, at the end of two hours, he found, by the alteration made in the weight of the veſſel, that about a ſixtieth part of an inch of the depth of the water was gone off in vapour; and therefore, in twelve hours, one tenth of an inch would have gone off. Now this accurate obſerver allows the Mediterranean Sea to be forty degrees long, and four broad, (the broader parts compenſating for the narrower, ſo that its whole ſurface is 160 ſquare degrees); which, according to the experiment, muſt yield at leaſt 5,280,000,000 tons of water: In which account no regard is had to the wind and the agitation of the ſurface of the ſea, both which undoubtedly promote the evaporation.

It remained now to compare this quantity of water with that which is daily conveyed into the ſame ſea by the rivers. The only way to do which, was to compare them with ſome known river; and accordingly he takes his computation from the river Thames; and, to avoid all objections, makes allowances, probably greater than what were abſolutely neceſſary.

The Mediterranean receives the following conſiderable rivers, viz. the Iberus, the Rhone, the Tyber, the Po, the Danube, the Nieſter, the Boryſthenes, the Tanais, and the Nile. Each of theſe he ſuppoſes to bring down ten times as much water as the Thames, whereby he allows for ſmaller rivers which fall into the ſame ſea. The Thames, then, he finds by menſuration to diſcharge about 20,300,000 tons of water a-day. If therefore the above-ſaid nine rivers yield ten times as much water as the Thames doth, it will follow, that all of them together yield but 1827 millions of tons in a day, which is but little more than one-third of what is proved to be raiſed in vapour out of the Mediterranean in the ſame time. We have therefore from hence a ſource abundantly ſufficient for the ſupply of fountains.

Now having found that the vapour exhaled from the ſea is a ſufficient ſupply for the fountains, he proceeds in the next place to conſider the manner in which they are raiſed; and how they are condenſed into water again, and conveyed to the ſources of ſprings.

In order to this he conſiders, that if an atom of water was expanded into a ſhell or bubble, ſo as to be ten times as big in diameter as when it was water, that atom would become ſpecifically lighter than air; and therefore would riſe ſo long as the warmth which firſt ſeparated it from the ſurface of the water ſhould continue to diſtend it to the ſame degree; and conſequently, that vapours may be raiſed from the ſurface of the ſea in that manner, till they arrive at a certain height in the atmoſphere, at which they find air of equal ſpecific gravity with themſelves. Here they will float till, being condenſed by cold, they become ſpecifically heavier than the air, and fall down in dew; or being driven by the winds againſt the ſides of mountains, (many of which far ſurpaſs the uſual height to which the va-

pours would of themſelves aſcend), are compelled by the ſtream of the air to mount up with it to the tops of them; where, being condenſed into water, they preſently precipitate, and gleeting down by the crannies of the ſtones, part of them enters into the caverns of the hills; which being once filled, all the overplus of water that comes thither runs over by the loweſt place, and breaking out by the ſides of the hills forms ſingle ſprings. Many of theſe running down by the valleys between the ridges of the hills, and coming to unite, form little rivulets or brooks: many of theſe again meeting in one common valley, and gaining the plain ground, being grown leſs rapid, become a river; and many of theſe being united in one common channel, make ſuch ſtreams as the Rhine and the Danube; which latter, he obſerves, one would hardly think to be a collection of water condenſed out of vapour, unleſs we conſider how vaſt a tract of ground that river drains, and that it is the ſum of all thoſe ſprings which break out on the ſouth ſide of the Carpathian mountains, and on the north ſide of the immenſe ridge of the Alps, which is one continued chain of mountains from Switzerland to the Black Sea.

Thus one part of the vapours which are blown on the land is returned by the rivers into the ſea from whence it came. Another part falls into the ſea before it reaches the land; and this is the reaſon why the rivers do not return ſo much water into the Mediterranean as is raiſed in vapour. A third part falls on the low lands, where it affords nouriſhment to plants; yet it does not reſt there, but is again exhaled in vapour by the action of the ſun, and is either carried by the winds to the ſea to fall in rain or dew there, or elſe to the mountains to become the ſources of ſprings.

However, it is not to be ſuppoſed that all fountains are owing to one and the ſame cauſe; but that ſome proceed from rain and melted ſnow, which, ſubſiding through the ſurface of the earth, makes its way into certain cavities, and thence iſſues out in the form of ſprings; becauſe the waters of ſeveral are found to increaſe and diminiſh in proportion to the rain which falls: that others again, eſpecially ſuch as are ſalt, and ſpring near the ſea ſhore, owe their origin to ſea-water percolated through the earth; and ſome to both theſe cauſes; though without doubt moſt of them, and eſpecially ſuch as ſpring near the tops of high mountains, receive their waters from vapours, as before explained.

This reaſoning of Dr. Halley's is confirmed by more recent obſervations and diſcoveries. It is now found, that though water is a tolerable conductor of the electric fluid, dry earth is an electric *per ſe,* conſequently the dry land muſt always be in an electrified ſtate compared with the ocean, unleſs in ſuch particular caſes as are mentioned under the article EARTHQUAKE.—It is alſo well known, that ſuch bodies as are in an electrified ſtate, whether *plus* or *minus*, will attract vapour, or other light ſubſtances that come near them. Hence the vapours that are raiſed from the ocean muſt neceſſarily have a tendency to approach the land in great quantity, even without the aſſiſtance of the wind, though this laſt muſt undoubtedly contribute greatly towards the ſame purpoſe, as Dr. Halley juſtly obſerves. In like manner, the higher grounds are always in a more electrified ſtate than the lower ones; and hence the vapours having once left the ocean and approached the ſhore, are attracted by the high mountains, of which Mr. Pennant gives an inſtance in Snowdon. Hence we may ſee the reaſon why ſprings are ſo common in the neighbourhood of mountains, they being ſo advantageouſly formed in every reſpect for collecting and condenſing the vapours into water.

The heat of ſprings is generally the ſame with the mean temperature of the atmoſphere. The mean temperature of the ſouth of England is 48°; in Scotland, near Edinburgh, it is 45; in the north of Ireland it is 48°; and on the ſouth coaſt about 51°. At Upſal, in Sweden, it is 43°; and in Paris 53°. According to accurate experiments made by eminent philoſophers, the heat of the ſprings in theſe different countries correſponds with the medium temperature. We have not heard that ſimilar experiments have been made in other countries, or we ſhould have been careful to collect them. We do not, however, doubt but they have been made in moſt countries of Europe; yet we ſuſpect little attention has been paid to this ſubject within the tropical regions.

Though this coincidence of the heat of ſprings with the mean temperature of the climate where they flow, ſeems to be a general fact, yet it admits of many exceptions. In many parts of the world there are ſprings which not only exceed the mean temperature, but even the ſtrongeſt meridian heat ever known in the torrid regions. The following table will give a diſtinct notion of the degrees of heat which different ſprings have been found to poſſeſs, according to the experiments of philoſophers. It is neceſſary to remark, that experiments made upon the ſame ſprings, performed by different perſons, vary a little from one another, which may be owing to many accidents eaſily accounted for. Where this is the caſe, we ſhall mention both the loweſt and higheſt degree of heat which has been aſcribed to the ſame ſpring, according to Fahrenheit's thermometer.

Places.	Springs.	Higheſt degree of heat.	Loweſt degree of heat.
Briſtol,	St. Vincent's, or the hot well,	84	76
Buxton,	Gentleman's bath,	82	
Matlock,	——— ———	69	
Bath,	King's bath,	119	113
Aix la Chapelle,	——— ———	146	136
Barege,	——— ———	122	
Piſa,	——— ———	104	
Caroline baths in Bohemia	Prudel, or furious,	165	
Iceland,	Geyzer,	212	

In cold countries, where congelation takes place, the heat of the earth is conſiderably above the freezing point, and continues ſo through the whole year. From experiments that have been made in mines and deep pits, it appears that this heat is uniform and ſtationary at a certain depth. But as the heat of theſe ſprings far exceeds the common heat of the internal parts of the earth, it muſt be occaſioned by cauſes peculiar to certain places; but what theſe cauſes are it is no eaſy matter to determine.

Springs are of different kinds. Some are perennial, or continue to flow during the whole year; others flow only during the rainy ſeaſon; ſome ebb and flow. At Torbay there is one of this kind, which ebbs and flows five or ſix inches every hour. There is another near Coriſa in Italy, which ebbed and flowed three times a-day in the time of Pliny, and continues to do ſtill. A ſpring near Henley ſometimes flows for two years together, and then dries up for an equal period. The cauſe of this is explained under the article HYDROSTATICS. For the ingredients found in ſprings, ſee MINERAL *Waters and* WATER.

SPRING, in mechanics, denotes a thin piece of tempered ſteel, or other elaſtic ſubſtance, which being wound up ſerves to put machines in motion by its elaſticity, or endeavours to unbend itſelf; ſuch is the ſpring of a watch, clock, or the like.

SPRING, *Ver*, in coſmography, denotes one of the ſeaſons of the year; commencing, in the northern parts of the world, on the day the ſun enters the firſt degree of Aries, which is about the 10th day of March, and ending when the ſun leaves Gemini; or, more ſtrictly and generally, the ſpring begins on the day when the diſtance of the ſun's meridian altitude from the

zenith, being on the increaſe, is at a medium between the greateſt and leaſt. The end of the ſpring coincides with the beginning of ſummer. See SUMMER.

SPRING *Tide*. See ASTRONOMY and TIDE.

Burning SPRINGS. See BURNING *Springs*.

SPRINGER, or SPRING *Bok*, in zoology. See CAPRA.

SPRIT, a ſmall boom or pole, which croſſes the ſail of a boat diagonally, from the maſt to the upper hindmoſt corner of the ſail, which it is uſed to extend and elevate; the lower end of the ſprit reſts in a ſort of wreath or collar called the *ſnotter*, which encircles the maſt in that place.

SPRITSAIL. See SAIL and SHIP.

SPRITSAIL *Topſail*. See SAIL and SHIP.

SPRUCE-TREE. See PINUS.

SPRUCE-*Beer*, a cheap and wholeſome liquor, which is thus made: Take of water ſixteen gallons, and boil the half of it. Put the water thus boiled, while in full heat, to the reſerved cold part, which ſhould be previouſly put into a barrel or other veſſel; then add ſixteen pounds of treacle or molaſſes, with a few tableſpoonfuls of the eſſence of ſpruce, ſtirring the whole well together; add half a pint of yeaſt, and keep it in a temperate ſituation, with the bung-hole open, for two days, till the fermentation be abated. Then cloſe it up or bottle it off, and it will be fit for being drunk in a few days afterwards. In North America, and perhaps in other countries, where the black and white ſpruce-firs abound, inſtead of adding the *eſſence* of the ſpruce at the ſame time with the molaſſes, they make a decoction of the leaves and ſmall branches of theſe trees, and find the liquor equally good. It is a powerful antiſcorbutic, and may prove very uſeful in long ſea-voyages.

SPUNGE, or SPONGE. See SPONGIA.

SPUNGING, in gunnery, the cleaning of the inſide of a gun with a ſpunge, in order to prevent any ſparks of fire from remaining in it, which would endanger the life of him that ſhould load it again.

SPUN YARN, among ſailors, is a kind of line made from rope yarn, and uſed for ſeizing or faſtening things together.

SPUNK, in botany. See BOLETUS.

SPUR, a piece of metal conſiſting of two branches encompaſſing a horſeman's heel, and a rowel in form of a ſtar, advancing out behind to prick the horſe.

SPUR *Winged Water Hen*. See PARRA.

SPURGE, in botany. See EUPHORBIA.

SPURGE *Laurel*. See DAPHNE.

SPURREY, in botany. See SPERGULA.

SPY, a perſon hired to watch the actions, motions, &c. of another; particularly what paſſes in a camp. When a ſpy is diſcovered, he is hanged immediately.

SQUADRON, in military affairs, denotes a body of horſe whoſe number of men is not fixed; but is uſually from 100 to 200.

SQUADRON *of Ships*, either implies a detachment of ſhips employed on any particular expedition, or the third part of a naval armament.

SQUADS, in a military ſenſe, are certain diviſions of a company into ſo many ſquads, generally into three or four. The uſe of forming companies into as many ſquads of inſpection as it has ſerjeants and corporals, is proved by thoſe regiments who have practiſed that method; as by it the irregularity of the ſoldiers is conſiderably reſtrained, their dreſs improved, and the diſcipline of the regiment in general moſt remarkably forwarded. Every officer ſhould have a roll of his company by ſquads

SQUALL, a ſudden and violent blaſt of wind, uſually occaſioned by the interruption and reverberation of the wind from high mountains. Theſe are very frequent in the Mediterranean, particularly that part of it which is known by the name of the *Levant*, as produced by the repulſion and new direction which the wind meets with in its paſſage between the various iſlands of the Archipelago.

SQUALUS, SHARK, in ichthyology; a genus arranged by Linnæus under the claſs of *amphibia*, and the order of *nantes*, but by Gmelin referred to the claſs of *piſces*, and order of *chondropterygii*. The head is obtuſe; on the ſides of the neck there are from four to ſeven ſemilunar ſpiracles. The eyes are oblong, vertical, half covered, and before the *foramen temporale*. The mouth is ſituated in the anterior and lower part of the head, and is armed with ſeveral rows of teeth, which are ſerrated, acute, partly moveable and partly fixed, and unequal in form. The body is oblong, tapering, and rough, with very tender prickles. The ventral fins are much leſs than the pectoral, and are ſituated round the anus and genitals. There are thirty-two ſpecies; the iſabella canicula or greater dog fiſh; catulus or ſmaller dog-fiſh; ſtellaris; galeus or tope; muſtelus or ſmooth hound; cirratus; barbatus or barbu; tigrinus or tigre; Africanus or galonné; ocellatus or oeillé; zygæna or balance-fiſh; tiburo or pantouflier of Brouſſonet; griſeus or griſet; vulpes or ſea-fox; longicaudus; glaucus or blue ſhark; cornubius, porbeagle, or beaumaris-ſhark; cinereus or perlon; maximus; carcharias or white ſhark; priſtis or ſcie; ſpinoſus or bouelé; acanthias or piked dog-fiſh; fernandinus; ſpinax or ſagre; ſquamoſus or ecailleux; centrina or humantin; indicus; Americanus or liche; ſquatina or angel-fiſh; maſſaſa; and kumal. The following are the moſt remarkable:

1. The *iſabella* has a wrinkly ſpotted ſkin, and the anterior dorſal fin is perpendicular to the abdominal fins. The body is ſomewhat flat; the head ſhort, large, and obtuſe. The teeth are diſpoſed in ſix rows, compreſſed, ſhort, and triangular, having a notch on each ſide of their baſes. The eyes are ſunk; the iris is of a copper colour, and the pupil is black and oblong. The fins of the back are almoſt ſquare; the caudal fin is divided into two lobes, and the lateral line is parallel to the back. The upper part of the body is of a reddiſh aſh-colour, with blackiſh ſpots diſpoſed irregularly. The under part is of a dirty white hue. This ſpecies is found near New Zealand, and is about $2\frac{1}{2}$ feet long.

2. *Canicula*, greater dog-fiſh, or ſpotted ſhark, is diſtinguiſhed by large noſtrils, which are covered by a lobe and worm-ſhaped flap, or by the poſition of the anal fin, which is at an equal diſtance from the anus and tail. The body is ſpotted; the head is ſmall, with a ſhort ſnout; the eyes are oblong; the iris whitiſh; the mouth is large and oblong, armed with three rows of teeth; the tongue is cartilaginous; the anus is before the middle of the body; the firſt dorſal fin is behind the ventral fins; the other, which is leſs, is almoſt oppoſite the anal fin; the caudal fin is narrow and marginated. This ſpecies is found in almoſt every ſea, is about four feet long, extremely voracious, generally feeding on fiſhes, and is long-lived. The ſkin, which is ſpotted like a leopard's, is uſed when dried for various purpoſes.

3. *Catulus*, ſmaller dog-fiſh, has a large head; the pupil of the eyes is black; the iris white; the ſnout is of a bright hue; the mouth, which is large, is ſituated between the noſtrils, and is armed with four rows of teeth, ſerrated with three points bent inwards; thoſe in the middle between the two mandibles are longer than the reſt. The tongue is broad and ſmooth; the ſpiracles are five; the back is tapering and yellowiſh; the ſides are ſomewhat compreſſed; the tail longer than the body, and the caudal fin is narrow and marginated; the anterior anal and dorſal fins are behind the ventral; the poſterior dorſal fin is oppoſite to the anal. It inhabits the Mediterranean, Northern, and Indian Ocean, and is two or three feet long.

4. *Stellaris*, or greater cat-fiſh. The head is marked with points; the abdominal fins are united and ſharp at the apex;

the dorſal fins extend almoſt to the tail; the ſkin is reddiſh, marked with black ſpots of different ſizes, and is of a dirty aſh-colour below. It is from two to ſix feet long; reſembles the canicula, but diſtinguiſhed by larger and fewer ſpots, by a ſnout ſomewhat longer, a tail ſomewhat ſhorter, and noſtrils almoſt ſhut. It brings forth nineteen or twenty young at a time. It inhabits the European ſeas, living chiefly on ſhell-fiſh, molluſcæ, and other ſmall fiſhes. The dorſal fins are equal; the anterior one being behind the middle of the body, and the poſterior one being a little behind the anal.

5. *Tigrinus*, or tigre, is about fifteen feet long; the body is long, of unequal thickneſs, black, interſperſed with white ſtripes and ſpots, irregularly and tranſverſely.—The head is is large; the mouth low and tranſverſe, the upper jaw having two curls; the upper lip is thick and prominent; there are five ſpiracles on each ſide, the two laſt being united ſo as to give the appearance only of four; the mandibles are armed with very ſmall pointed teeth; the tongue is ſhort and thick; the eyes ſmall and oblong; the pupil azure coloured; the iris black. The abdomen is broad; the pectoral fins are broad, and rounded at the extremity. The anterior dorſal is oppoſite to the ventral fins, and the poſterior dorſal fin to the anal. The tail is compreſſed on both ſides, and the fin which terminates it is hollow. The tigrinus is found in the Indian Ocean, and lives chiefly on ſhell-fiſh. See Pl. 21. fig. 1.

7. *Zygæna, marteau*, or balance-fiſh, is frequently ſix feet long, and weighs 500 lbs. The head is elongated on each ſide; the fore-part is bent back, and convex both above and below. At the extremities of the elongated part are the eyes, which are large, prominent, and directed downwards; the iris is of a golden colour; the mouth is arched, and near the beginning of the trunk. It has a horrible appearance from the teeth, which are arranged in three or four rows, and are broad, pointed, and ſerrated on both ſides. The tongue is thick, broad, and like a man's. The trunk is long and tapering: the fins are ſemicircular on the margin, and black at the baſis; the ventral fins are ſeparated; the anal and poſterior dorſal fins are ſmall; the anterior dorſal fin is large, and near the head; the caudal is long.—This ſpecies inhabits the Mediterranean Sea and the Indian Ocean. It is one of the moſt voracious of the whole tribe. See fig. 2.

8. *Vulpes*, or ſea-fox, is moſt remarkable for the great length of its tail. the body being about ſeven feet and the tail ſix feet long. The head is ſhort and conical; the eyes are large; the jaws are armed in a dreadful manner with three rows of triangular, compreſſed, and pointed teeth; the tongue is blunt; the lateral line is ſtraight. The anterior dorſal fin is placed about the middle of the back; the poſterior, which conſiſts of two pointed lobes, is oppoſite to the anal fin; the ventral fins are very near one another; the anal is acuminated; the inferior lobe of the tail is about a foot long; the upper, which is ſhaped like a ſcythe, is five times longer. This ſpecies inhabits the Mediterranean, the coaſt of Scotland and England. It is covered with ſmall ſcales; its back is aſh-coloured, belly whitiſh. It is extremely voracious. The ancients ſtyled this fiſh *αλωπηξ*, and *vulpes*, from its ſuppoſed cunning. They believed, that when it had the misfortune to have taken a bait, it ſwallowed the hook till it got at the cord, which it bit off, and ſo eſcaped.

9. *Glaucus*, or blue ſhark, is about ſeven feet long. The colour of the back is a fine blue; the belly a ſilvery white; the head is flat; the eyes ſmall and roundiſh; the teeth are almoſt triangular, elongated, and pointed, but not ſerrated. The anus is very near the tail; the anterior dorſal fin is ſituated before the ventral fins, about the middle of the body, and is almoſt triangular; the poſterior dorſal fin is equal to the anal fin, and is placed nearer the tail; the pectoral fins are large, long, and marginated; and the ventral are blue above and white below; the caudal is blue, divided into two lobes, of which the ſuperior is much longer than the inferior lobe. This ſpecies is frequent in every ſea, and is fierce, but not very deſtructive in our ſeas.

10. The *maximus*, baſking-ſhark, or the ſun-fiſh of the Iriſh. This ſpecies has been long known to the inhabitants of the ſouth and weſt of Ireland and Scotland, and thoſe of Caernarvonſhire and Angelſea; but having never been conſidered in any other than a commercial view, is deſcribed by no Engliſh writer except Mr. Pennant; and, what is worſe, miſtaken for and confounded with the luna of Rondeletius, the ſame that our Engliſh writers call the ſun-fiſh. The Iriſh and Welſh give it the ſame name, from its lying as if to ſun itſelf on the ſurface of the water; and for the ſame reaſon Mr. Pennant call it the baſking ſhark. See Fig. 3. It was long taken for a ſpecies of whale, till Mr. Pennant pointed out the bronchial orifices on the ſides, and the perpendicular ſite of the tail. Theſe are migratory fiſh, or at leaſt it is but in a certain number of years that they are ſeen in multitudes on the Welſh ſeas, though in moſt ſummers a ſingle, and perhaps a ſtrayed fiſh appears. They inhabit the northern ſeas, even as high as the arctic circle. They viſited the bays of Caernarvonſhire and Angelſea in vaſt ſhoals in the ſummers of 1756 and a few ſucceeding years, continuing there only the hot months; for they quitted the coaſt about Michaelmas, as if cold weather was diſagreeable to them. Some old people ſay they recollect the ſame ſort of fiſh viſiting theſe ſeas in vaſt numbers about forty years ago. They appear in the Frith of Clyde, and among the Hebrides, in the month of June, in ſmall droves of ſeven or eight, but oftener in pairs. They continue in thoſe ſeas till the latter end of July, when they diſappear.

They have nothing of the fierce and voracious nature of the ſhark kind, and are ſo tame as to ſuffer themſelves to be ſtroked: they generally lie motionleſs on the ſurface, commonly on their bellies, but ſometimes, like tired ſwimmers, on their backs. Their food ſeems to conſiſt entirely of ſea-plants, no remains of fiſh being ever diſcovered in the ſtomachs of numbers that were cut up, except ſome green ſtuff, the half digeſted parts of algæ, and the like. Linnæus ſays it feeds on meduſæ.

At certain times, they are ſeen ſporting on the waves, and leaping with vaſt agility ſeveral feet out of the water. They ſwim very deliberately, with the dorſal fins above water. Their length is from three to twelve yards, and ſometimes even longer. Their form is rather ſlender, like others of the ſhark kind. The upper jaw is much longer than the lower, and blunt at the end. The tail is very large, and the upper part remarkably longer than the lower. The colour of the upper part of the body is a deep leaden; the belly white. The ſkin is rough like ſhagreen, but leſs ſo on the belly than the back. In the mouth, towards the throat, is a very ſhort ſort of whale-bone. The liver is of a great ſize, but that of the female is the largeſt; ſome weigh above 1000 pounds, and yield a great quantity of pure and ſweet oil, fit for lamps, and alſo much uſed to cure bruiſes, burns, and rheumatic complaints. A large fiſh has afforded to the captors a profit of 20l. They are viviparous; a young one about a foot in length being found in the belly of a fiſh of this kind. The meaſurements of one found dead on the ſhore of Loch Ranza in the iſle of Arran were as follow: The whole length, 27 feet 4 inches; firſt dorſal fin, 3 feet; ſecond, 1 foot; pectoral fin, 4 feet; ventral, 2 feet; the upper lobe of the tail, 5 feet; the lower, 3.

They will permit a boat to follow them, without accelerating their motion till it comes almoſt within contact, when a harponeer ſtrikes his weapon into them, as near to the gills as poſſible. But they are often ſo inſenſible as not to move till the united ſtrength of two men have forced in the harpoon deeper. As ſoon as they perceive themſelves wounded, they

fling up their tail and plunge headlong to the bottom; and frequently coil the rope round them in their agonies, attempting to disengage the harpoon by rolling on the ground, for it is often found greatly bent. As soon as they discover that their efforts are in vain, they swim away with amazing rapidity, and with such violence, that there has been an instance of a vessel of seventy tons having been towed away against a fresh gale. They sometimes run off with 200 fathoms of line, and with two harpoons in them; and will employ the fishers for twelve, and sometimes for twenty-four hours, before they are subdued. When killed, they are either hauled on shore, or, if at a distance from land, to the vessel's side. The liver (the only useful part), is taken out, and melted into oil in kettles provided for that purpose. A large fish will yield eight barrels of oil, and two of worthless sediment.

11. *Carcharias, requin*, or white shark, is often thirty feet long, and according to Gillius weighs 4000 pounds. The mouth of this fish is sometimes furnished with a six-fold row of teeth, flat, triangular, and exceedingly sharp at their edges, and finely serrated. Mr. Pennant had one rather more than an inch and a half long. Grew says, that those in the jaws of a shark two yards in length are not half an inch; so that the fish to which this tooth belonged must have been six yards long, provided the teeth and body keep pace in their growth. See fig. 4.

This dreadful apparatus, when the fish is in a state of repose, lies quite flat in the mouth; but when he seizes his prey, he has power of erecting them by the help of a set of muscles that join them to the jaw. The mouth is placed far beneath; for which reason these, as well as the rest of the kind, are said to be obliged to turn on their backs to seize their prey; which is an observation as ancient as the days of Pliny. The eyes are large; the back broad, flat, and shorter than that of other sharks. The tail is of a semilunar form, but the upper part is longer than the lower. It has vast strength in the tail, and can strike with great force; so that the sailors instantly cut it off with an axe as soon as they draw one on board. The pectoral fins are very large, which enables it to swim with great swiftness. The colour of the whole body and fins is a light ash. The ancients were acquainted with this fish; and Oppian gives a long and entertaining account of its capture. Their flesh is sometimes eaten, but is esteemed coarse and rank.—They are the dread of the sailors in all hot climates, where they constantly attend the ships in expectation of what may drop over-board: a man that has that misfortune perishes without redemption; they have been seen to dart at him like gudgeons at a worm. A master of a Guinea ship informed Mr. Pennant, that a rage of suicide prevailed among his new-bought slaves, from a notion the unhappy creatures had, that after death they should be restored again to their families friends, and country. To convince them at least that they should not reanimate their bodies, he ordered one of their corpses to be tied by the heels to a rope and lowered into the sea; and though it was drawn up again as fast as the united force of the crew could be exerted, yet in that short space the sharks had devoured every part but the feet, which were secured at the end of the cord.

Swimmers very often perish by them; sometimes they lose an arm or leg, and sometimes are bit quite asunder, serving but for two morsels for this ravenous animal: a melancholy tale of this kind is related in a West India ballad, preserved in Dr. Percy's Relics of ancient English Poetry.

This species inhabits the abyss of the ocean, and only appears on the surface when allured by its prey. It is the most voracious of all animals, not even it is said sparing its own offspring, and often swallowing its prey entire. At the famous naval battle of the 12th of April 1782, when the Cæsar, one of the French ships of the line, was set on fire, the sailors threw themselves into the sea, Sir Charles Douglas observed great numbers of these sharks, which lay between the French and British fleets, instantly seize on the unhappy victims. He several times saw two of them disputing about their prey, each seizing a leg, and at length disappearing, dragging the body along with them. Notwithstanding the continued roar of artillery, he heard distinctly the cries of those unhappy men.

12. *Pristis, scie*, or saw-fish, is sometimes fifteen feet long, smooth, black on the upper parts, ash-coloured on the sides, and white underneath. The head is flat and conical; the beak or snout projecting from the nose is about five feet long, covered with a coriaceous skin, and armed on each side, generally with twenty-four long, strong, and sharp-pointed teeth; but the number varies with age. The teeth are granulated; the eyes large, the iris of a golden colour, and the spiracles five. The anterior dorsal fin corresponds to those of the belly; the posterior is situated in the middle, between the former and apex of the tail; the pectoral fins are broad and long; the caudal is shorter than in the other species. It inhabits all the seas from Greenland to Brazil: and is found also in the Indian Ocean. It is harmless.

13. *Spinax, sagre*, or piked dog-fish, takes its name from a strong and sharp spine placed just before each of the back fins, distinguishing it at once from the rest of the British sharks. The nose is long, and extends greatly beyond the mouth, but is blunt at the end. The teeth are disposed in two rows, are small and sharp, and bend from the middle of each jaw towards the corners of the mouth. The back is of a brownish ash-colour; the belly white.—It grows to the weight of about twenty pounds. This species swarms on the coasts of Scotland, where it is taken, split, and dried; and is a food among the common people. It forms a sort of inland commerce, being carried on women's backs fourteen or sixteen miles up the country, and sold or exchanged for necessaries.

14. *Squatina*, angel-fish, is from six to eight feet long, has a large head; teeth broad at their base, but slender and very sharp above, and disposed in five rows all round the jaws. Like those of all sharks, they are capable of being raised or depressed by means of muscles uniting them to the jaws, not being lodged in sockets as the teeth of cetaceous fish are. The back is of a pale ash-colour, and very rough; along the middle is a prickly tuberculated line: the belly is white and smooth. The pectoral fins are very large, and extend horizontally from the body to a great distance; they have some resemblance to wings, whence its name. The ventral fins are placed in the same manner, and the double penis is placed in them; which forms another character of the males in this genus.

This is the fish which connects the genus of rays and sharks, partaking something of the character of both; yet is an exception to each in the situation of the mouth, which is placed at the extremity of the head. It is a fish not unfrequent on most of our coasts, where it prowls about for prey like others of the kind. It is extremely voracious; and like the ray, feeds on flounders and flat-fish, which keep at the bottom of the water. It is extremely fierce, and dangerous to be approached. Mr. Pennant mentions a fisherman whose leg was terribly torn by a large one of this species, which lay within his nets in shallow water, and which he went to lay hold of incautiously. The aspect of these, as well as the rest of the genus, have much malignity in them: their eyes are oblong, and placed lengthwise in their head, sunk in it, and overhung by the skin, and seem fuller of malevolence than fire. Their skin is very rough; the ancients made use of it to polish wood and ivory, as we do at present that of the greater dog-fish. The flesh is now but little esteemed on account of its coarse-

neſs and rankneſs; yet Archeſtratus (as quoted by Athenæus, p. 319), ſpeaking of the fiſh of Miletus, gives this the firſt place, in reſpect to delicacy, of the whole cartilaginous tribe. They grow to a great ſize; being ſometimes near a hundred weight.

Sharks are ſeldom deſtructive in the temperate regions; it is in the torrid zone that their ravages are moſt frequent. In the Weſt Indies accidents happen from them almoſt every day.

SQUAMARIA, in botany. See LATHRÆA.

SQUAMOUS, in anatomy, a name given to the ſpurious or falſe ſutures of the ſkull, becauſe compoſed of ſquamæ, or ſcales like thoſe of fiſhes.

SQUARE, in geometry, a quadrilateral figure both equilateral and equiangular. See GEOMETRY.

SQUARE *Root*. See ALGEBRA, and ARITHMETIC.

Hollow SQUARE, in the military art, a body of foot drawn up with an empty ſpace in the middle, for the colours, drums, and baggage, faced and covered by the pikes every way, to keep off the horſe.

SQUARE, among mechanics, an inſtrument conſiſting of two rules or branches, faſtened perpendicularly at one end of their extremities, ſo as to form a right-angle. It is of great uſe in the deſcription and menſuration of right-angles, and laying down perpendiculars.

SQUARE *Rigged*, an epithet applied to a ſhip whoſe yards are very long. It is alſo uſed in contradiſtinction to all veſſels whoſe ſails are extended by ſtays or lateen-yards, or by booms and gaffs; the uſual ſituation of which is nearly in the plane of the keel; and hence,

SQUARE *Sail*, is a ſail extended to a yard which hangs parallel to the horizon, as diſtinguiſhed from the other ſails which are extended by booms and ſtays placed obliquely. This ſail is only uſed in fair winds, or to ſcud under in a tempeſt. In the former caſe, it is furniſhed with a large additional part, called the *bonnet*, which is then attached to its bottom, and removed whenever it is neceſſary to SCUD. See SCUDDING.

SQUATINA. See SQUALUS.

SQUILL, in botany. See SCILLA.

SQUILLA, the name of a ſpecies of cancer. See CANCER.

SQUINTING, a well-known deformity of the eyes, occaſioned by an irregular contraction of the muſcles that move the eye-ball. It frequently ariſes from mere habit, and may be cured by the uſe of a gnomon, and the perſevering efforts of the perſon labouring under the defect. See OPTICS.

SQUIRREL, in zoology. See SCIURUS.

STABBING, in law. The offence of mortally ſtabbing another, though done upon ſudden provocation, is puniſhed as murder; the benefit of clergy being taken away from it by ſtatute. (See MURDER). For by Ja. I. c. 8. when one thruſts or ſtabs another, not then having a weapon drawn, or who hath not then firſt ſtricken the party ſtabbing, ſo that he dies thereof within ſix months after, the offender ſhall not have the benefit of clergy, though he did it not of malice aforethought. This ſtatute was made on account of the frequent quarrels and ſtabbings with ſhort daggers between the Scotch and the Engliſh, at the acceſſion of James I.; and being therefore of a temporary nature, ought to have expired with the miſchief which it meant to remedy. For, in point of ſolid and ſubſtantial juſtice, it cannot be ſaid that the mode of killing, whether by ſtabbing, ſtrangling, or ſhooting, can either extenuate or enhance the guilt; unleſs where, as in the caſe of poiſoning, it carries with it internal evidence of cool and deliberate malice. But the benignity of the law hath conſtrued the ſtatute ſo favourably in behalf of the ſubject, and ſo ſtrictly when againſt him, that the offence of ſtabbing now ſtands almoſt upon the ſame footing as it did at the common law. Thus (not to repeat the caſes mentioned under MANSLAUGHTER, of ſtabbing an adultereſs, &c. which are barely manſlaughter, as at common law) in the conſtruction of this ſtatute it hath been doubted, whether, if the deceaſed had ſtruck at all before the mortal blow given, this does not take it out of the ſtatute, though in the preceding quarrel the ſtabber had given the firſt blow; and it ſeems to be the better opinion, that this is not within the ſtatute. Alſo it hath been reſolved, that the killing a man, by throwing a hammer or other weapon, is not within the ſtatute; and whether a ſhot with a piſtol be ſo or not is doubted. But if the party ſlain had a cudgel in his hand, or had thrown a pot or a bottle, or diſcharged a piſtol at the party ſtabbing, this is a ſufficient reaſon for having a weapon drawn on his ſide within the words of the ſtatute.

STACHYS, in botany: A genus of plants belonging to the claſs of *didynamia*, and order of *gymnoſpermia*; and in the natural ſyſtem arranged under the 42d order, *Verticillatæ*. The upper lip of the corolla is arched; the lower lip reflexed, and the larger intermediate lacinia is marginated. The ſtamina, after ſhedding the farina, are bent towards the ſides. There are ſeventeen ſpecies, the ſylvatica, paluſtris, alpina, germanica, lanata, cretica, glutinoſa, orientalis, palæſtina, maritima, æthiopica, hirta, canarienſis, recta, annua, and arvenſis. Four only are natives of Britain; viz. 1. *Sylvatica*, hedge-nettle. The plant is hairy all over, erect, a yard high, and branched; the hairs are jointed. The flowers are of a deep red colour, ſix or eight in a whirl, which terminates in a long ſpike deſtitute of leaves. The leaves are heart-ſhaped, and grow on footſtalks. The whole plant has a ſtrong fetid ſmell. It grows commonly in woods and ſhady places, and flowers in July or Auguſt. 2. *Paluſtris*, clown's all-heal. The roots are white and tuberous. The ſtalk is branched at the bottom, and two or three feet high. The flowers are red or purple, from ſix to ten in a whirl, ending in a long ſpike. The leaves are ſeſſile, narrow, pointed, and in part ſurrounding the ſtem. This plant has a fetid ſmell and bitter taſte, and is reckoned a good vulnerary. It grows on the ſides of rivers and lakes, in low moiſt grounds, and ſometimes in corn-fields. 3. *Germanica*, baſe hore-hound. The ſtem is downy, and about two feet high. The leaves are white, downy, wrinkled, and indented. The flowers are white, purpliſh within, and grow in multiflorous whirls. It grows in England. 4. *Arvenſis*, corn-ſtachys, petty iron-wort, or all-heal. The ſtalk is ten or twelve inches high, ſquare, branched, and hairy. The leaves are heart-ſhaped, obtuſe, bluntly ſerrated, and leſs hairy. The calyx is hairy and ſeſſile, and deeply divided into five acute dents of equal length. The flowers are fleſh-coloured, and grow from three to ſix in a whirl. The lower lip is trifid; the middle ſegment ſpotted with red, but not emarginated according to the character of the genus. It is frequent in corn-fields, and grows from June to Auguſt.

STADIUM, an ancient Greek long meaſure, containing 125 geometrical paces, or 625 Roman feet, correſponding to our furlong. The word is ſaid to be formed from the Greek word ϛασις "a ſtation," or ἵϛημι "to ſtand," becauſe it is reported that Herculus having run a ſtadium at one breath, ſtood ſtill at the end of it. The Greeks uſually meaſured diſtances by ſtadia, which they called ϛαδιασμους. Stadium alſo ſignified the courſe on which their races were run.

STADTHOLDER, the principal magiſtrate or governor of the Seven United Provinces. This office is now aboliſhed by the republican influence of France; but as the prince of Orange is in alliance with this country, our readers will probably not be ill pleaſed with a ſhort account of his ſeveral powers and claims. To render that account the more intelligible, we ſhall trace the office of Stadtholder from its origin.

The Seven Provinces of the Low Countries were long governed by princes invefted with the fovereignty, though limited in their powers, and under various titles; as *Counts of Holland, Dukes of Guelder, Bifhop of Utrecht*, &c. When thefe countries fell to the princes of the houfe of Burgundy, and afterwards to thofe of Auftria, who had many other dominions, the abfence of the fovereign was fupplied by a ftadtholder or governor, vefted with very ample powers. Thefe ftadtholders or lieutenants had the adminiftration of the government, and prefided in the courts of juftice, whofe jurifdiction was not at that time confined merely to the trial of caufes, but extended to affairs of ftate. The ftadtholder fwore allegiance to the princes at their inauguration, jointly with the ftates of the provinces they governed. They likewife took an oath to the ftates, by which they promifed to maintain their fundamental laws and privileges.

It was upon this footing that William I. prince of Orange, was made governor and lieutenant-general of Holland, Zealand, and Utrecht, by Philip II. upon his leaving the Low Countries to go into Spain. The troubles beginning foon after, this prince found means to bring about an union, in 1576, between Holland and Zealand; the ftates of which two provinces put into his hands, as far as was in their power, the fovereign authority (for fo long time as they fhould remain in war and under arms), upon the fame footing as Holland had intrufted him with in the year before. In 1581 the fame authority was again renewed to him by Holland, as it was foon after by Zealand likewife; and in 1584, being already elected count of Holland, upon certain conditions he would have been formally invefted with the fovereignty, had not a wretch, hired and employed by the court of Spain, put an end to his life by a horrid affaffination.

In the preamble of the inftruments by which the ftates in 1581 conferred the fovereign authority upon prince William I. we find thefe remarkable words, which are there fet down as fundamental rules: "That all republics and communities ought to preferve, maintain, and fortify themfelves by unanimity; which being impoffible to be kept up always among fo many members, often differing in inclinations and fentiments, it is confequently neceffary that the government fhould be placed in the hands of one fingle chief magiftrate." Many good politicians, and the greateft part of the inhabitants of thefe provinces, have, fince the eftablifhment of the republic, looked upon the ftadtholderian government as an effential part of her conftitution; nor has fhe been without a ftadtholder but twice, that is to fay, from the end of 1650 to 1672, and again from March 1702 till April 1747. The provinces of Friefland and Groningen, with Ommelands, have always had a ftadtholder without interruption: their inftructions, which are now no longer in force, may be feen in Aitzema; but formerly the powers of the ftadtholder of thefe provinces were confined within narrower bounds, and till William IV. there was no ftadtholder of the feven provinces together.

The ftadtholder cannot declare war nor make peace, but he has, in quality of captain-general of the union, the command in chief of all the forces of the ftate (A); and military perfons are obliged to obey him in every thing that concerns the fervice. He is not limited by inftructions, but he has the important power of giving out orders for the march of troops, and the difpofition of all matters relative to them. He not only directs their marches, but provides for the garrifons, and changes them at pleafure. All military edicts and regulations come from him alone; he conftitutes and authorifes the high council of war of the United Provinces, and, as captain-general of every province, difpofes of all military offices, as far as the rank of colonel inclufively. The higher pofts, fuch as thofe of velt-marfhals, generals, lieutenant-generals, major-generals, are given by the ftates-general, who choofe the perfons recommended by his highnefs. He makes the governors, commandants, &c. of towns and ftrong places of the republic, and of the barrier. The perfons nominated prefent their inftruments of appointment to their high mightineffes, who provide them with commiffions. The ftates-general have likewife great regard to the recommendation of the prince ftadtholder in the difpofition of thofe civil employments which are in their gift.

The power of the ftadtholder as high-admiral, extends to every thing that concerns the naval force of the republic, and to all the other affairs that are here within the jurifdiction of the admiralty. He prefides at thefe boards either in perfon or by his reprefentatives; and as chief of them all in general, and of every one in particular, he has power to make their orders and inftructions be obferved by themfelves and others. He beftows the pofts of lieutenant-admiral, vice-admiral, and rear-admiral, who command under him; and he makes likewife poft-captains.

The ftadtholder grants likewife letters of grace, pardon, and abolition, as well for the crime called *Communia Delicta*, as for military offences. In Holland and Zealand thefe letters are made out for crimes of the firft fort, in the name of the ftates, with the advice of his highnefs. In military offences, he confults the high council of war, and upon the *communia delicta* he takes the advice of the courts of juftice, of the counfellors, committees of the provinces, of the council of ftate, and the tribunals of juftice in the refpective towns, according to the nature of the cafe.

In the provinces of Holland and Zealand, the ftadtholder elects the magiftrates of the towns annually, out of a double number that are returned to him by the towns themfelves.

When any of thofe offices become vacant, which at the time there was no governor, were in the difpofal of the ftates of Holland, or as formerly in that of the chamber of accounts, the ftadtholder has his choice of two, or, in fome cafes, of three candidates, named by their noble and great mightineffes. He choofes likewife the counfellors, infpectors of the dykes of Rynland, Delfland, and Scheeland, out of three perfons prefented to him by the boards of the counfellors infpectors; which boards are of very ancient eftablifhment in Holland.

His highnefs prefides in the courts of Holland, and in the courts of juftice of the other provinces; and his name is placed at the head of the proclamations and acts, called in Dutch *Mandamenten*, or *Provifien van Juftitie*. In Overyffel, and in the province of Utrecht, the poffeffors of fiefs hold of the prince ftadtholder. He is fupreme curator of the univerfities of Guelder, Friefland, and Groningen; grand forefter and

(A) In times of war, however, the ftates have always named deputies for the army, to accompany the ftadtholders in the field, and to ferve them as counfellors in all their enterprifes, particularly in the moft important affairs, fuch as giving battle, or undertaking a fiege, &c. This was always practifed till the acceffion of king William III. to the crown of Great Britain, and after his death was continued with regard to the general in chief of the army of the republic. In 1747 and 1748 there were likewife deputies with the army, but with more limited power.

grand veneur in Guelder, in Holland, and other places. In the province of Utrecht, his highneſs, by virtue of the regulation of 1674, diſpoſes of the provoſtſhips and other benefices which remain to the chapters, as alſo of the canonical prebends that fall in the months which were formerly the papal months.

By the firſt article of the council of ſtate of the United Provinces, the ſtadtholder is the firſt member of it, and has a right of voting there, with an appointment of 25,000 guilders a-year. He aſſiſts alſo as often as he thinks it for the ſervice of the ſtate, at the deliberations of the ſtates-general, to make propoſitions to them, and ſometimes alſo at the conferences which the deputies of their high-mightineſſes hold in their different committees, in conſequence of their ſtanding orders. He likewiſe aſſiſts at the aſſemblies of the ſtates of each particular province, and at that of the counſellors committees. In Guelder, Holland, and Utrecht, his highneſs has a ſhare of the ſovereignty, as chief or preſident of the body of nobles; and in Zealand, where he poſſeſſes the marquiſate of Veer and Fluſhing, as firſt noble, and repreſenting the whole nobility. In his abſence he has in Zealand his repreſentatives, who have the firſt place and the firſt voice in all the councils, and the firſt of whom is always firſt deputy from the province to the aſſembly of their high mightineſſes.

In 1749 the prince ſtadtholder was created by the ſtates-general, governor-general and ſupreme director of the Eaſt and Weſt India companies; dignities which give him a great deal of authority and power, and which had never been conferred upon any of his predeceſſors, nor have they hitherto been made hereditary. He has his repreſentatives in the ſeveral chambers of the company, and chooſes their directors out of a nomination of three qualified perſons. The prince enjoyed this prerogative in Zealand from the time of his elevation to the ſtadtholderate.

The revenues of the ſtadtholderate of the ſeven United Provinces are reckoned (including the 25,000 guilders which the prince enjoys annually as the firſt member of the council of ſtate, and what he has from the India company's dividends) to amount to 300,000 guilders a-year. As captain-general of the union, his ſerene highneſs has 120,000 guilders *per annum*, beſides 24,000 from Frieſland, and 12,000 from Groninghen, in quality of captain-general of thoſe provinces. In times of war the ſtate allows extraordinary ſums to the captain-general for the expence of every campaign.

To all theſe powers and privileges the prince of Orange has a legal and conſtitutional right; but he has been diveſted of them by a faction which ſeems determined to ſell to the cruel and arbitrary republic of France that country which his anceſtors redeemed from Auſtrian ſlavery, at the hazard of loſing every thing dear to them but liberty and honour.

STÆHELINA, in botany: A genus of plants belonging to the claſs of *ſyngeneſia*, and order of *polygamia æqualis*; and in the natural ſyſtem arranged under the 49th order, *Compoſitæ*. The receptacle is paleaceous, the chaff being very ſhort; the pappus is branchy, and the antheræ caudated. There are eight ſpecies, the gnaphaloides, dubia, arboreſcens, fruticoſa, ilicifolia, corymboſa, chamæpeuce, and imbricata.

STAFF, an inſtrument ordinarily uſed to reſt on in walking. The ſtaff is alſo frequently uſed as a kind of natural weapon both of offence and defence; and for ſeveral other purpoſes.

Staff, a light pole erected in different parts of a ſhip, whereon to hoiſt and diſplay the colours. The principal of theſe is reared immediately over the ſtern, to diſplay the enſign; another is fixed on the bowſprit, to extend the jack; three more are erected at the three maſt heads, or formed by their upper ends, to ſhow the flag or pendant of the reſpective ſquadron or diviſion to which the ſhip is appropriated. See Ensign, Mast, Jack, and Pendant.

Staff, in military matters, conſiſts of a quarter-maſter-general, adjutant-general, and majors of brigade. The ſtaff properly exiſts only in time of war. See Quarter-*Maſter General*, &c.

Regimental Staff, conſiſts in the adjutant, quarter-maſter, chaplain, ſurgeon, &c.

Staff, in muſic, five lines, on which, with the intermediate ſpaces, the notes of a ſong or piece of muſic are marked.

Fore-Staff. See Fore-*Staff*.

STAFFA, one of the Hebrides or Weſtern Iſlands of Scotland, remarkable for its baſaltic pillars. It was viſited by Sir Joſeph Banks, who communicated an account of it to Mr. Pennant.

STAFFORD, the county town of Staffordſhire, in W. Long. 2. 0. N. Lat. 53. 0. It ſtands on the river Sow, has two pariſh-churches, a fine ſquare market-place, and a flouriſhing cloth-manufacture. It ſends two members to parliament, and is 135 miles from London.

STAFFORDSHIRE, a county of England, bounded on the north-eaſt by Derbyſhire, on the eaſt by Leiceſterſhire, on the ſouth-eaſt by Warwickſhire, on the ſouth by Worceſterſhire, on the weſt by Shropſhire, and on the north-weſt by Cheſhire, about fifty-four miles in length from north to ſouth, and from eighteen to thirty-ſix in breadth. It is divided into five hundreds, which contain one city (Lichfield) twenty-one towns, and 181 pariſhes. Towards the north is a ridge of hills, which under various names are continued through different counties into Scotland. The middle and ſouthern parts of the county are more level, with a few hills, of which ſome are compoſed of gravel, others contain lime-ſtone, and other ſtones of a coarſe kind, fit for roads, rough walls, and pavement. The higheſt ground in the northern part called the *Moorland*, is ſuppoſed to be above 1500 feet above the level of the river Thames, at Brentford. The ſoil is various; from a ſtiff clay to a looſe ſand, loamy, and in ſome places a thin light black earth, with a gravelly bottom. This county contains about 780,800 acres, of which 600,000 are in a ſtate of cultivation. The mines of Staffordſhire are rich and extenſive; thoſe of coal are ſuppoſed to occupy a ſpace of 50,000 acres: the beds of limeſtone alſo are numerous, and in ſome diſtricts alabaſter is met with: iron ore is found in large quantities, particularly in the ſouthern part of the county. In theſe mines of coal, ſays a late ſenſible writer, lime, and iron, and in the founderies, blaſt furnaces, ſlitting mills, and other branches of the iron-trade, great numbers of workmen are employed, and the extenſion of the iron-trade in particular is of great conſequence to the intereſts of this kingdom. The extent of the iron-trade in all its varieties, wrought and unwrought, for agricultural and other internal purpoſes, and for home conſumption and exportation, under its innumerable ſhapes and forms, is now ſo very great, as to rival even that of the great ſtaple, wool; and to make the ſuperiority of the latter ſomewhat queſtionable; and from the abundance of iron-ore and fuel, with which this county abounds, the trade, particularly ſo far as relates to the production of the metal, is capable of being much extended; and there can be little doubt of the poſſibility that this county may wholly ſupply itſelf with that article. The other minerals of the county are principally thoſe of copper and lead, of both which conſiderable quantities are raiſed in the northern part of the county, on the borders of Derbyſhire, with ſeveral ſmelting and braſs-works; and in the neighbourhood of Cheadle is a conſiderable ſalt work. The principal rivers are the Trent, Dove, Mani-

fold, Sow, and Tame. According to the agricultural report, the horned cattle, ſheep, and ſwine of this county ſeem to be of a quality equal, if not ſuperior to moſt other counties of the kingdom. The towns are Stafford, Newcaſtle under Line, Tamworth, Brewood, Bromley Abbey, Burſlem, Burton upon Trent, Betley (the market diſcontinued), Cannock (market diſcontinued), Cheadle, Eccleſhal, Leek, Longnor, Penkridge, Rugely, Stone, Tutbury, Uttoxeter, Walſal, Wedneſbury, and Wolverhampton. Of theſe the four firſt, the county and city of Lichfield, ſend each two members to the Britiſh parliament. Stafford is the county town.

STAG, in zoology. See CERVUS.

STAG BEETLE. See LUCANUS.

STAGE, in the modern drama, the place of action and repreſentation included between the pit and the ſcenes, and anſwering to the proſcenium or pulpitum of the ancients. See PLAYHOUSE and THEATRE.

STAGGERS. See FARRIERY.

STAHL (George Erneſt), an eminent German chemiſt, was born in Franconia in 1660, and choſen profeſſor of medicine at Hall, when a univerſity was founded in that city in 1694. The excellency of his lectures while he filled that chair, the importance of his various publications, and his extenſive practice, ſoon raiſed his reputation to a very great height. He received an invitation to Berlin in 1716, which having accepted, he was made counſellor of ſtate and phyſician to the king. He died in 1734, in the 75th year of his age. Stahl is without doubt one of the greateſt men of which the annals of medicine can boaſt: his name marks the commencement of a new and more illuſtrious era in chemiſtry. He was the author of the doctrine of phlogiſton, which, though now completely overturned by the diſcoveries of Lavoiſier and others, was not without its uſe; as it ſerved to combine the ſcattered fragments of former chemiſts into a ſyſtem, and as it gave riſe to more accurate experiments and a more ſcientific view of the ſubject, to which many of the ſubſequent diſcoveries were owing. This theory maintained its ground for more than half a century, and was received and ſupported by ſome of the moſt eminent men which Europe has produced; a ſufficient proof of the ingenuity and the abilities of its author. He was the author alſo of A Theory of Medicine, founded upon the notions which he entertained of the abſolute dominion of mind over body; in conſequence of which, he affirmed, that every muſcular action is a voluntary act of the mind, whether attended with conſciouſneſs or not. This theory he and his followers carried a great deal too far, but the advices at leaſt which he gives to attend to the ſtate of the mind of the patient are worthy of the attention of phyſicians. His principal works are, 1. *Experimenta et Obſervationes Chemicæ et Phyſicæ*, Berlin, 1731, 8vo. 2. *Diſſertationes Medicæ*, Hall, 2 vols. 4to. This is a collection of theſes. 3. *Theoria Medica vera*, 1737, 4to. 4. *Opuſculum Chymico-phyſico medicum*, 1740, 4to. 5. A Treatiſe on Sulphur, both Inflammable and Fixed, written in German. 6. *Negotium Otioſum*, Hall, 1720, 4to. It is in this treatiſe chiefly that he eſtabliſhes his ſyſtem concerning the action of the ſoul upon the body. 7. *Fundamenta Chymicæ Dogmaticæ et Experimentalis*, Nuremberg, 1747, 3 vols 4to. 8. A Treatiſe on Salts, writen in German. 9. *Commentarium in Metallurgiam Beccheri*, 1723.

STAINING *or* COLOURING *of* BONE, HORN, MARBLE, PAPER, WOOD, &c. See thoſe articles.

STAIRCASE, in architecture, an aſcent incloſed between walls, or a baluſtrade conſiſting of ſtairs or ſteps, with landing places and rails, ſerving to make a communication between the ſeveral ſtories of a houſe. See ARCHITECTURE.

STALACTITÆ, in natural hiſtory, cryſtalline ſpars formed into oblong, conical, round, or irregular bodies, compoſed of various cruſts, and uſually found hanging in form of iſicles from the roofs of grottoes, &c.

STALAGMITIS, in botany: A genus of the *monœcia* order, belonging to the *polygamia* claſs of plants; and in the natural method ranking under the 38th order, *Tricoccæ*. The calyx is either quadriphyllous or hexaphyllous; the corolla conſiſts of four or of ſix petals: the receptacle is fleſhy, and ſomewhat ſquare-ſhaped; the filaments about 30. In the hermaphrodite flower the *ſtylus* is ſhort, thick, and erect; the fruit is a berry of a globular ſhape, unilocular, and crowned with the *ſtylus* and *ſtigma*: they contain three oblong jointed triangular ſeeds. Of this there is only one ſpecies, viz. the *Cambogioides*, a native of the Eaſt Indies and of the warmer parts of America. From this plant is obtained the gutta cambogia, or gum gamboge of the ſhops. See GAMBOGE. Till very lately botaniſts were at a loſs for the true nature of the plant which yields this gum. Koenig, a native of Ireland, and an excellent botaniſt, travelled over a great part of India, and collected a great number of new plants, and among the reſt the ſtalagmitis. Theſe he bequeathed to Sir Joſeph Banks.

STALE, among ſportſmen, a living fowl put in a place to allure and bring others where they may be taken. For want of theſe, a bird ſhot, his entrails taken out, and dried in an oven in his feathers, with a ſtick thruſt through to keep it in a convenient poſture, may ſerve as well as a live one.

STALE is alſo a name for the urining of cattle..

ANIMATED STALK. This remarkable animal was found by Mr. Ives at Cuddalore: and he mentions ſeveral kinds of it; ſome appearing like dry ſtraws tied together, others like graſs; ſome have bodies much larger than others, with the addition of two ſcaly imperfect wings; their neck is no bigger than a pin, but twice as long as their bodies; their heads are like thoſe of an hare and their eyes vertical and very briſk. They live upon flies, and catch theſe inſects very dexterouſly with the two fore-feet, which they keep doubled up in three parts cloſe to their head, and dart out very quick on the approach of their prey; and when they have caught it, they eat it very voraciouſly, holding it in the ſame manner as a ſquirrel does its food. On the outer joints of the fore feet are ſeveral very ſharp hooks for the eaſier catching and holding of their prey; while, with the other feet, which are four in number, they take hold of trees or any other thing, the better to ſurpriſe whatever they lie in wait for. They drink like a horſe, putting their mouths into the water. Their excrements, which are very white, are almoſt as large as the body of the animal, and as the natives ſay, dangerous to the eyes.

STALLION, or STONE-HORSE, in the manege, an horſe deſigned for the covering of mares, in order to propagate the ſpecies. See EQUUS.

STAMFORD, an ancient town of Lincolnſhire in England; ſeated on the river Welland, on the edge of Northamptonſhire. It is a large handſome place, containing ſix pariſh-churches, ſeveral good ſtreets, and fine buildings. It had formerly a college, the ſtudents of which removed to Brazen-Noſe college in Oxford. It has no conſiderable manufactories, but deals chiefly in malt. W. Long. 0 31. N. Lat. 52 42.

STAMINA, in botany, are thoſe upright filaments which, on opening a flower, we find within the corolla ſurrounding the piſtillum. According to Linnæus, they are the male organs of generation, whoſe office it is to prepare the pollen. Each ſtamen conſiſts of two diſtinct parts, viz. the FILAMENTUM and the ANTHERA.

STAMINA, in the animal body, are defined to be thoſe ſimple original parts which exiſted firſt in the embryo or even

in the feed; and by whose distinction, augmentation, and accretion by additional juices, the animal body at its utmost bulk is supposed to be formed.

STAMP-duties, a branch of the perpetual revenue. See Revenue. The stamp-duties constitute a tax which, though in some instances it may be heavily felt, by greatly increasing the expence of all mercantile as well as legal proceedings, yet (if moderately imposed) is of service to the public in general, by authenticating instruments, and rendering it much more difficult than formerly to forge deeds of any standing; since, as the officers of this branch of the revenue vary their stamps frequently, by marks perceptible to none but themselves, a man that would forge a deed of King William's time, must know and be able to counterfeit the stamp of that date also. In France and some other countries the duty is laid on the contract itself, not on the instrument in which it is contained; as, with us too in England (besides the stamps on the indentures), a tax is laid, by statute 8 Ann. c. 9. on every apprentice-fee; of 6d in the pound if it be 50l. or under, and 1s. in the pound if a greater sum: but this tends to draw the subject into a thousand nice disquisitions and disputes concerning the nature of his contract, and whether taxable or not; in which the farmers of the revenue are sure to have the advantage. Our general method answers the purposes of the state as well, and consults the ease of the subject much better. The first institution of the stamp duties was by statute 5 and 6 W. and M. c. 21. and they have since, in many instances, been increased to five times their original amount.

STANCHION, or Stanchions, a sort of small pillars of wood or iron used for various purposes in a ship; as to support the decks, the quarter-rails, the nettings, the awnings, &c. The first of these are two ranges of small columns fixed under the beams, throughout the ship's length between decks; one range being on the starboard and the other on the larboard side of the hatch-ways. They are chiefly intended to support the weight of the artillery.

STAND, in commerce, a weight from two hundred and a half to three hundred of pitch.

STANDARD, in war, a sort of banner or flag, borne as a signal for the joining together of the several troops belonging to the same body.

Standard, in commerce, the original of a weight, measure, or coin, committed to the keeping of a magistrate, or deposited in some public place, to regulate, adjust, and try the weights used by particular persons in traffic. See Money.

STANHOPE (Philip Dormer, earl of Chesterfield), was born in 1695, and educated in Trinity-hall, Cambridge; which place he left in 1714, when, by his own account, he was an absolute pedant. In this character he went abroad, where a familiarity with good company soon convinced him he was totally mistaken in almost all his notions: and an attentive study of the air, manner, and address of people of fashion, soon polished a man whose predominant desire was to please; and who, as it afterward appeared, valued exterior accomplishments beyond any other human acquirement. While Lord Stanhope, he got an early seat in parliament; and in 1722 succeeded to his father's estate and titles. In 1728, and in 1745, he was appointed ambassador-extraordinary and plenipotentiary to Holland: which high character he supported with the greatest dignity; serving his own country, and gaining the esteem of the states-general. Upon his return from Holland, he was sent lord-lieutenant of Ireland; and during his administration there, gave general satisfaction to all parties. He left Dublin in 1746, and in October succeeded the earl of Harrington as secretary of state, in which post he officiated until February 6th, 1748. Being seized with a deafness in 1752 that incapacitated him for the pleasures of society, he from that time led a private and retired life, amusing himself with books and his pen; in particular, he engaged largely as a volunteer in a periodical miscellaneous paper called *The World*, in which his contributions have a distinguished degree of excellence. He died in 1773, leaving a character for wit and abilities that had few equals. He distinguished himself by his eloquence in parliament on many important occasions; of which we have a characteristic instance, of his own relating. He was an active promoter of the bill for altering the style; on which occasion, as he himself writes in one of his letters to his son, he made so eloquent a speech in the house, that every one was pleased, and said he had made the whole very clear to them; "when," says he, "God knows, I had not even attempted it. I could just as soon have talked Celtic or Sclavonian to them, as astronomy; and they would have understood me full as well." Lord Macclesfield, one of the greatest mathematicians in Europe, and who had a principal hand in framing the bill, spoke afterwards, with all the clearness that a thorough knowledge of the subject could dictate; but not having a flow of words equal to Lord Chesterfield, the latter gained the applause from the former, to the equal credit of the speaker and the auditors. The high character Lord Chesterfield supported during life, received no small injury soon after his death, from a fuller display of it by his own hand. He left no issue by his lady, but had a natural son, Philip Stanhope, Esq. whose education was for many years a close object of his attention, and who was afterward envoy-extraordinary at the court of Dresden, but died before him. When Lord Chesterfield died, Mr. Stanhope's widow published a course of letters, written by the father to the son, filled with instructions suitable to the different gradations of the young man's life to whom they were addressed. These letters contain many fine observations on mankind, and rules of conduct: but it is observable that he lays a greater stress on exterior accomplishments and address, than on intellectual qualifications and sincerity; and allows greater latitude to fashionable pleasures than good morals will justify, especially in paternal instructions. Hence it is that a celebrated writer, and of manners somewhat different from those of the polite earl of Chesterfield, is said to have observed of these letters that "they inculcate only the morals of a whore, with the manners of a dancing master."

Stanhope (Dr. George), an eminent divine, was born at Hertishorn in Derbyshire, in the year 1660. His father was rector of that place, vicar of St. Margaret's church in Leicester, and chaplain to the earls of Chesterfield and Clare. His grandfather Dr. George Stanhope was chaplain to James I. and Charles I.; had the chancellorship of York, where he was also a canon residentiary, held a prebend, and was rector of Weldrake in that county. He was for his loyalty driven from his home with eleven children; and died in 1644. His writings, which are an inestimable treasure of piety and devotion are: A Paraphrase and Comment upon the Epistles and Gospels, 4 vols. 1705, 8vo. Sermons at Boyle's Lectures, 1706, 4to. Fifteen Sermons, 1700, 8vo. Twelve Sermons on several Occasions, 1727, 8vo. Thomas à Kempis, 1696, 8vo. Epictetus's Morals, with Simplicius's Comment, and the Life of Epictetus, 1700, 8vo. Parson's Christian Directory, 1716, 8vo. Rochefoucault's Maxims, 1706, 8vo. A Funeral Sermon on Mr. Richard Sare, bookseller, 1724; two editions 4to. Twenty Sermons, published singly between the years 1692 and 1724. Private Prayers for every Day in the Week, and for the several Parts of each Day; translated from the Greek Devotions of Bishop Andrews, with Additions, 1730. In his translations, it is well known, Dr. Stanhope did not confine himself to a strict and literal version: he took the liberty of paraphrasing, explaining, and improving upon

this author; as will evidently appear (not to mention any other work) by the flightest perusal of St. Augustine's Meditations, and the Devotions of Bishop Andrews.

STANITZAS, villages or small districts of the banks of the Don, inhabited by Cossacs.

STANLEY (Thomas), a very learned English writer in the 17th century, was the son of Sir Thomas Stanley of Cumberlow-Green in Herefordshire, knight. He was born at Cumberlow about 1644, and educated in his father's house, whence he removed to the university of Cambridge. He afterwards travelled; and, upon his return to England, prosecuted his studies in the Middle Temple. He married, when young, Dorothy, the eldest daughter of Sir James Engan of Flower, in Northamptonshire. He wrote, 1. A volume of Poems. 2. History of Philosophy, and Lives of the Philosophers. 3. A Translation of Eschylus, with a Commentary; and several other works. He died in 1678.

STANNARIES, the mines and works where tin is dug and purified; as in Cornwall, Devonshire, &c.

STANNARY COURTS, in Devonshire and Cornwall, for the administration of justice among the tinners therein. They are held before the lord-warden and his substitutes, in virtue of a privilege granted to the workers in the tin-mines there, to sue and be sued only in their own courts, that they may not be drawn from their business, which is highly profitable to the public, by attending their law-suits in other courts. The privileges of the tinners are confirmed by a charter, 33 Edw. I. and fully expounded by a private statute, 50 Edw. III. which has since been explained by a public act, 16 Car. I. c. 15. What relates to our present purpose is only this: That all tinners and labourers in and about the stannaries shall, during the time of their working therein, *bona fide*, be privileged from suits of other courts, and be only pleaded in the stannary court in all matters, excepting pleas of land, life, and member. No writ of error lies from hence to any court in Westminster-hall; as was agreed by all the judges, in 4 Jac. I. But an appeal lies from the steward of the court to the under-warden; and from him to the lord-warden; and thence to the privy council of the prince of Wales, as duke of Cornwall, when he hath had livery or investiture of the same. And from thence the appeal lies to the king himself, in the last resort.

STANNUM, TIN. See CHEMISTRY and TIN.

STANZA, in poetry, a number of lines regularly adjusted to each other; so much of a poem as contains every variation of measure or relation of rhyme used in that poem.

STAPHYLEA, BLADDER-NUT, in botany: A genus of plants belonging to the class of *pentandria*, and order of *trigynia*; and in the natural system arranged under the 23d order, *tribilatæ*. The calyx is quinquepartite. There are five petals. The capsules are three, inflated and joined together by a longitudinal suture. The seeds are two, and are globose with a scar. There are two species, the pinnata and trifolia. The *pinnata*, or bladder-nut tree, is a tall shrub or tree. The leaves are pinnated; the pinnæ are generally five, oblong, pointed, and notched round the edges. The flowers are white, and grow in whirls on long pendulous footstalks. This plant flowers in June, and is frequent in hedges about Pontefract and in Kent. The *trifolia*, or three-leaved bladder-nut, is a native of Virginia.

STAPHYLINUS, a genus of animals belonging to the class of *insectæ*, and order of *coleoptera*. The antennæ are moniliform; the feelers four in number; the elytra are not above half the length of the abdomen; the wings are folded up and concealed under the elytra; the tail or extremity of the abdomen is single, is provided with two long vesicles which the insect can shoot out or draw back at pleasure. Gmelin enumerates 117 species, of which five only are natives of Great Britain. 1. *Murinus*. The head is depressed. The colour is grey, clouded with black. The length is six lines. It lives among horse-dung. 2. The *maxillosus*, is black, with ash-coloured stripes, and jaws as long as the head. It inhabits the woods. 3. *Rufus*, is of an orange colour; but the posterior part of the elytra and abdomen is black, as are also the thighs at their base. 4. *Riparius*, is of a reddish brown colour; but the elytra are azure-coloured; and the head, antennæ, and two last rings of the abdomen, are black. It is frequent on the banks of rivers in Europe. 5. *Chrysomelinus*, is black; the thorax, elytra, and feet being testaceous. It is found in the north of Europe.

The insects have a peculiarity to be met with in almost every species of this genus, which is, that they frequently turn up their tail, or extremity of the abdomen, especially if you chance to touch them; in which case the tail is seen to rise immediately, as if the insect meant to defend itself by stinging. Yet that is not the place where the insect's offensive weapons are situated. Its tail has no sting, but in recompense it bites and pinches strongly with its jaws; and care must be taken, especially in laying hold of the larger species. Their jaws are strong, shoot out beyond the head, and are subservient to the animal in seizing and destroying its prey. It feeds on all other insects it can catch: even frequently two staphylini of the same species bite and tear each other. Though this insect has very small elytra, yet its wings are large; but they are curiously folded up, and concealed under the elytra. The insect unfolds and expands them when he chooses to fly, which he does very lightly. Among the small species of this genus, there are several whose colours are lively and singularly intermingled. Some of them are found upon flowers, but they chiefly inhabit the dung of cows. Their larvæ, which resemble them so much as to be scarce distinguishable, live in damp places under ground. They are by some called *Rove beetles*.

STAPLE, primarily signifies a public place or market, whither merchants, &c. are obliged to bring their goods to be bought by the people; as the Greve, or the places along the Seine, for sale of wines and corn, at Paris, whither the merchants of other parts are obliged to bring those commodities. Formerly, the merchants of England were obliged to carry their wool, cloth, lead, and other like staple commodities of this realm, in order to expose them by wholesale; and these staples were appointed to be constantly kept at York, Lincoln, Newcastle upon Tyne, Norwich, Westminster, Canterbury, Chichester, Winchester, Exeter, and Bristol; in each whereof a public mart was appointed to be kept, and each of them had a court of the mayor of the staple, for deciding differences, held according to the law-merchant, in a summary way.

STAR, in astronomy, a general name for all the heavenly bodies, which, like so many brilliant studs, are dispersed throughout the whole heavens. The stars are distinguished, from the phenomena of their motion, &c. into fixed, and erratic or wandering stars: these last are again distinguished into the greater luminaries, viz. the sun and moon; the planets, or wandering stars, properly so called; and the comets; which have been all fully considered and explained under the article ASTRONOMY. As to the fixed stars, they are so called, because they seem to be fixed, or perfectly at rest, and consequently appear always at the same distance from each other.

Falling STARS, in meteorology, fiery meteors which dart through the sky in form of a star. See METEOR.

Twinkling of the STARS. See OPTICS.

STAR, is also a badge of honour, worn by the knights of the garter, bath, and thistle. See GARTER.

STAR *of Bethlehem*, in botany. See ORNITHOGALUM.

Court of STAR-CHAMBER, (*camera ſtellata*), a famous, or rather infamous, Engliſh tribunal, ſaid to have been ſo called either from a Saxon word ſignifying to *ſteer* or govern; or from its puniſhing the *crimen ſtellionatus*, or coſenage; or becauſe the room wherein it ſat, the old council-chamber of the palace of Weſtminſter (Lamb. 148.), which is now converted into the lottery-office, and forms the eaſtern ſide of New Palace-yard, was full of windows; or (to which Sir Edward Coke, 4 Inſt. 66. accedes), becauſe *haply* the roof thereof was at the firſt garniſhed with gilded *ſtars*. As all theſe are merely conjectures (for no ſtars are now in the roof, nor are any ſaid to have remained there ſo late as the reign of queen Elizabeth), it may be allowable to propoſe another conjectural etymology, as plauſible perhaps as any of them. It is well known, that, before the baniſhment of the Jews under Edward I. their contracts and obligations were denominated in our ancient records *ſtarra* or *ſtarrs*, from a corruption of the Hebrew word, *ſhetar*, a covenant. (Tovey's *Angl. Judaic.* 32. Selden. tit. of hon. ii. 34. *Uxor Ebraic.* i. 14.) Theſe ſtarrs, by an ordinance of Richard the Firſt, preſerved by Hoveden, were commanded to be enrolled and depoſited in cheſts under three keys in certain places; one and the moſt conſiderable of which was in the king's exchequer at Weſtminſter: and no ſtarr was allowed to be valid, unleſs it were found in ſome of the ſaid repoſitories. (*Memorand. in Scac' P.* 6. *Edw.* I. prefixed to Maynard's year-book of Edw. II. fol. 8. Madox hiſt. exch. c. vii. § 4, 5, 6.) The room at the exchequer, where the cheſts containing theſe ſtarrs were kept, was probably called the *ſtar-chamber*; and, when the Jews were expelled the kingdom, was applied to the uſe of the king's council, ſitting in their judicial capacity. To confirm this, the firſt time the ſtar-chamber is mentioned in any record, it is ſaid to have been ſituated near the receipt of the exchequer at Weſtminſter: (the king's council, his chancellor, treaſurer, juſtices, and other ſages, were aſſembled *en la chaumbre des eſteilles pres la reſceipt al Weſtminſter*. *Clauſ.* 41 *Edw.* III. *m.* 13.) For in proceſs of time, when the meaning of the Jewiſh *ſtarrs* were forgotten, the word *ſtar-chamber* was naturally rendered in law French, *la chaumbre des eſteilles*, and in law Latin *camera ſtellata*; which continued to be the ſtyle in Latin till the diſſolution of that court.

This was a court of very ancient original; but new-modelled by ſtatutes 3 Hen. VII. c. 1. and 21. Hen. VIII. c. 20. conſiſting of divers lords ſpiritual and temporal, being privy-counſellors, together with two judges of the courts of common-law, without the intervention of any jury. Their juriſdiction extended legally over riots, perjury, miſbehaviour of ſheriffs, and other notorious miſdemeanors, contrary to the laws of the land. Yet this was afterwards (as lord Clarendon informs us) ſtretched to the moſt arbitrary purpoſes; for which reaſon, it was finally aboliſhed by ſtatute 16 Car. I. c. 10. to the general joy of the whole nation. See KING'S *Bench*. There is in the Britiſh Muſeum (Harl. MSS. Vol. I. n° 126) a very full, methodical, and accurate account of the conſtitution and courſe of this court, compiled by William Hudſon of Gray's Inn, an eminent practitioner therein. A ſhort account of the ſame, with copies of all its proceſs, may alſo be found in 18 Rym. Foed. 192, &c.

STAR-*Board*, the right ſide of the ſhip when the eye of the ſpectator is directed forward.

STAR-*Fiſh*. See ASTERIAS.

STAR-*ſhot*, a gelatinous ſubſtance frequently found in fields, and ſuppoſed by the vulgar to have been produced from the meteor called a *falling ſtar*: but, in reality, is the half-digeſted food of herons, ſea-mews, and the like birds; for theſe birds have been found, when newly ſhot, to diſgorge a ſubſtance of the ſame kind.

STAR-*Stone*, in natural hiſtory, a name given to certain extraneous foſſil ſtones, in form of ſhort, and commonly ſomewhat crooked, columns compoſed of ſeveral joints, each reſembling the figure of a radiated ſtar, with a greater or ſmaller number of rays in the different ſpecies: they are uſually found of about an inch in length, and of the thickneſs of a gooſe-quill. Some of them have five angles or rays, and others only four; and in ſome the angles are equidiſtant, while in others they are irregularly ſo: in ſome alſo they are ſhort and blunt, while in others they are long, narrow, and pointed; and ſome have their angles very ſhort and obtuſe. The ſeveral joints in the ſame ſpecimen are uſually all of the ſame thickneſs; this, however, is not always the caſe: but in ſome they are larger at one end, and in others at the middle, than in any other part of the body; and ſome ſpecies have one of the rays bifid, ſo as to emulate the appearance of a ſix-rayed kind.

STAR-*Thiſtle*, in botany. See CENTAUREA.

STAR-*Wort*, in botany. See ASTER.

STARCH, a fecula or ſediment, found at the bottom of veſſels wherein wheat has been ſteeped in water, of which fecula, after ſeparating the bran from it, by paſſing it through ſieves, they form a kind of loaves, which being dried in the ſun or an oven, is afterwards cut into little pieces, and ſo ſold. The beſt ſtarch is white, ſoft, and friable, and eaſily broken into powder. Such as require fine ſtarch, do not content themſelves, like the ſtarchmen, with refuſe wheat, but uſe the fineſt grain. The proceſs is as follows: The grain, being well cleaned, is put to ferment in veſſels full of water, which they expoſe to the ſun while in its greateſt heat; changing the water twice a-day, for the ſpace of eight or twelve days, according to the ſeaſon. When the grain burſts eaſily under the finger, they judge it ſufficiently fermented. The fermentation perfected, and the grain thus ſoftened, it is put, handful by handful, into a canvas-bag, to ſeparate the flour from the huſks; which is done by rubbing and beating it on a plank laid acroſs the mouth of an empty veſſel that is to receive the flour.

As the veſſels are filled with this liquid flour, there is ſeen ſwimming at top a reddiſh water, which is to be carefully ſcummed off from time to time, and clean water is to be put in its place, which, after ſtirring the whole together, is alſo to be ſtrained through a cloth or ſieve, and what is left behind put into the veſſel with new water, and expoſed to the ſun for ſome time. As the ſediment thickens at the bottom, they drain off the water four or five times, by inclining the veſſel, but without paſſing it through the ſieve. What remains at bottom is the ſtarch, which they cut in pieces to get out, and leave it to dry in the ſun. When dry, it is laid up for uſe.

STARLING. See STURNUS.

STATES, or ESTATES, a term applied to ſeveral orders or claſſes of people aſſembled to conſult of matters for the public good. Thus *ſtates-general* is the name of an aſſembly conſiſting of the deputies of the ſeven United Provinces. Theſe are uſually 30 in number, ſome provinces ſending two, others more; and whatever reſolution the ſtates-general take, muſt be confirmed by every province, and by every city and republic in that province, before it has the force of a law. The deputies of each province, of what number ſoever they be, have only one voice, and are eſteemed as but one perſon, the votes being given by provinces. Each province preſides in the aſſembly in its turn, according to the order ſettled among them. Guelderland preſides firſt, then Holland, &c. *States of Holland* are the deputies of eighteen cities, and one repreſentative of the nobility, conſtituting the ſtates of the province of Holland: the other provinces have likewiſe their ſtates, repreſenting their ſovereignty; deputies from which make what

they call the ſtates-general. In an aſſembly of the ſtates of a particular province, one diſſenting voice prevents their coming to any reſolution.

STATICE Thrift, in botany: A genus of plants belonging to the claſs of *pentandria*, and order of *pentagynia*; and in the natural ſyſtem ranging under the forty-eighth order, *aggregatæ*. The calyx is monophyllous, entire, folded, and ſcarioſe. There are five petals, with one ſuperior ſeed. There are twenty-two ſpecies, the armeria, pſeudarmeria, limonium, incana, cordata, reticulata, echioides, ſpecioſa, tatarica, echinus, flexuoſa, purpurata, minuta, ſuffruticoſa, monopetala, aurea, ferulacea, linifolia, pruinoſa, ſinuata, mucronata, and lobata. Three of theſe are Britiſh plants. 1. The *armeria*, thrift, or ſea gilly-flower, has a ſimple naked ſtem about ſix inches high. The radical leaves are like graſs. The flowers are terminal, pale red, with a round head, and not very large. This plant flowers in July or Auguſt, and grows in meadows near the ſea. 2. *Limonium*, ſea-lavender. The ſtem is naked, branched, and about a foot high. The radical leaves are long, pointed, and grow on footſtalks. The flowers are blue, and grow on long ſpikes on the tops of the branches. It grows on the ſea-coaſt in South Britain. 3. *Reticulata*, matted ſea-lavender. The ſtem is proſtrate, and terminated by a panicle of flowers. The branches are naked, barren, and bent back. The leaves are wedge-ſhaped. This ſpecies is alſo found on the ſea-coaſt of South Britain.

STATICS, a term which the modern improvements in knowledge have made it neceſſary to introduce into phyſico-mathematical ſcience. It was found convenient to diſtribute the doctrines of univerſal mechanics into two claſſes, which required both a different mode of conſideration and different principles of reaſoning.

Till the time of Archimedes little ſcience of this kind was poſſeſſed by the ancients, from whom we have received the firſt rudiments. His inveſtigation of the centre of gravity, and his theory of the lever, are the foundations of our knowledge of common mechanics; and his theory of the equilibrium of floating bodies contains the greateſt part of our hydroſtatical knowledge. But it was as-yet limited to the ſimpleſt caſes; and there were ſome in which Archimedes was ignorant, or was miſtaken. The marquis Guido Ubuldi, in 1578, publiſhed his theory of mechanics, in which the doctrines of Archimedes were well explained and conſiderably augmented. Stevinus, the celebrated Dutch engineer, publiſhed, about twenty years after, an excellent ſyſtem of mechanics, containing the chief principles which now form the ſcience of equilibrium among ſolid bodies. In particular, he gave the theory of inclined planes, which was unknown to the ancients, though it is of the very firſt importance in almoſt every machine. He even ſtates in the moſt expreſs terms the principle afterwards made the foundation of the whole of mechanics, and publiſhed as a valuable diſcovery by Varignon, viz. that three forces, whoſe directions and intenſities are as the ſides of a triangle, balance each other. His theory of the preſſure of fluids, or hydroſtatics, is no leſs eſtimable, including every thing that is now received as a leading principle in the ſcience. When we conſider the ignorance, even of the moſt learned, of that age in mechanical or phyſico-mathematical knowledge, we muſt conſider thoſe performances as the works of a great genius, and we regret that they are ſo little known, being loſt in a crowd of good writings on thoſe ſubjects which appeared ſoon after.

Hitherto the attention had been turned entirely to equilibrium, and the circumſtances neceſſary for producing it. Mechanicians indeed ſaw, that the energy of a machine might be ſomehow meaſured by the force which could be oppoſed or overcome by its intervention: but they did not remark, that the force which prevented its motion, but did no more than prevent it, was an *exact* meaſure of its energy, becauſe it was in immediate equilibrio with the preſſure exerted by that part of the machine with which it was connected. If this oppoſed force was leſs, or the force acting at the other extremity of the machine was greater, the mechanicians knew that the machine would move, and that work would be performed; but what would be the rate of its motion or its performance, they hardly pretended to conjecture. They had not ſtudied the action of moving forces, nor conceived what was done when motion was communicated.

The great Galileo opened a new field of ſpeculation in his work on Local Motion. He there conſiders a change of motion as the indication and exact and adequate meaſure of a moving force; and he conſiders every kind of preſſure as competent to the production of ſuch changes.—He contented himſelf with the application of this principle to the motion of bodies by the action of gravity, and gave the theory of projectiles, which remains to this day without change, and only improved by conſidering the changes which are produced in it by the reſiſtance of the air.

Sir Iſaac Newton took up this ſubject nearly as Galileo had left it. For, if we except the theory of the centrifugal forces ariſing from rotation, and the theory of pendulums, publiſhed by Huygens, hardly any thing had been added to the ſcience of motion. Newton conſidered the ſubject in its utmoſt extent; and in his mathematical principles of natural philoſophy he conſiders every conceivable variation of moving force, and determines the motion reſulting from its action.—His firſt application of theſe doctrines was to explain the celeſtial motions; and the magnificence of this ſubject cauſed it to occupy for a while the whole attention of the mathematicians. But the ſame work contained propoſitions equally conducive to the improvement of common mechanics, and to the complete underſtanding of the mechanical actions of bodies. Philoſophers began to make theſe applications alſo. They ſaw that every kind of work which is to be performed by a machine may be conſidered abſtractedly as a retarding force; that the impulſe of water or wind, which are employed as moving powers, act by means of preſſures which they exert on the impelled point of the machine; and that the machine itſelf may be conſidered as an aſſemblage of bodies moveable in certain limited circumſtances, with determined directions and proportions of velocity. From all theſe conſiderations reſulted a general abſtract condition of a body acted on by known powers. And they found, that after all conditions of equilibrium were ſatisfied, there remains a ſurplus of moving force. They could now ſtate the motion which will enſue, the new reſiſtance which this will excite, the additional power which this will abſorb; and they at laſt determined a new kind of equilibrium, not thought of by the ancient mechanicians, between the reſiſtance to the machine performing work and the moving power, which exactly balance each other, and is indicated, not by the *reſt*, but by the *uniform motion* of the machine.—In like manner, the mathematician was enabled to calculate that preciſe motion of water which would completely abſorb, or, in the new language, balance the ſuperiority of preſſure by which water is forced through a ſluice, a pipe, or canal, with a conſtant velocity,

Thus the general doctrines of motion came to be conſidered in two points of view, according as they balanced each other in a ſtate of reſt or of uniform motion. Theſe two ways of conſidering the ſame ſubject required both different principles and a different manner of reaſoning. The firſt has been named Statics, as expreſſing that reſt which is the teſt of this kind of equilibrium. The ſecond has been called Dynamics, or Universal Mechanics, becauſe the different kinds of mo-

tion are characteriſtic of the powers or forces which produce them. A knowledge of both is indiſpenſably neceſſary for acquiring any uſeful practical knowledge of machines: and it was ignorance of the doctrines of accelerated and retarded motions which made the progreſs of practical mechanical knowledge ſo very ſlow and imperfect. The mechanics, even of the moderns, before Galileo, went no further than to ſtate the proportion of the power and reſiſtance which would be balanced by the intervention of a given machine, or the proportion of the parts of a machine by which two known forces may balance each other. This view of the matter introduced a principle, which even Galileo conſidered as a mechanical axiom, viz. that *what is gained in force by means of a machine is exactly compenſated by the additional time which it obliges us to employ.* This is falſe in every inſtance, and not only prevents improvement in the conſtruction of machines, but leads us into erroneous maxims of conſtruction. The true principles of dynamics teach us, that there is a certain proportion of the machine, dependent on the kind and proportion of the power and reſiſtance, which enables the machine to perform the greateſt poſſible work.

It is highly proper, therefore, to keep ſeparate theſe two ways of conſidering machines, that both may be improved to the utmoſt, and then to blend them together in every practical diſcuſſion.

Statics, therefore, is preparatory to the proper ſtudy of mechanics; but it does not hence derive all its importance. It is the ſole foundation of many uſeful parts of knowledge. This will be beſt ſeen by a brief enumeration.

1. It comprehends all the doctrines of the excitement and propagation of preſſure through the parts of ſolid bodies, by which the energies of machines are produced. A preſſure is exerted on the impelled point of a machine, ſuch as the float-boards or buckets of a mill-wheel. This *excites* a preſſure at the pivots of its axle, which act on the points of ſupport. This muſt be underſtood, both as to direction and intenſity, that it may be effectually reſiſted. A preſſure is alſo excited at the acting tooth of the cog-wheel on the ſame axle, by which it urges round another wheel, exciting ſimilar preſſures on its pivots, and on the acting tooth perhaps of a third wheel.—Thus a preſſure is ultimately excited in the working point of the machine, perhaps a wiper, which lifts a heavy ſtamper, to let it fall again on ſome matter to be pounded. Now ſtatics teaches us the intenſities and direction of all thoſe preſſures, and therefore how much remains at the working point of the machine unbalanced by reſiſtance.

2. It comprehends every circumſtance which influences the ſtability of heavy bodies; the inveſtigation and properties of the centre of gravity; the theory of the conſtruction of arches, vaults, and domes; the attitudes of animals.

3. The ſtrength of materials, and the principles of conſtruction, ſo as to make the proper adjuſtment of ſtrength and ſtrain in every part of a machine, edifice, or ſtructure of any kind. Statics therefore furniſhes us with what may be called *a theory of carpentry*, and gives us proper inſtructions for framing floors, roofs, centres, &c.

4. Statics comprehends the whole doctrine of the preſſure of fluids, whether liquid or aeriform, whether ariſing from their weight or from any external action. Hence, therefore, we derive our knowledge of the ſtability of ſhips, or their power of maintaining themſelves in a poſition nearly upright, in oppoſition to the action of the wind on their ſails. We learn on what circumſtances of figure and ſtowage this quality depends, and what will augment or diminiſh it.

Very complete examples will be given in the remaining part of this work of the advantages of this ſeparate conſideration of the condition of a machine at reſt and in working motion; and in what yet remains to be delivered of the hydraulic doctrines in our account of WATER-*Works* in general, will be perceived the propriety of ſtating apart the equilibrium which is indicated by the uniform motion of the fluid. The obſervations too which we have to make on the ſtrength of the materials employed in our edifices or mechanical ſtructures, will be examples of the inveſtigation of thoſe powers, preſſures, or ſtrains, which are excited in all their parts.

STATISTICS, a word lately introduced to expreſs a view or ſurvey of any kingdom, county, or pariſh.

A Statiſtical view of Germany was publiſhed in 1790 by Mr. B. Clarke; giving an account of the imperial and territorial conſtitutions, forms of government, legiſlation, adminiſtration of juſtice, and of the eccleſiaſtical ſtate; with a ſketch of the character and genius of the Germans; a ſhort enquiry into the ſtate of their trade and commerce; and giving a diſtinct view of the dominions, extent, number of inhabitants to a ſquare mile; chief towns, with their ſize and population; revenues, expences, debts, and military ſtrength of each ſtate. In Pruſſia, in Saxony, Sardinia, and Tuſcany, attempts have alſo been made to draw up ſtatiſtical accounts; but they were done rather with a view of aſcertaining the preſent ſtate of theſe countries, than as the means of future improvement.

A grand and extenſive work of this kind was undertaken in Scotland in the year 1790 by Sir John Sinclair. The great object of it is to give an accurate view of the ſtate of the country, its agriculture, its manufactures, and its commerce; the means of improvement, of which they are reſpectively capable; the amount of the population of a ſtate, and the cauſes of its increaſe or decreaſe; the manner in which the territory of a country is poſſeſſed and cultivated; the nature and amount of the various productions of the ſoil; the value of the perſonal wealth or ſtock of the inhabitants, and how it can be augmented; the diſeaſes to which the people are ſubject, their cauſes and their cure; the occupations of the people; where they are entitled to encouragement, and where they ought to be ſuppreſſed; the condition of the poor, the beſt mode of maintaining them, and of giving them employment; the ſtate of ſchools, and other inſtitutions, formed for purpoſes of public utility; the ſtate of the villages and towns, and the regulations beſt calculated for their police and good government; the ſtate of the manners, the morals, and the religious principles of the people, and the means by which their temporal and eternal intereſts can beſt be promoted.

To ſuch of our readers as have not an opportunity of peruſing this national work, or of examining its plan, we recommend the ſcheme for the ſtatiſtical account of a parochial diſtrict which Sir John Sinclair publiſhed for the conſideration of the clergy, and which has been generally followed by them, though often with great improvements. If ſimilar ſurveys (ſays the public-ſpirited editor of this work) were inſtituted in the other kingdoms of Europe, it might be the means of eſtabliſhing, on ſure foundations, the principles of that moſt important of all ſciences; viz. political or ſtatiſtical philoſophy; that is, the ſcience, which, in preference to every other, ought to be held in reverence. No ſcience can furniſh, to any mind capable of receiving uſeful information, ſo much real entertainment; none can yield ſuch important hints, for the improvement of agriculture, for the extenſion of commercial induſtry, for regulating the conduct of individuals, or for extending the proſperity of the ſtate; none can tend ſo much to promote the general happineſs of the ſpecies.

STATIUS (Publius Papinius), a celebrated Latin poet of the firſt century, was born at Naples, and was the ſon of Statius, a native of Epirus, who went to Rome to teach poetry

and eloquence, and had Domitian for his ſcholar. Statius the poet alſo obtained the favour and friendſhip of that prince; and dedicated to him his Thebais and Achilleis; the firſt in twelve books, and the laſt in two. He died at Naples about the year 100. Beſides the above poems, there are alſo ſtill extant his *Sylvæ*, in five books; the ſtyle of which is purer, more agreeable, and more natural, than that of his Thebais and Achilleis.

STATUARY, a branch of ſculpture, employed in the making of ſtatues. See SCULPTURE and the next article. Statuary is one of thoſe arts wherein the ancients ſurpaſſed the moderns; and indeed it was much more popular, and more cultivated, among the former than the latter. It is diſputed between ſtatuary and painting, which of the two is the moſt difficult and the moſt artful. *Statuary* is alſo uſed for the artificer who makes ſtatues. Phidias was the greateſt ſtatuary among the ancients, and Michael Angelo among the moderns.

STATUE, is defined to be a piece of ſculpture in full relievo, repreſenting a human figure. Daviler more ſcientifically defines ſtatue a repreſentation, in high relievo, and inſulate, of ſome perſon diſtinguiſhed by his birth, merit, or great actions, placed as an ornament in a fine building, or expoſed in a public place, to preſerve the memory of his worth. In Greece, one of the higheſt honours to which a citizen could aſpire was to obtain a ſtatue. Statues are formed with the chiſel, of ſeveral matters, as ſtone, marble, plaſter, &c. They are alſo caſt of various kinds of metal, particularly gold, ſilver, braſs, and lead. For the method of caſting ſtatues, ſee the article FOUNDERY *of Statues*. Statues are uſually diſtinguiſhed into four general kinds. The firſt are thoſe leſs than the life; of which kind we have ſeveral ſtatues of great men, of kings, and of gods themſelves. The ſecond are thoſe equal to the life; in which manner it was that the ancients, at the public expence, uſed to make ſtatues of perſons eminent for virtue, learning, or the ſervices they had done. The third are thoſe that exceed the life; among which thoſe that ſurpaſſed the life once and a half were for kings and emperors; and thoſe double the life for heroes. The fourth kind were thoſe that exceeded the life twice, thrice, and even more, and were called *coloſſuſes*. See COLOSSUS. Every ſtatue reſembling the perſon whom it is intended to repreſent, is called *ſtatua iconica.* Statues acquire various other denominations. 1. Thus, allegorical ſtatue is that which, under a human figure, or other ſymbol, repreſents ſomething of another kind; as a part of the earth, a ſeaſon, age, element, temperament, hour, &c. 2. Curule ſtatues, are thoſe which are repreſented in chariots drawn by bigæ or quadrigæ, that is, by two or four horſes; of which kind there were ſeveral in the circuſes, hippodromes, &c. or in cars, as we ſee ſome, with triumphal arches on antique medals. 3. Equeſtrian ſtatue, that which repreſents ſome illuſtrious perſon on horſeback, as that famous one of Marcus Aurelius at Rome; that of king Charles I at Charing-croſs; king George II. in Lieceſter-ſquare, &c. 4. Greek ſtatue, denotes a figure that is naked and antique; it being in this manner the Greeks repreſented their deities, athletæ of the Olympic games, and heroes; the ſtatues of heroes were particularly called *Achillean ſtatues*, by reaſon of the great number of figures of Achilles in moſt of the cities of Greece. 5. Hydraulic ſtatue, is any figure placed as an ornament of a fountain or grotto, or that does the office of a *jet d'eau*, a cock, ſpout, or the like, by any of its parts, or by any attribute it holds: the like is to be underſtood of any animal ſerving for the ſame uſe. 6. Pedeſtrian ſtatue, a ſtatue ſtanding on foot; as that of king Charles II. in the Royal Exchange, and of king James II. in the Privy Gardens. 7. Roman ſtatue, is an appellation given to ſuch as are clothed, and which receive various names from their various dreſſes. Thoſe of emperors, with long gowns over their armour, were called *ſtatuæ paludatæ*: thoſe of captains and cavaliers, with coats of arms, *thoracatæ*; thoſe of ſoldiers with cuiraſſes, *loricatæ*; thoſe of ſenators and augurs, *trabeatæ*; thoſe of magiſtrates with long robes, *togatæ*; thoſe of the people with a plain tunica, *tunicatæ*; and, laſtly, thoſe of women with long trains, *ſtolatæ*.

In repairing a ſtatue caſt in a mould, they touch it up with a chiſel, graver, or other inſtrument, to finiſh the places which they have not come well off: they alſo clear off the barb, and what is redundant in the joints and projectures.

STATURE. See DWARF and GIANT.

STATUTE, in its general ſenſe, ſignifies a law, ordinance, decree, &c. See LAW, &c.

STATUTE, in our laws and cuſtoms, more immediately ſignifies an act of parliament made by the three eſtates of the realm; and ſuch ſtatutes are either general, of which the courts at Weſtminſter muſt take notice without pleading them; or they are ſpecial and private, which laſt muſt be pleaded.

STAVESACRE, in botany; a ſpecies of DELPHINIUM.

STAY, a large ſtrong rope employed to ſupport the maſt on the fore-part, by extending from its upper end towards the fore-part of the ſhip, as the ſhrouds are extended to the right and left, and behind it. See MAST, RIGGING, and SHROUD. The ſtay of the fore-maſt *a*, Vol. V. pl. 15. fig. 5. which is called the *fore ſtay*, reaches from the maſt-head towards the bowſprit-end: the main-ſtay *b* extends over the forecaſtle to the ſhip's ſtem; and the mizen-ſtay *c* is ſtretched down to that part of the main-maſt which lies immediately above the quarter-deck: the fore-top-maſt ſtay *d* comes alſo to the end of the bowſprit, a little beyond the fore-ſtay: the main-top-maſt ſtay *e* is attached to the head or hounds of the fore-maſt; and the mizen-top-maſt ſtay comes alſo to the hounds of the main-maſt; the fore-top-gallant ſtay comes to the outer end of the jib-boom; and the main-top gallant ſtay is extended to the head of the fore-top-maſt.

STAY-*Sail*, a ſort of triangular ſail extended upon a ſtay. See SAIL.

STEAM, is the name given in our language to the viſible moiſt vapour which ariſes from all bodies which contain juices eaſily expelled from them by heats not ſufficient for their combuſtion. Thus we ſay, the ſteam of boiling-water, of malt, of a tan-bed, &c. It is diſtinguiſhed from ſmoke by its not having been produced by combuſtion, by not containing any ſoot, and by its being condenſed by cold into water, oil, inflammable ſpirits, or liquids compoſed of theſe.

We ſee it riſe in great abundance from bodies when they are heated, forming a white cloud, which diffuſes itſelf and diſappears at no very great diſtance from the body from which it was produced. In this caſe the ſurrounding air is found loaded with the water or other juices which ſeem to have produced it, and the ſteam ſeems to be completely ſoluble in air, as ſalt is in water, compoſing while thus united a tranſparent elaſtic fluid.

But in order to its appearance in the form of an opaque white cloud, the mixture with or diſſemination in air ſeem abſolutely neceſſary. If a tea-kettle boils violently, ſo that the ſteam is formed at the ſpout in great abundance, it may be obſerved, that the viſible cloud is not formed at the very mouth of the ſpout, but at a ſmall diſtance before it, and that the vapour is perfectly tranſparent at its firſt emiſſion. This is rendered ſtill more evident by fitting to the ſpout of the tea-kettle a glaſs pipe of any length, and of as large a diameter as we pleaſe. The ſteam is produced as copiouſly as without this pipe, but the vapour is tranſparent through the whole length of the pipe. Nay, if this pipe communicate with

a glaſs veſſel terminating in another pipe, and if the veſſel be kept ſufficiently hot, the ſteam will be as abundantly produced at the mouth of this ſecond pipe as before, and the veſſel will be quite tranſparent. The viſibility therefore of the matter which conſtitutes the ſteam is an accidental or extraneous circumſtance, and requires the admixture with air; yet this quality again leaves it when united with air by ſolution. It appears therefore to require a *diſſemination* in the air. The appearances are quite agreeable to this notion: for we know that one perfectly tranſparent body, when minutely divided and diffuſed among the parts of another tranſparent body, but not diſſolved in it, makes a maſs which is viſible. Thus oil beat up with water makes a white opaque maſs.

In the mean time, as ſteam is produced, the water gradually waſtes in the tea-kettle, and will ſoon be totally expended, if we continue it on the fire. It is reaſonable therefore to ſuppoſe, that this ſteam is nothing but water changed by heat into an aërial or elaſtic form. If ſo, we ſhould expect that the privation of this heat would leave it in the form of water again. Accordingly this is fully verified by experiment; for if the pipe fitted to the ſpout of the tea-kettle be ſurrounded with cold water, no ſteam will iſſue, but water will continually trickle from it in drops; and if the proceſs be conducted with the proper precautions, the water which we thus obtain from the pipe will be found equal in quantity to that which diſappears from the tea-kettle.

This is evidently the common proceſs for diſtilling; and the whole appearances may be explained by ſaying, that the water is converted by heat into an elaſtic vapour, and that this, meeting with colder air, imparts to it the heat which it carried off as it aroſe from the heated water, and being deprived of its heat it is again water. The particles of this water being vaſtly more remote from each other than when they were in the tea-kettle, and thus being diſſeminated in the air, become viſible, by reflecting light from their anterior and poſterior ſurfaces, in the ſame manner as a tranſparent ſalt becomes viſible when reduced to a fine powder. This diſſeminated water being preſented to the air in a very extended ſurface, is quickly diſſolved by it, as pounded ſalt is in water, and again becomes a tranſparent fluid, but of a different nature from what it was before, being no longer convertible into water by depriving it of its heat.

Accordingly this opinion, or ſomething very like it, has been long entertained. Muſchenbroeck expreſsly ſays, that the water in the form of vapour carries off with it all the heat which is continually thrown in by the fuel. But Dr. Black was the firſt who attended minutely to the whole phenomena, and enabled us to form diſtinct notions of the ſubject. He had diſcovered that it was not ſufficient for converting ice into water that it be raiſed to that temperature in which it can no longer remain in the form of ice. A piece of ice of the temperature 32° of Fahrenheit's thermometer will remain a very long while in air of the temperature 50° before it be all melted, remaining all the while of the temperature 32°, and therefore continually abſorbing heat from the ſurrounding air. By comparing the time in which the ice had its temperature changed from 28° to 32° with the ſubſequent time of its complete liquefaction, he found that it abſorbed about 130 or 140 times as much heat as would raiſe its temperature one degree; and he found that one pound of ice, when mixed with one pound of water 140 degrees warmer, was juſt melted, but without riſing in its temperature above 32°. Hence he juſtly concluded, that water differed from ice of the ſame temperature by containing, as a conſtituent ingredient, a great quantity of fire, or of the cauſe of heat, united with it in ſuch a way as not to quit it for another colder body, and therefore ſo as not to go into the liquor of the thermometer and expand it. Conſidered therefore as the poſſible cauſe of heat, it was latent, which Dr. Black expreſſed by the abbreviated term LATENT HEAT. If any more heat was added to the water it was not latent, but would readily quit it for the thermometer, and, by expanding the thermometer, would ſhow what is the degree of this *redundant* heat, while fluidity alone is the indication of the *combined* and latent heat.

Dr. Black, in like manner, concluded, that in order to convert water into an elaſtic vapour, it was neceſſary, not only to increaſe its uncombined heat till its temperature is 212°, in which ſtate it is juſt ready to become elaſtic; but alſo to pour into it a great quantity of fire, or the cauſe of heat, which combines with every particle of it, ſo as to make it repel, or to recede from, its adjoining particles, and thus to make it a particle of an elaſtic fluid. He ſuppoſed that this additional heat might be combined with it ſo as not to quit it for the thermometer; and therefore ſo as to be in a latent ſtate, having elaſtic fluidity for its ſole indication.

This opinion was very conſiſtent with the phenomenon of boiling off a quantity of water. The application of heat to it cauſes it gradually to riſe in its temperature till it reaches the temperature 212°. It then begins to ſend off elaſtic vapour, and is ſlowly expended in this way, continuing all the while of the ſame temperature. The ſteam alſo is of no higher temperature, as appears by holding a thermometer in it. We muſt conclude that this ſteam contains all the heat which is expended in its formation. Accordingly the ſcalding power of ſteam is well known; but it is extremely difficult to obtain preciſe meaſures of the quantity of heat abſorbed by water during its converſion into ſteam. Dr. Black endeavoured to aſcertain this point, by comparing the time of raiſing its temperature a certain number of degrees with the time of boiling it off by the ſame external heat; and he found that the heat latent in ſteam, which balanced the preſſure of the atmoſphere, was not leſs than 800 degrees. He alſo directed Dr. Irvine of Glaſgow to the form of an experiment for meaſuring the heat actually extricated from ſuch ſteam during its condenſation in the refrigeratory of a ſtill, which was found to be not leſs than 774 degrees. Dr. Black was afterwards informed by Mr. Watt, that a courſe of experiments, which he had made in each of theſe ways with great preciſion, determined the latent heat of ſteam under the ordinary preſſure of the atmoſphere to be about 948 or 950 degrees. Mr. Watt alſo found that water would diſtil with great eaſe *in vacuo* when of the temperature 70°; and that in this caſe the latent heat of the ſteam is not leſs than 1200 or 1300 degrees: and a train of experiments, which he had made by diſtilling in different temperatures, made him conclude that the ſum of the ſenſible and latent heats is a conſtant quantity. This is a curious and not an improbable circumſtance; but we have no information of the particulars of theſe experiments. The concluſion evidently preſuppoſes a knowledge of that particular temperature in which the water has no heat; but this is a point which is ſtill *ſub judice.*

This converſion of liquids (for it is not confined to water, but obtains alſo in ardent ſpirits, oils, mercury, &c.) is the cauſe of their boiling. The heat is applied to the bottom and ſides of the veſſel, and gradually accumulates in the fluid, in a ſenſible ſtate, uncombined, and ready to quit it and to enter into any body that is colder, and to diffuſe itſelf between them. Thus it enters into the fluid of a thermometer, expands it, and thus gives us the indication of the degree in which it has been accumulated in the water; for the thermometer ſwells as long as it continues to abſorb ſenſible heat from the water: and when the ſenſible heat in both is in equilibrio, in a proportion depending on the nature of the two fluids, the thermometer riſes no more, becauſe it abſorbs no more heat or fire from the water; for the particles of water which are in immediate contact with the bottom, are now (by this gradual expanſion of liquidity) at ſuch diſtance from each other, and that their laws

of attraction for each other and for heat are totally changed. Each particle either no longer attracts, or perhaps it repels its adjoining particle, and now accumulates round itſelf a great number of the particles of heat, and forms a particle of elaſtic fluid, ſo related to the adjoining new-formed particles, as to repel them to a diſtance at leaſt a hundred times greater than their diſtances in the ſtate of water. Thus a maſs of elaſtic vapour of ſenſible magnitude is formed. Being at leaſt ten thouſand times lighter than an equal bulk of water, it muſt riſe up through it, as a cork would do, in form of a tranſparent ball or bubble, and getting to the top, it diſſipates, filling the upper part of the veſſel with vapour or ſteam. Thus, by toſſing the liquid into bubbles, which are produced all over the bottom and ſides of the veſſel, it produces the phenomenon of ebullition or boiling. Obſerve, that during its paſſage up through the water, it is not changed or condenſed; for the ſurrounding water is already ſo hot than the ſenſible or uncombined heat in it, is in equilibrio with that in the vapour, and therefore it is not diſpoſed to abſorb any of that heat which is combined as an ingredient of this vapour, and gives it its elaſticity. For this reaſon, it happens that water will not boil till its whole maſs be heated up to 212°; for if the upper part be colder, it robs the riſing bubble of that heat which is neceſſary for its elaſticity, ſo that it immediately collapſes again, and the ſurface of the water remains ſtill. This may be perceived by holding water in a Florence flaſk over a lamp or choffer. It will be obſerved, ſome time before the real ebullition, that ſome bubbles are formed at the bottom, and get up a very little way, and then diſappear. The diſtances which they reach before collapſing increaſe as the water continues to warm farther up the maſs, till at laſt it breaks out into boiling. If the handle of a tea-kettle be graſped with the hand, a tremor will be felt for ſome little time before boiling, ariſing from the little ſucceſſions which are produced by the collapſing of the bubbles of vapour. This is much more violent, and is really a remarkable phenomenon, if we ſuddenly plunge a lump of red hot iron into a veſſel of cold water, taking care that no red part be near the ſurface. If the hand be now applied to the ſide of the veſſel, a moſt violent tremor is felt, and ſometimes ſtrong thumps: theſe ariſe from the collapſing of very large bubbles. If the upper part of the iron be too hot, it warms the ſurrounding water ſo much, that the bubbles from below come up through it uncondenſed, and produce ebullition without this ſucceſſion. The great reſemblance of this tremor to the feeling which we have during the ſhock of an earthquake has led many to ſuppoſe that theſe laſt are produced in the ſame way; (ſee Earthquake); and their hypotheſis, notwithſtanding the objections which we have elſewhere ſtated to it, is by no means unfeaſible.

It is owing to a ſimilar cauſe that violent thumps are ſometimes felt on the bottom of a tea-kettle, eſpecially one which has been long in uſe. Such are frequently cruſted on the bottom with a ſtony concretion. This ſometimes is detached in little ſcales. When one of theſe is adhering by one end to the bottom, the water gets between them in a thin film. Here it may be heated conſiderably above the boiling temperature, and it ſuddenly riſes up in a large bubble, which collapſes immediately. A ſmooth ſhilling lying on the bottom will produce this appearance very violently, or a thimble with the mouth down.

In order to make water boil, the fire muſt be applied to the bottom or ſides of the veſſel. If the heat be applied at the top of the water, it will waſte away without boiling; for the very ſuperficial particles are firſt ſupplied with the heat neceſſary for rendering them elaſtic, and they fly off without agitating the reſt.

Since this diſengagement of vapour is the effect of its elaſticity, and ſince this elaſticity is a determined force when the temperature is given, it follows, that fluids cannot boil till the elaſticity of the vapour overcomes the preſſure of the incumbent fluid and of the atmoſphere. Therefore, when this preſſure is removed or diminiſhed, the fluids muſt ſooner overcome what remains, and boil at a lower temperature. Accordingly it is obſerved that water will boil in an exhauſted receiver when of the heat of the human body. If two glaſs balls A and B (ſee *Pulſe Glaſs* in 3d. Pl. 21.) be connected by a ſlender tube, and one of them A be filled with water (a ſmall opening or pipe *b* being left at top of the other), and this be made to boil, the vapour produced from it will drive all the air out of the other, and will at laſt come out itſelf, producing ſteam at the mouth of the pipe. When the ball B is obſerved to be occupied by tranſparent vapour, we may conclude that the air is completely expelled. Now ſhut the pipe by ſticking it into a piece of tallow or bees-wax; the vapour in B will ſoon condenſe, and there will be a vacuum. The flame of a lamp and blow-pipe being directed to the little pipe, will cauſe it immediately to cloſe and ſeal hermetically. We now have a pretty inſtrument or toy called a Pulse glass. Graſp the ball A in the hollow of the hand; the heat of the hand will immediately expand the bubble of vapour which may be in it, and this vapour will drive the water into B, and then will blow up through it for a long while, keeping it in a ſtate of violent ebullition, as long as there remains a drop or film of water in A. But care muſt be taken that B is all the while kept cold, that it may condenſe the vapour as faſt as it riſes through the water. Touching B with the hand, or breathing warm on it, will immediately ſtop the ebullition in it. When the water in A has thus been diſſipated, graſp B in the hand; the water will be driven into A, and the ebullition will take place there as it did in B. Putting one of the balls into the mouth will make the ebullition more violent in the other, and the one in the mouth will feel very cold. This is a pretty illuſtration of the rapid abſorption of the heat by the particles of water which are thus converted into elaſtic vapour. We have ſeen this little toy ſuſpended by the middle of the tube like a balance, and thus placed in the inſide of a window, having two holes *a* and *b* cut in the pane, in ſuch a ſituation that when A is full of water and preponderates, B is oppoſite to the hole *b*. Whenever the room became ſufficiently warm, the vapour was formed in A, and immediately drove the water into B, which was kept cool by the air coming into the room through the hole *b*. By this means B was made to preponderate in its turn, and A was then oppoſite to the hole *a*, and the proceſs was now repeated in the oppoſite direction; and this amuſement continued as long as the room was warm enough.

We know that liquors differ exceedingly in the temperatures neceſſary for their ebullition. This forms the great chemical diſtinction between volatile and fixed bodies. But the difference of temperature in which they boil, or are converted into permanently elaſtic vapour, under the preſſure of the atmoſphere, is not a certain meaſure of their differences of volatility. The natural boiling point of a body is that in which it will be converted into elaſtic vapour under no preſſure, or *in vacuo*. The boiling point in the open air depends on the law of the elaſticity of the vapour in relation to its heat. A fluid A may be leſs volatile, that is, may require more heat to make it boil *in vacuo*, than a fluid B: but if the elaſticity of the vapour of A be more increaſed by an increaſe of temperature than that of the vapour of B, A may boil at as low, or even at a lower temperature, in the open air, than B does; for the increaſed elaſticity of the vapour of A may ſooner overcome the preſſure of the atmoſphere. Few experiments have been made on the relation between the temperature and the elaſticity of different vapours. So long ago as the year

1765, we had occasion to examine the boiling points of all ſuch liquors as we could manage in an air-pump; that is, ſuch as did not produce vapours which deſtroyed the valves and the leathers of the piſtons: and we thought that the experiments gave us reaſon to conclude, that the elaſticity of all the vapours was affected by heat nearly in the ſame degree. For we found that the difference between their boiling points in the air and *in vacuo* was nearly the ſame in all, namely, about 120 degrees of Fahrenheit's thermometer. It is exceedingly difficult to make experiments of this kind: the vapours are ſo condenſible, and change their elaſticity ſo prodigiouſly by a trifling change of temperature, that it is almoſt impoſſible to examine this point with preciſion. It is, however, as we ſhall ſee by and by, a ſubject of conſiderable practical importance in the mechanic arts; and an accurate knowledge of the relation would be of great uſe alſo to the diſtiller: and it would be no leſs important to diſcover the relation of their elaſticity and denſity, by examining their compreſſibility, in the ſame manner as we have aſcertained the relation in the caſe of what we call *aërial fluids*, that is, ſuch as we have never obſerved in the form of liquids or ſolids, except in conſequence of their union with each other or with other bodies. In the article PNEUMATICS we took notice of it as ſomething like a natural law, that all theſe airs, or gaſes as they are now called, had their elaſticity very nearly, if not exactly proportional to their denſity. This appears from the experiments of Achard, of Fontana, and others, on vital air, inflammable air, fixed air, and ſome others. It gives us ſome preſumption to ſuppoſe that it holds in all elaſtic vapours whatever, and that it is connected with their elaſticity; and it renders it ſomewhat probable that they are all elaſtic, only becauſe the cauſe of heat (the matter of fire if you will) is elaſtic, and that their law of elaſticity, in reſpect of denſity, is the ſame with that of fire. But it muſt be obſerved, that although we thus aſſign the elaſticity of fire as the immediate cauſe of the elaſticity of vapour, in the ſame way, and on the ſame grounds, that we aſcribe the fluidity of brine to the fluidity of the water which holds the ſolid ſalt in ſolution, it does not follow that this is owing, as is commonly ſuppoſed, to a repulſion or tendency to recede from each other exerted by the particles of fire. We are as much entitled to infer a repulſion of unlimited extent between the particles of water; for we ſee that by its means a ſingle particle of ſea-ſalt becomes diſſeminated through the whole of a very large veſſel. If water had not been a viſible and palpable ſubſtance, and the ſalt only had been viſible and palpable, we might have formed a ſimilar notion of chemical ſolution. But we, on the contrary, have conſidered the *quaquaverſum* motion or expanſion of the ſalt as a diſſemination among the particles of water; and we have aſcribed it to the ſtrong attraction of the atoms of ſalt for the atoms of water, and the attraction of theſe laſt for each other, thinking that each atom of ſalt accumulates round itſelf a multitude of watery atoms, and by ſo doing muſt recede from the other ſaline atoms. Nay, we farther ſee, that by forces which we naturally conſider as attractions, an expanſion may be produced of the whole maſs, which will act againſt external mechanical forces. It is thus that wood ſwells with almoſt inſuperable force by imbibing moiſture; it is thus that a ſponge immerſed in water becomes really an elaſtic compreſſible body, reſembling a blown bladder; and there are appearances which warrant us to apply this mode of conception to elaſtic fluids.—When air is ſuddenly compreſſed, a thermometer included in it ſhows a riſe of temperature; that is, an appearance of heat now redundant which was formerly combined. The heat ſeems to be ſqueezed out as the water from the ſponge.

Accordingly this opinion, that the elaſticity of ſteam and other vapours, is owing merely to the attraction for fire, and the conſequent diſſemination of their particles through the whole maſs of fire, has been entertained by many naturaliſts, and it has been aſcribed entirely to attraction. We by no means pretend to decide; but we think the analogy by far too ſlight to found any confident opinion on it. The aim is to ſolve phenomena by attraction only, as if it were of more eaſy conception than repulſion. Conſidered merely as facts, they are quite on a par. The appearances of nature in which we obſerve actual receſſes of the parts of body from each other, are as diſtinct, and as frequent and familiar, as the appearances of actual approach. And if we attempt to go farther in our contemplation, and to conceive the way and the forces by which either the approximations or receſſes of the atoms are produced, we muſt acknowledge that we have no conception of the matter; and we can only ſay, that there is a cauſe of theſe motions, and we call it a force, as in every caſe of the production of motion. We call it attraction or repulſion juſt as we happen to contemplate an acceſs or a receſs. But the analogy here is not only ſlight, but imperfect, and fails moſt in thoſe caſes which are moſt ſimple, and where we ſhould expect it to be moſt complete. We can ſqueeze water out of a ſponge, it is true, or out of a piece of green wood; but when the white of an egg, the tremella, or ſome gums, ſwell to a hundred times their dry dimenſions by imbibing water, we cannot ſqueeze out a particle. If fluidity (for the reaſoning muſt equally apply to this as to vapourouſneſs) be owing to an accumulation of the extended matter of fire, which gradually expanded the ſolid by its very minute additions; and if the accumulation round a particle of ice, which is neceſſary for making it a particle of water, be ſo great in compariſon of what gives it the expanſion of one degree, as experiment obliges us to conclude—it ſeems an inevitable conſequence that all fluids ſhould be many times rarer than the ſolids from which they were produced. But we know that the difference is trifling in all caſes, and in ſome (water, for inſtance, and iron) the ſolid is rarer than the fluid. Many other arguments (each of them perhaps of little weight when taken alone, but which are all ſyſtematically connected) concur in rendering it much more probable that the matter of fire, in cauſing elaſticity, acts immediately by its own elaſticity, which we cannot conceive in any other way than as a mutual tendency in its particles to recede from each other; and we doubt not but that, if it could be obtained alone, we ſhould find it an elaſtic fluid like air. We even think that there are caſes in which it is obſerved in this ſtate. The elaſtic force of gunpowder is very much beyond the elaſticity of all the vapours which are produced in its deflagration, each of them being expanded as much as we can reaſonably ſuppoſe by the great heat to which they are expoſed. The writer of this article exploded ſome gunpowder mixed with a conſiderable portion of finely powdered quartz, and another parcel mixed with fine filings of copper. The elaſticity was meaſured by the penetration of the ball which was diſcharged, and was great in the degree now mentioned. The experiment was ſo conducted, that much of the quartz and copper was collected; none of the quartz had been melted, and ſome of the copper was not melted. The heat, therefore, could not be ſuch as to explain the elaſticity by expanſion of the vapours; and it became not improbable that fire was acting here as a detached chemical fluid by its own elaſticity. But to return to our ſubject.

There is one circumſtance in which we think our own experiments ſhow a remarkable difference (at leaſt in degree) between the condenſible and incondenſible vapours. It is well known, that when air is very ſuddenly expanded, cold is produced, and heat when it is ſuddenly condenſed. When

making experiments with the hopes of discovering the connection between the elasticity and density of the vapours of boiling water, and also of boiling spirits of turpentine, we found the change of density accompanied by a change of temperature vastly greater than in the case of incoercible gases. When the vapour of boiling water was suddenly allowed to expand into five times its bulk, we observed the depression of a large and sensible air thermometer to be at least four or five times greater than in a similar expansion of common air of the same temperature. The chemical reader will readily see reasons for expecting, on the contrary, a smaller alteration of temperature, both on account of the much greater rarity of the fluid, and on account of a partial condensation of its water, and the consequent disengagement of combined heat.

This difference in the quantity of fire which is combined in vapours and gases is so considerable as to authorize us to suppose that there is some difference in the chemical constitution of vapours and gases, and that the connection between the specific bases of the vapour and the fire which it contains is not the same in air, for instance, as in the vapour of boiling water; and this difference may be the reason why the one is easily condensible by cold, while the other has never been exhibited in a liquid or solid form, except by means of its chemical union with other substances. In this particular instance we know that there is an essential difference—that in vital or atmospheric air there is not only a prodigious quantity of fire which is not in the vapour of water, but that it also contains light, or the cause of light, in a combined state. This is fully evinced by the great discovery of Mr. Cavendish of the composition of water. Here we are taught that water (and consequently its vapour) consists of air from which the light and greatest part of the fire have been separated. And the subsequent discoveries of the celebrated Lavoisier show, that almost all the condensible gases with which we are acquainted consist either of airs which have already lost much of their fire (and perhaps light too), or of matters in which we have no evidence of fire or light being combined in this manner.

This consideration may go far in explaining this difference in the condensibility of these different species of aerial fluids, the gases and the vapours; and it is with this qualification only that we are disposed to allow that all bodies are condensible into liquids or solids by abstracting the heat. In order that vital air may become liquid or solid, we hold that it is not sufficient that a body be presented to it which shall simply abstract its heat. This would only abstract its uncombined fire.—But another, and much larger portion remains chemically combined by means of light. A chemical affinity must be brought into action which may abstract, not the fire from the oxygen (to speak in the language of Mr. Lavoisier), but the oxygen from the fire and light. And our production is not the detached basis of air, but detached heat and light, and the formation of an oxyd of some kind.

To prosecute the chemical consideration of Steams farther than these general observations, which are applicable to all, would be almost to write a treatise of chemistry, and would be a repetition of many things which have been treated of in sufficient detail in other articles of this work. We shall therefore content ourselves with referring to those articles.

Steam-*Engine*, an engine for raising water by means of fire. The earliest account to be met with of the invention of this engine is in a book published by the marquis of Worcester in the year 1663, where he proposed the raising of great quantities of water by the force of fire, or by turning water into steam; and mentions an engine of that kind of his own contrivance which could raise a continual stream like a fountain forty feet high, by the means of two cocks which were alternately and successively turned by a man to admit the steam, and to re-fill the vessel with cold water, the fire being continually kept up: for which reason this nobleman is generally looked upon as the first inventor of this engine; and though his method of applying the force of steam was certainly much different from the present, yet the water was raised by the same original power, which is the expansion of water into steam by fire. However, this invention not meeting with encouragement, probably owing to the confused state in which the public affairs were about that time, it was neglected, and lay dormant several years, until one captain Savery having read the marquis of Worcester's books, several years afterwards, tried many experiments upon the force and power of steam; and at last luckily hit upon a method of applying it to raise water. This he had no sooner done, than he bought up and destroyed all the marquis's books that could be got, and then claimed the honour of this invention to himself, and obtained a patent for it, pretending to have discovered this secret of nature by such an accident as by experiment was found could not give him any such idea. He contrived an engine which, after many experiments, he brought to some degree of perfection, so as to raise water in small quantities: but he could not succeed in raising water a great height and in large quantities for the draining of mines; to effect which by his method, the steam required to be boiled to such a strength as would have burst all his vessels; so that he was obliged to be content with raising water a small height or in small quantities. The largest engine that he ever erected, was for the York-buildings company in London, for the supplying of the inhabitants of the Strand and that neighbourhood with water. A draught and description of one of these engines is in Harris's Lexicon Technicum.

At the same time that captain Savery was employed in perfecting his engine, Dr. Papinus of Marburg was contriving one on the same principles, which he describes in a small book published in 1707, intitled *Ars nova ad aquam ignis adminiculo efficacissime elevandum.* Captain Savery's engine, however, was much completer than that proposed by Dr. Papinus.

About the same time also one Monsieur Amontons of Paris was engaged in the same pursuit: but his method of applying the force of the steam was different from those before mentioned; for he intended it to drive or turn a wheel, which he called a *fire-mill*, which was to work pumps for raising water: but he never brought it to perfection. Each of these three gentlemen claimed the originality of the invention; but it is more than probable they all took the hint from the book published by the marquis of Worcester many years before.

In this imperfect state it continued without farther improvements until the year 1705, when Mr. Newcommon and Mr. Calley of Dartmouth in Southamptonshire made several experiments to bring it to work with a piston and beam, as now used; in which, after much pains taken, they succeeded, and obtained a patent for the sole use of this invention, for fourteen years. The first proposal they made for draining of mines by this engine was in the year 1711; but they were very coldly received by many persons in the south of England, who did not understand the nature of it. In 1712 they came to an agreement with the owners of a colliery at Griff in Warwickshire, where they erected an engine with a cylinder of twenty-two inches diameter. At first they were under great difficulties in many things; but by the assistance of some good workmen they got all the parts put together in such a manner as to answer their intention tolerably well: and this was the first engine of the kind erected in England. There was at first one man to attend the steam-cock, and another to attend the injection-cock; but they afterwards contrived a method of opening and shutting them by some small machinery connected with the working-beam. The next engine erected by these patentees was at a colliery in the county of Durham, about

the year 1718, where one Mr. Beighton was concerned; who, not approving of the intricate manner of opening and ſhutting the cocks by ſtrings and catches as in the former engine, ſubſtituted the hanging-beam for that purpoſe as at preſent uſed, and likewiſe made ſome improvements in the pipes, valves, and ſome other parts of the engine.

In a few years afterwards theſe engines came to be better underſtood than they had been; and their advantages, eſpecially in draining of mines, became more apparent: and from the great number of them erected, they received additional improvements from different hands, until they arrived at their preſent degree of perfection.

This engine, as now improved, is the moſt curious and compound machine of all thoſe inventions which have been owing to modern philoſophy; and is not only applicable to the raiſing of large quantities of water out of mines, and for the ſupplying of towns, &c. but to many other of the moſt neceſſary purpoſes for mankind.

The principles on which it acts are truly philoſophical; and when all the parts of the machine are proportioned to each other agreeable to theſe principles, it never fails anſwering the intention of the engineer.

1. It has been proved in Pneumatics, that the preſſure of the atmoſphere upon a ſquare inch at the earth's ſurface, is about 14.8 pounds avoirdupoiſe at a mean. And,

2. If a vacuum is made by any means in a cylinder, which has a moveable piſton ſuſpended at one end of a lever equally divided, the air will endeavour to ruſh in, and will preſs down the piſton, with a force proportionable to the area of the ſurface, and will raiſe an equal weight at the other end of the lever.

3. Water may be rarefied near 14,000 times by being reduced into ſteam, the particles whereof are ſo ſtrongly repellent, as to drive away air of the common denſity, only by a heat ſufficient to keep the water in a boiling ſtate: by increaſing the heat, the ſteam may be rendered much ſtronger; but this requires great ſtrength in the veſſels to ſupport it. This ſteam may again be condenſed into its former ſtate by a jet of cold water diſperſed among it; ſo that 14,000 cubic inches of ſteam admitted into a cylinder, may be reduced into the ſpace of one cubic inch of water only, by which means a vacuum is partly obtained.

4. Though the preſſure of the atmoſphere be about $14\frac{7}{10}$ pounds upon every ſquare inch, yet on account of the friction of the ſeveral parts, the reſiſtance from ſome air which is unavoidably admitted with the jet of cold water, and from ſome remainder of ſteam in the cylinder, the vacuum is very imperfect, and the piſton does not deſcend with a force exceeding eight or nine pounds upon every ſquare inch of its ſurface.

5. The gallon of water of 282 cubic inches weighs 10.2 pounds avoirdupoiſe, or a cubic foot 62.5 pounds. The piſton being preſſed by the atmoſphere with a force proportionable to its area in inches, multiplied by about eight or nine pounds, depreſſeth that end of the lever, and raiſeth a column of water in the pumps of equal weight at the other end, by means of the pump-rods ſuſpended to it. When the ſteam is again admitted, the piſton riſes and the pump-rods ſink; and when that ſteam is condenſed, the pump-rods again lift; and ſo alternately as long as the engine works.

It has been obſerved above, that the piſton does not deſcend with a force exceeding eight or nine pounds upon every ſquare inch of its ſurface; but by reaſon of accidental frictions and alterations in the denſity of the air, it will be the ſafeſt method, in calculating the power of the cylinder, to allow ſomething leſs than eight pounds for the preſſure of the atmoſphere upon every ſquare inch, viz. ſeven pounds ten ounces; and it being allowed that the gallon of water of 282 cubic inches weighs 10.2 pound avoirdupoiſe, from theſe premiſſes the dimenſions of the cylinder, pumps, &c. for any fire-engine, may be deduced as follows:

Suppoſe c = the cylinder's diameter in inches.
p = the pump's ditto.
f = the depth of the pit in fathoms.
g = the gallons drawn by a ſtroke of ſix feet or one fathom.
h = the hogſheads drawn per hour.
s = the number of ſtrokes per minute.

Then $c^2 \times .7854$ = area of the cylinder, which multiplied by 7.64 pound, the air's preſſure on a ſquare inch, we have $6c^2$ for the power of any cylinder in pounds avoirdupoiſe.

And, $\frac{p^2 \times .7854 \times 72}{282} = g$, the gallons contained in one fathom of any pump $= .2005\,p^2$; which multiplied by f fathoms, we have $.2005p^2f$ for the gallons contained in any number of fathoms of any pump.

Alſo, $.2005p^2f \times 10.2$ pound, the weight of one gallon, we have $2.0451p^2f$ = the weight in pounds of the column of water which is to be raiſed by the power of the cylinder.

But as a ſufficient allowance was made in the power of the cylinder, by eſtimating it at 7.64 pound only inſtead of eight pounds, the fraction of .0451 in the weight of the column of water may be ſafely omitted; whence we ſhall have $6c^2 = 2p^2f$ by the latter equation; and by the ſame mode $.2p^2 = \frac{p^2}{5} = g$ by the former.

Or if, inſtead of ſix pounds for the preſſure of the air on each circular inch of the cylinder, it be ſuppoſed a pound, we ſhall then have $ac^2 = 2p^2f$; and ſubſtituting $5g$ in the place of p^2, it will be, $ac^2 = 10gf$. And farther, $\frac{63h}{60s} = g$; whence $\frac{1.05h}{s} = \frac{p^2}{5}$.

From a compariſon of theſe equations, the following theorems are derived, which will determine the ſize of the cylinder and pumps of any ſteam-engine capable of drawing a certain quantity of water from any aſſigned depth, with the preſſure of the atmoſphere on each circular inch of the cylinder's area.

A Table of Theorems for the readier computing of the Powers of a Fire-engine.

1	$c=$	$\sqrt{\frac{p^2f}{3}} =$	$\sqrt{\frac{5gf}{3}} =$	$\sqrt{\frac{2p^2f}{a}} =$	$\sqrt{\frac{1{:}75hf}{s}}$
2	$p=$	$\sqrt{\frac{3c^2}{f}} =$	$\sqrt{5g} =$	$\sqrt{\frac{ac^2}{2f}} =$	$\sqrt{\frac{5.25h}{s}}$
3	$f=$	$\frac{3c^2}{p^2} =$	$\frac{3c^2}{5g} =$	$\frac{c^2a}{10g} =$	$\frac{c^2s}{1.75h}$
4	$g=$	$\frac{p^2}{5} =$	$\frac{3c^2}{5f} =$	$\frac{c^2a}{10f} =$	$\frac{1.05h}{s}$
5	$a=$	$\frac{2p^2f}{c^2} =$	$\frac{10gf}{c^2} =$	$\frac{5gf}{.5c^2} =$	$\frac{10.5hf}{sc^2}$
6	$h=$	$\frac{sp^2}{5.25} =$	$\frac{gs}{1.05} =$	$\frac{c^2s}{1.75f} =$	$\frac{ac^2s}{10.5f}$
7	$s=$	$\frac{1.75hf}{c^2} =$	$\frac{5.25}{p^2} =$	$\frac{1.05h}{g} =$	$\frac{10.5hf}{ac^2}$

In this table there are four particular values of each letter, which render it more extenſively uſeful than it would have been upon a leſs ſcale, becauſe ſometimes one value is more convenient for finding the unknown letter or quantity than another; as will be ſeen in the following examples, in which, to avoid repetitions, it is ſuppoſed that the preſſure of the atmoſphere is ſix pounds upon a circular inch of the piſton, and that the engine goes at the rate of 12 ſtrokes, 6 feet long each, in a minute.

Examples of the uſe of the Table.

1. Required the ſize of the cylinder to work a pump of 12 inches diameter, 30 fathoms deep. *Per* theorem 1. $c=\sqrt{\frac{p^2f}{3}}$; therefore $\sqrt{\frac{12\times12\times30}{3}}=c=38$ inches.

2. Required the ſize of the pump that a cylinder of 38 inches diameter can work at 30 fathoms deep. *Per* theorem 2. $p=\sqrt{\frac{3c^2}{f}}$; therefore $\sqrt{\frac{38\times38\times3}{30}}=p=12$ inches.

3 Required the depth that a 36-inch cylinder will work a pump of 10 inches diameter. *Per* theorem 3. $f=\frac{3c^2}{p^2}$; therefore $\frac{36\times36\times3}{10\times10}=f=39$ fathoms.

4. Required the number of gallons drawn at a ſix-feet ſtroke *per* laſt-mentioned cylinder and pumps. *Per* theorem 4. $g=\frac{p^2}{5}$; therefore $\frac{10\times10}{5}=20$ gal. $=g$.

5. Required the preſſure of the atmoſphere on a cylinder of 36 inches, which works a pump 10 inches diameter, 39 fathoms deep. *Per* theorem 5. $a=\frac{2p^2f}{c^2}$; therefore $\frac{10\times10\times39\times2}{36\times36}=a=6$ pounds.

6. Required the hogſheads delivered *per* hour by a pump of 16 inches diameter at 12 ſtrokes *per* minute. *Per* theorem 6. $h=\frac{sp^2}{5.25}$; therefore $\frac{16\times16\times12}{5.25}=h=585$ hogſheads.

7. Required the number of ſtrokes *per* minute an engine muſt make to raiſe 585 hogſheads *per* hour by a 16-inch pump. *Per* theorem 7. $s=\frac{5.25h}{p^2}$; therefore $\frac{585\times5.25}{16\times16}=s=12$ ſtrokes.

By theſe examples it is evident that the quantity ſought is diſcoverable (by the help of the theorems) by one operation only, which without them might have taken ſeveral. But it often happens in practice, that an engine has to draw ſeveral pumps of different diameters from different depths; in which caſe the operations will be ſomewhat different from thoſe above, as will be ſeen in the following example.

8. Let it be required to find the diameters of the cylinder and pumps to draw 520 hogſheads *per* hour from 30 fathoms deep, 450 hogſheads *per* hour from 20 fathoms deep, and 80 hogſheads *per* hour for the jackhead from 10 fathoms deep, allowing the engine to make 12 ſix-feet ſtrokes *per* minute, and the air's preſſure 6 pounds upon each circular inch of the piſton.

Per theorem 2. $p=\sqrt{\frac{5.25h}{s}}$; therefore $\sqrt{\frac{520\times5.25}{12}}=15$, the firſt pump$=x$.

Per ditto, $\sqrt{\frac{450\times5.25}{12}}=14$, the 2d pump $=y$.

Per ditto, $\sqrt{\frac{80\times5.25}{12}}=6$, the 3d pump $=z$.

Then, *per* theorem 1. $c=\sqrt{\frac{p^2f}{3}}$, if the water was to be raiſed in one column from a certain depth; but it being in three columns of various dimenſions, it is evident from the queſtion, that the power of the cylinder muſt be a counterpoiſe to the weight of all theſe columns; and putting x, y, z, for the three pumps, inſtead of p, the equation will be $c=\sqrt{\frac{x^2f\times y^2f\times z^2f}{3}}$, which is $\sqrt{\frac{11030}{3}}=60.6$ inches, the cylinder's diameter. If there had been a greater number of pumps, the ſize of the cylinder might have been found in the ſame manner, by ſubſtituting the ſum of their ſquares inſtead of p^2 in the theorem.

It is the practice of ſome engineers to allow a longer ſtroke than ſix feet; and, although the advantages of it are rather problematical, if that be ſuppoſed, for inſtance, a z feet ſtroke; then, inſtead of $p=\sqrt{5g}$, and $g=\frac{p^2}{5}$ in the table of theorems, we ſhall have $p=\sqrt{\frac{5g\times6}{z}}$ and $g=\frac{p^2z}{5\times6}$.

On the following page is given a Table, calculated from the foregoing theorems, of the powers of cylinders from 30 to 70 inches diameter; and the diameter and lengths of pumps which thoſe cylinders are capable of working, from a ſix-inch bore to that of 20 inches, together with the quantity of water drawn *per* ſtroke and *per* hour, allowing the engine to make 12 ſtrokes of 6 feet *per* minute.

TABLE of the Power and Effects of STEAM-ENGINES, allowing 12 strokes of 6 feet long each *per* minute, and the Pressure of the Air 7 lb. 10 oz. *per* square inch.

The Diameters of the Cylinders in Inches.	The Diameters of the Pumps in Inches. 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Power of the cylinders, and weight of water in pounds.
30	75	55	42	33	27	22	19	16	14	12	10	—	—	—	—	5400
31	80	58	45	35	29	24	20	17	15	13	11	10	—	—	—	5766
32	83	61	47	37	30	25	21	18	16	13	12	10	—	—	—	6144
33	90	67	51	40	33	27	22	19	17	14	13	11	10	—	—	6534
34	94	70	53	42	34	28	23	20	18	15	14	12	10	—	—	6936
35	102	75	57	45	37	30	26	22	19	16	14	13	11	—	—	7350
36	—	79	61	48	39	32	27	23	20	17	15	14	12	10	—	7776
37	—	84	64	51	41	34	29	24	21	18	16	14	12	11	10	8214
38	—	88	68	53	43	35	30	26	22	19	17	15	13	12	10	8664
39	—	93	71	56	45	37	32	27	23	20	18	16	14	12	11	9126
40	—	98	75	59	48	39	34	28	24	21	19	17	15	13	12	9600
42	—	108	83	65	53	43	38	31	27	23	21	18	16	14	13	10584
44	—	—	90	71	58	48	41	34	30	26	23	20	18	16	14	11616
46	—	—	99	78	63	52	45	37	33	29	25	21	19	17	16	12696
48	—	—	—	85	69	57	49	41	35	31	27	24	21	19	17	13824
50	—	—	—	92	75	62	53	44	38	34	29	26	23	21	19	15000
52	—	—	—	100	81	67	57	48	41	36	31	28	25	22	20	16224
54	—	—	—	—	87	72	61	52	44	38	34	30	27	24	22	17496
56	—	—	—	—	94	78	66	56	48	42	37	32	29	26	23	18816
58	—	—	—	—	101	83	70	59	54	44	39	34	31	28	25	20184
60	—	—	—	—	—	89	75	63	55	48	42	37	33	30	27	21600
62	—	—	—	—	—	95	80	68	58	51	45	39	35	32	28	23064
64	—	—	—	—	—	—	85	72	62	54	48	42	38	34	30	24546
66	—	—	—	—	—	—	90	77	66	57	51	45	40	36	32	26676
68	—	—	—	—	—	—	96	82	70	61	54	48	42	38	34	27744
70	—	—	—	—	—	—	—	86	75	64	57	50	45	40	36	29400
Quantity drawn at one stroke in gallons.	7.2	10	13	16.2	20	24.2	28.8	33.8	392	45	51.2	57.8	64.8	72.2	80	
Quantity drawn in one hour in hogsheads.	82	114	148	184	228	27[illegible]	328	385	447	513	583	659	738	823	912	
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

Explanation of the Table.

The firſt column on the left is the diameter of the cylinders from 30 inches to 70. The firſt line of numbers at the top is the diameters of pumps from 6 to 20 inches; and the numbers in the common angle of meeting are the fathoms in depth which the cylinder is capable of working with any of theſe pumps. The right-hand column gives the power of the cylinder in pounds, to which it ſtands oppoſite, likewiſe the weight of the columns of water in the ſame line. Thus the firſt ſum, 5400 pounds, is the power of a 30-inch cylinder; it is alſo the weight of water contained in 75 fathoms of 6-inch pumps, 55 fathoms of 7 inches diameter, 42 fathoms of 8 inches, 33 fathoms of 9 inches, &c.

The quantity in gallons drawn by a ſix-feet ſtroke, or the quantity contained in one ſathom of any of the pumps, is expreſſed in the loweſt line but one; any quantity in this line multiplied by 10.2 will give the weight in pounds of one fathom, if wanted. The loweſt line of figures is the number of hogſheads drawn in an hour by each pump reſpectively, when the engine goes 12 ſtrokes *per* minute.

Examples of the Uſe of the Table.

1. Required the ſize of the cylinder to work a pump of 12 inches diameter 30 fathom deep.

Under 12 inches, the diameter of the pump, find the fathoms 30 (or the neareſt number to it); and on the ſame line in the firſt column is 38 inches, the diameter of the cylinder.

2. Required the ſize of the pump that a cylinder of 38 inches diameter can work at 30 fathoms deep.

Find 38, the cylinder's diameter in the firſt column; then in the line from it look for 30 fathoms, or the neareſt number to it; and where that is found, the diameter of the pump will be found above: thus 30 fathoms has 12 inches for the pump's diameter.

3. Required the depth that a 36-inch cylinder will work a pump of 10 inches diameter.

Find 36 in the ſide-column, and 10 in the upper line; and in the common angle of meeting is 39, the fathoms required.

4. Required the number of gallons drawn *per* ſtroke by the laſt-mentioned cylinder and pumps.

Under the diameter 10 of the pump, and in the loweſt line but one, is 20, the number of gallons drawn *per* ſtroke.

5. Required the hogſheads delivered *per* hour by a 12-inch pump.

Under 12, the pump's diameter, in the loweſt line of figures, is 328, the hogſheads delivered *per* hour.

6. Required the diameter of the cylinder and pumps to draw 520 hogſheads *per* hour from 30 fathoms deep, 450 hogſheads *per* hour from 20 fathoms deep, and 80 hogſheads *per* hour from 10 fathoms deep.

In this queſtion take the neareſt numbers in the Table: thus 513 hogſheads *per* hour is the neareſt to 520, and above it find the fathoms 29, which is neareſt to 30; then at the head of that column is 15 inches for the ſize of the largeſt pump, and in the right-hand column, oppoſite 29, is 12,696 lb. the weight of that water; viz.

Pump, 15 inches, Weight,	- -	12,696
In the ſame manner find pump 14 inch.	-	7,776
Alſo pump 6 inch.	-	800
The ſum is the weight of the whole,	-	21,272

Then, by looking in the laſt column amongſt the powers of cylinders, the neareſt number to 21,272 is 21,600; and oppoſite to it, in the firſt column, is 60 inches, the diameter of a cylinder capable of working thoſe three pumps.

We ſhall now deſcribe the gradual way in which Mr. Watt brought this moſt important invention to its preſent high ſtate of perfection, and alſo give a full deſcription of the engine itſelf. See 3d Plate 21. fig. 1.

About the time of the diſcovery of latent heat by Dr. Black, viz. 1763, Mr. Watt, then eſtabliſhed in Glaſgow in the commercial line, was amuſing himſelf with repairing a working model of the ſteam-engine which belonged to the philoſophical apparatus of the univerſity. Mr. Watt was a perſon of a truly philoſophical mind, eminently converſant in all branches of natural knowledge, and the pupil and intimate friend of Dr. Black. In the courſe of the above-mentioned amuſement many curious facts in the production and condenſation of ſteam occurred to him; and among others, that remarkable fact which is always appealed to by Dr. Black as the proof of the immenſe quantity of heat which is contained in a very minute quantity of water in the form of claſtic ſteam. When a quantity of water is heated ſeveral degrees above the boiling point in a cloſe digeſter, if a hole be opened, the ſteam ruſhes out with prodigious violence, and the heat of the remaining water is reduced, in the courſe of three or four ſeconds, to the boiling temperature. The water of the ſteam which has iſſued amounts only to a very few drops; and yet theſe have carried off with them the whole exceſs of heat from the water in the digeſter.

Since then a certain quantity of ſteam contains ſo great a quantity of heat, it muſt expend a great quantity of fuel; and no conſtruction of furnace can prevent this. Mr. Watt therefore ſet his invention to work to diſcover methods of huſbanding this heat. The cylinder of his little model was heated almoſt in an inſtant, ſo that it could not be touched by the hand. It could not be otherwiſe, becauſe it condenſed the vapour by abſtracting its heat. But all the heat thus communicated to the cylinder, and waſted by it on ſurrounding bodies, contributed nothing to the performance of the engine, and muſt be taken away at every injection, and again communicated and waſted. Mr. Watt quickly underſtood the whole proceſs which was going on within the cylinder, and which we have conſidered ſo minutely, and ſaw that a very conſiderable portion of the ſteam muſt be waſted in warming the cylinder. His firſt attempts were made to aſcertain how much was thus waſted, and he found that it was not leſs than three or four times as much as would fill the cylinder and work the engine. He attempted to diminiſh this waſte by uſing wooden cylinders. But though this produced a ſenſible diminution of the waſte, other reaſons forced him to give them up. He then caſed his metal cylinders in a wooden caſe with light wood aſhes between. By this, and uſing no more injection than was abſolutely neceſſary for the condenſation, he reduced the waſte almoſt one half. But by uſing ſo ſmall a quantity of cold water, the inſide of the cylinder was hardly brought below the boiling temperature; and there conſequently remained in it a ſteam of very conſiderable elaſticity, which robbed the engine of a proportionable part of the atmoſpherical preſſure. He ſaw that this was unavoidable as long as the condenſation was performed in the cylinder. The thought ſtruck him to attempt the condenſation in another place. His firſt experiment was made in the ſimpleſt manner. A globular veſſel communicated by means of a long pipe of one inch diameter with the bottom of his little cylinder of four inches diameter and thirty inches long. This pipe had a ſtop-cock, and the globe was immerſed in a veſſel of cold water. When the piſton was at the top, and the cylinder filled with ſtrong ſteam, he turned the cock. It was ſcarcely turned, nay he did not think it completely turned, when the ſides of his

cylinder (only ſtrong tin-plate) were cruſhed together like an empty bladder. This ſurpriſed and delighted him. A new cylinder was immediately made of braſs ſufficiently thick, and nicely bored. When the experiment was repeated with this cylinder, the condenſation was ſo rapid, that he could not ſay that any time was expended in it. But the moſt valuable diſcovery was, that the vacuum in the cylinder was, as he hoped, almoſt perfect. Mr. Watt found, that when he uſed water in the boiler purged of air by long boiling, nothing that was very ſenſibly inferior to the preſſure of the atmoſphere on the piſton could hinder it from coming quite down to the bottom of the cylinder. This alone was gaining a great deal, for in moſt engines the remaining elaſticity of the ſteam was not leſs than one-eighth of the atmoſpherical preſſure, and therefore took away one-eighth of the power of the engine.

Having gained this capital point, Mr. Watt found many difficulties to ſtruggle with before he could get the machine to continue its motion. The water produced from the condenſed ſteam, and the air which was extricated from it, or which penetrated through unavoidable leaks, behoved to accumulate in the condenſing veſſel, and could not be voided in any way ſimilar to that adopted in Newcomen's engine. He took another method: He applied pumps to extract both, which were worked by the great beam. The contrivance is eaſy to any good mechanic; only we muſt obſerve, that the piſton of the water-pump muſt be under the ſurface of the water in the condenſer, that the water may enter the pump by its own weight, becauſe there is no atmoſpherical preſſure there to force it in. We muſt alſo obſerve, that a conſiderable force is neceſſarily expended here, becauſe, as there is but one ſtroke for rarefying the air, and this rarefaction muſt be nearly complete, the air-pump muſt be of large dimenſions, and its piſton muſt act againſt the whole preſſure of the atmoſphere. Mr. Watt, however, found that this force could be eaſily ſpared from his machine, already ſo much improved in reſpect of power.

Thus has the ſteam-engine received a very conſiderable improvement. The cylinder may be allowed to remain very hot; nay, boiling hot, and yet the condenſation be completely performed. The only elaſtic ſteam that now remains is the ſmall quantity in the pipe of communication. Even this ſmall quantity Mr. Watt at laſt got rid of, by admitting a ſmall jet of cold water up this pipe to meet the ſteam in its paſſage to the condenſer. This both cooled this part of the apparatus in a ſituation where it was not neceſſary to warm it again, and it quickened the condenſation. He found at laſt that the ſmall pipe of communication was of itſelf ſufficiently large for the condenſation, and that no ſeparate veſſel, under the name of condenſer, was neceſſary. This circumſtance ſhows the prodigious rapidity of the condenſation. We may add, that unleſs this had been the caſe, his improvement would have been vaſtly diminiſhed; for a large condenſer would have required a much larger air-pump, which would have expended much of the power of the engine. By theſe means the vacuum below the piſton is greatly improved: for it will appear clear to any perſon who underſtands the ſubject, that as long as any part of the condenſer is kept of a low temperature, it will abſtract and condenſe the vapour from the warmer parts, till the whole acquires the elaſticity correſponding to the coldeſt part. By the ſame means much of the waſte is prevented, becauſe the cylinder is never cooled much below the boiling temperature. Many engines have been erected by Mr. Watt in this form, and their performance gave univerſal ſatisfaction.

We have contented ourſelves with giving a very ſlight deſcription without a figure of this improved engine, becauſe we imagine it to be of very eaſy comprehenſion, and becauſe it is only a preparation for ſtill greater improvements, which, when underſtood, will at the ſame time leave no part of this more ſimple form unexplained.

During the progreſs of theſe improvements Mr. Watt made many experiments on the quantity and denſity of the ſteam of boiling water. Theſe fully convinced him, that although he had greatly diminiſhed the waſte of ſteam, a great deal yet remained, and that the ſteam expended during the riſe of the piſton was at leaſt three times more than what would fill the cylinder. The cauſe of this was very apparent. In the ſubſequent deſcent of the piſton, covered with water much below the boiling temperature, the whole cylinder was neceſſarily cooled and expoſed to the air. Mr. Watt's fertile genius immediately ſuggeſted to him the expedient of employing the elaſticity of the ſteam from the boiler to impel the piſton down the cylinder, in place of the preſſure of the atmoſphere; and thus he reſtored the engine to its firſt principles, making it an engine *really moved by ſteam*. As this is a new epoch in its hiſtory, we ſhall be more particular in the deſcription; at the ſame time ſtill reſtricting ourſelves to the eſſential circumſtances, and avoiding every peculiarity which is to be found in the prodigious varieties which Mr. Watt has introduced into the machines which he has erected, every individual of which has been adapted to local circumſtances, or diverſified by the progreſs of Mr. Watt's improvements.

Let A (fig. 2.) repreſent the boiler. This has received great improvements from his complete acquaintance with the procedure of nature in the production of ſteam. In ſome of his engines the fuel has been placed in the midſt of the water, ſurrounded by an iron or copper veſſel, while the exterior boiler was made of wood, which tranſmits, and therefore waſtes the heat very ſlowly. In others, the flame not only plays round the whole outſide, as in common boilers, but alſo runs along ſeveral flues which are conducted through the midſt of the water. By ſuch contrivances the fire is applied to the water in a moſt extenſive ſurface, and for a long time, ſo as to impart to it the greateſt part of its heat. So ſkilfully was it applied in the Albion Mills, that although it was perhaps the largeſt engine in the kingdom, its unconſumed ſmoke was inferior to that of a very ſmall brew-houſe. In the ſecond engine of Mr. Watt, the top of the cylinder is ſhut up by a ſtrong metal plate *g h*, in the middle of which is a collar or box of leathers *k l*, formed in the uſual manner of a jack-head pump, through which the piſton rod P D, nicely turned and poliſhed, can move up and down, without allowing any air to paſs by its ſides. From the dome of the boiler proceeds a large pipe B C I O Q, which, after reaching the cylinder with its horizontal part B C, deſcends parallel to its ſide, ſending off two branches, *viz.* I M to the top of the cylinder, and O N to its bottom. At I is a puppet valve opening from below upwards. At L, immediately below this branch, there is a ſimilar valve, alſo opening from below upwards. The pipe deſcends to Q, near the bottom of a large ciſtern *c d e f*, filled with cold water conſtantly renewed. The pipe is then continued horizontally along the bottom of this ciſtern (but not in contact), and terminates at R in a large pump S T. The piſton S has clack valves opening upwards, and its rod S *s*, paſſing through a collar of leathers at T, is ſuſpended by a chain to a ſmall arch head on the outer arm of the beam. There is a valve R in the bottom of this pump, as uſual, which opens when preſſed in the direction Q R, and ſhuts againſt a contrary preſſure. This pump delivers its contents into another pump X Y, by means of the ſmall pipe *t* X, which proceeds from its top. This ſecond pump has a valve at X, and a clack in its piſton Z as uſual, and the piſton rod Z *z* is ſuſpended from another arch head on the outer arm of the beam. The two valves I and L are opened and ſhut by

means of ſpanners and handles, which are put in motion by a plug frame, in the ſame manner as in Newcomen's engine.

Laſtly, there may be obſerved a crooked pipe *a b o*, which enters the upright pipe laterally a little above Q. This has a ſmall jet hole at *o*; and the other end *a*, which is conſiderably under the ſurface of the water of the condenſing ciſtern, is covered with a puppet valve *v*, whoſe long ſtalk *v u* riſes above the water, and may be raiſed or lowered by hand or by the plug beam. The valves R and X, and the clacks in the piſtons S and Z, are opened or ſhut by the preſſures to which they are immediately expoſed.

This figure is not an exact copy of any of Mr. Watt's engines, but has its parts ſo diſpoſed that all may come diſtinctly into view, and exactly perform their various functions. It is drawn in its quieſcent poſition, the outer end of the beam preponderating by the counter weight, and the piſton P at the top of the cylinder, and the piſtons S and Z in their loweſt ſituations.

In this ſituation let us ſuppoſe that a vacuum is (by any means) produced in all the ſpace below the piſton, the valve I being ſhut. It is evident that the valve R will alſo be ſhut, as alſo the valve *v*. Now let the valve I be opened. The ſteam from the boiler, as elaſtic as common air, will ruſh into the ſpace above the piſton, and will exert on it a preſſure as great as that of the atmoſphere. It will therefore preſs it down, raiſe the outer end of the beam, and cauſe it to perform the ſame work as an ordinary engine.

When the piſton P has reached the bottom of the cylinder, the plug frame ſhuts the valve I, and opens L. By ſo doing the communication is open between the top and bottom of the cylinder, and nothing hinders the ſteam which is above the piſton from going along the paſſage M L O N. The piſton is now equally affected on both ſides by the ſteam, even though a part of it is continually condenſed by the cylinder, and in the pipe I O Q. Nothing therefore hinders the piſton from being dragged up by the counter weight, which acts with its whole force, undiminiſhed by any remaining unbalanced elaſticity of ſteam. Here therefore this form of the engine has an advantage (and by no means a ſmall one) over the common engines, in which a great part of the counter weight is expended in overcoming unbalanced atmoſpheric preſſure.

Whenever the piſton P arrives at the top of the cylinder, the valve L is ſhut by the plug frame, and the valves I and *v* are opened. All the ſpace below the piſton is at this time occupied by the ſteam which came from the upper part of the cylinder. This being a little waſted by condenſation, is not quite a balance for the preſſure of the atmoſphere. Therefore, during the aſcent of the piſton, the valve R was ſhut, and it remains ſo. When, therefore, the valve *v* is opened, the cold water of the ciſtern muſt ſpout up through the hole *o*, and condenſe the ſteam. To this muſt be added the coldneſs of the whole pipe O Q S. As faſt as it is condenſed, its place is ſupplied by ſteam from the lower part of the cylinder. We have already remarked, that this ſucceſſive condenſation is accompliſhed with aſtoniſhing rapidity. In the mean time, ſteam from the boiler preſſes on the upper ſurface of the piſton. It muſt therefore deſcend as before, and the engine muſt perform a ſecond working ſtroke.

But in the mean time the injection water lies in the bottom of the pipe O Q R, heated to a conſiderable degree by the condenſation of the ſteam; alſo a quantity of air has been diſengaged from it and from the water in the boiler. How is this to be diſcharged?—This is the office of the pumps S T and X Y. The capacity of S T is very great in proportion to the ſpace in which the air and water are lodged. When, therefore, the piſton S has got to the top of its courſe, there muſt be a vacuum in the barrel of this pump, and the water and air muſt open the valve R and come into it. When the piſton S comes down again in the next returning ſtroke, this water and air gets through the valve of the piſton; and in the next working ſtroke they are diſcharged by the piſton into the pump X Y, and raiſed by its piſton. The air eſcapes at Y, and as much of the water as is neceſſary is delivered into the boiler by a ſmall pipe Y *g* to ſupply its waſte. It is a matter of indifference whether the piſtons S and Z riſe with the outer or inner end of the beam, but it is rather better that they riſe with the inner end. They are otherwiſe drawn here, in order to detach them from the reſt and ſhow them more diſtinctly.

Such is Mr. Watt's ſecond engine. Let us examine its principles, that we may ſee the cauſes of its avowed and great ſuperiority over the common engines.

We have already ſeen one ground of ſuperiority, the full operation of the counter-weight. We are authoriſed by careful examination to ſay, that in the common engines at leaſt one-half of the counter-weight is expended in counteracting an unbalanced preſſure of the air on the piſton during its aſcent. In many engines, which are not the worſt, this extends to one-fifth of the whole preſſure. This is evident from the examination of the engine at Montrelais by Boſſut. This makes a very great counter-weight neceſſary, which exhauſts a proportional part of the moving force.

But the great advantage of Mr. Watt's form is the almoſt total annihilation of the waſte of ſteam by condenſation in the cylinder. The cylinder is always boiling hot, and therefore perfectly dry. This muſt be evident to any perſon who underſtands the ſubject. By the time that Mr. Watt had completed his improvements, his experiments on the production of ſteam had given him a pretty accurate knowledge of its denſity; and he found himſelf authorized to ſay, that the quantity of ſteam employed did not exceed twice as much as would fill the cylinder, ſo that not above one-half was unavoidably waſted. But before he could bring the engine to this degree of perfection, he had many difficulties to overcome: he incloſed the cylinder in an outer wooden caſe at a ſmall diſtance from it. This diminiſhed the expence of heat by communication to ſurrounding bodies. Sometimes he allowed the ſteam from the boiler to occupy this interval. This undoubtedly prevented all diſſipation from the inner cylinder; but in its turn it diſſipated much heat by the outer caſe, and a very ſenſible condenſation was obſerved between them. This has occaſioned him to omit this circumſtance in ſome of his beſt engines.

The greateſt difficulty was to make the great piſton tight. The old and effectual method, by water lying on it, was inadmiſſible. He was therefore obliged to have his cylinders moſt nicely bored, perfectly cylindrical, and finely poliſhed; and he made numberleſs trials of different ſoft ſubſtances for packing his piſton, which ſhould be tight without enormous friction, and which ſhould long remain ſo, in a ſituation perfectly dry, and hot almoſt to burning.

After all that Mr. Watt has done in this reſpect, he thinks that the greateſt part of the waſte of ſteam which he ſtill perceives in his engines ariſes from the unavoidable eſcape by the ſides of the piſton during its deſcent.

But the fact is, that an engine of this conſtruction, of the ſame dimenſions with a common engine, making the ſame number of ſtrokes of the ſame extent, does not conſume above one-fourth part of the fuel that is conſumed by the beſt engines of the common form. It is alſo a very fortunate circumſtance, that the performance of the engine is not immediately deſtroyed, nor indeed ſenſibly diminiſhed, by a ſmall want of tightneſs in the piſton. In the common engine, if air get in, in this way, it immediately puts a ſtop to the work; but although even a conſiderable quantity of ſteam get paſt the piſton during its deſcent, the rapidity of condenſation is ſuch, that hardly any

diminution of preſſure can be obſerved, and the waſte of ſteam is the only inconvenience.

Mr. Watt's penetration ſoon diſcovered another moſt valuable property of this engine. When an engine of the common form is erected, the engineer muſt make an accurate eſtimate of the work to be performed, and muſt proportion his engine accordingly. He muſt be careful that it be *fully* able to execute its taſk; but its power muſt not exceed its load in any extravagant degree. This would produce a motion which is too rapid, and which, being alternately in oppoſite directions, would occaſion jolts which no building or machinery could withſtand. Many engines have been ſhattered by the pumps drawing air, or a pump-rod breaking; by which accidents the ſteam-piſton deſcends with ſuch rapidity that every thing gives way. But in moſt operations of mining, the taſk of the engine increaſes, and it muſt be ſo conſtructed at firſt as to be able to bear this addition. It is very difficult to manage an engine that is much ſuperior to its taſk; and the eaſieſt way is, to have it almoſt full loaded, and to work it only during a few hours each day, and allow the pit-water to accumulate during its repoſe. This increaſes the firſt coſt, and waſtes fuel during the inaction of the engine.

But this new engine can at all times be exactly fitted (at leaſt during the working ſtroke) to the load of work that then happens to be on it. We have only to adminiſter ſteam of a proper elaſticity. At the firſt erection the engine may be equal to twice its taſk, if the ſteam admitted above the cylinder be equal to that of common boiling water; but when once the ebullition is fairly commenced, and the whole air expelled from all parts of the apparatus, it is evident, that by damping the fire, ſteam of half this elaſticity may be continually ſupplied, and the water will continue boiling although its temperature does not exceed 185° of Fahrenheit's thermometer. This appears by inſpecting our table of vaporous elaſticity, and affords another argument for rendering that table more accurate by new experiments. We hope that Mr. Watt will not withhold from the public the knowledge which he has acquired on this ſubject. It may very poſſibly reſult from an accurate inveſtigation, that it would be adviſable to work our ſteam-engines with weak ſteams, and that the diminution of work may be more than compenſated by the diminution of fuel. It is more probable indeed, and it is Mr. Watt's opinion, that the contrary is the caſe, and that it is much more economical to employ great heats. At any rate, the deciſion of this queſtion is of great importance for improving the engine; and we ſee, in the mean time, that the engine can at all times be fitted ſo as to perform its taſk with a moderate and manageable motion, and that as the taſk increaſes we can increaſe the power of the engine.

But the method now propoſed has a great inconvenience. While the ſteam is weaker than the atmoſphere, there is an external force tending to ſqueeze in the ſides and bottom of the boiler. This could not be reſiſted when the difference is conſiderable, and common air would ruſh in through every crevice of the boiler, and ſoon choke the engine: it muſt therefore be given up.

But the ſame effect will be produced by diminiſhing the paſſage for the ſteam into the cylinder. For this purpoſe, the puppet valve by which the ſteam enters the cylinder was made in the form of a long taper ſpigot, and it was lodged in a cone of the ſame ſhape; conſequently the paſſage could be enlarged or contracted at pleaſure by the diſtance to which the inner cone was drawn up.

In this way ſeveral engines were conſtructed, and the general purpoſe of ſuiting the power of the engine to its taſk was completely anſwered; but (as the mathematical reader will readily perceive) it was extremely difficult to make this adjuſtment preciſe and conſtant. In a great machine like this, going by jerks, it was hardly poſſible that every ſucceſſive motion of the valve ſhould be preciſely the ſame. This occaſioned very ſenſible irregularities in the motion of the engine, which increaſed and became hazardous when the joints worked looſe by long uſe.

Mr. Watt's genius, always fertile in reſources, found out a complete remedy for all theſe inconveniences. Making the valve of the ordinary form of a puppet clack, he adjuſted the button of its ſtalk or tail, ſo that it ſhould always open full to the ſame height. He then regulated the pins of the plug frame, in ſuch a manner that the valve ſhould ſhut the moment that the piſton had deſcended a certain proportion (ſuppoſe one-fourth, one-third, one-half, &c.) of the cylinder. So far the cylinder was occupied by ſteam as elaſtic as common air. In preſſing the piſton farther down, it behoved the ſteam to expand, and its elaſticity to diminiſh. It is plain that this could be done in any degree we pleaſe, and that the adjuſtment can be varied in a minute, according to the exigency of the caſe, by moving the plug pins.

In the mean time, it muſt be obſerved, that the preſſure on the piſton is continually changing, and conſequently the accelerating force. The motion therefore will no longer be uniformly accelerated: it will approach much faſter to uniformity; nay, it may be retarded, becauſe although the preſſure on the piſton at the beginning of the ſtroke may exceed the reſiſtance of the load, yet when the piſton is near the bottom the reſiſtance may exceed the preſſure. Whatever may be the law by which the preſſure on the piſton varies, an ingenious mechanic may contrive the connecting machinery in ſuch a way that the chains or rods at the outer end of the beam ſhall continually exert the ſame preſſure, or ſhall vary their preſſure according to any law he finds moſt convenient. It is in this manner that the watchmaker, by the form of the fuzee, produces an equal preſſure on the wheel-work by means of a very unequal action of the main-ſpring. In like manner, by making the outer arch heads portions of a proper ſpiral inſtead of a circle, we can regulate the force of the beam at pleaſure.

Thus we ſee how manageable an engine is in this form, and alſo how eaſily inveſtigated in reſpect of its power in its various poſitions. The knowledge of this laſt circumſtance was of conſequence, for without it no notion could be formed of what it could perform. This ſuggeſted to Mr. Watt the uſe of the barometer communicating with the cylinder; and by the knowledge acquired by theſe means has the machine been ſo much improved by its ingenious inventor.

We muſt not omit in this place one deduction made by Mr. Watt from his obſervations, which may be called a diſcovery of great importance in the theory of the engine. Let A B C D (fig. 3.) repreſent a ſection of the cylinder of a ſteam-engine, and E F the ſurface of its piſton. Let us ſuppoſe that the ſteam was admitted while E F was in contact with A B, and that as ſoon as it had preſſed it down to the ſituation E F the ſteam cock is ſhut. The ſteam will continue to preſs it down, and as the ſteam expands its preſſure diminiſhes. We may expreſs its preſſure (exerted all the while the piſton moves from the ſituation A B to the ſituation E F) by the line E F. If we ſuppoſe the elaſticity of the ſteam proportional to its denſity, as is nearly the caſe with air, we may expreſs the preſſure on the piſton in any other poſition, ſuch as K L or D C, by K *l* and D *c*, the ordinates of a rectangular hyperbola F *l c*, of which A E, A B are the aſſymptotes, and A the centre. The accumulated preſſure during the motion of the piſton from E F to D C will be expreſſed by the area E F *c* D E, and the preſſure during the whole motion by the area A B F *c* D A.

Now it is well known that the area E F *c* D E is equal to

A B F E multiplied by the hyperbolic logarithm of $\frac{AD}{AE}$, $=$ L. $\frac{AD}{AE}$, and the whole area A B F c D A is $=$ A B F E $\times \left(1 + \text{L.} \frac{AD}{AE}\right)$.

Thus let the diameter of the piſton be 24 inches, and the preſſure of the atmoſphere on a ſquare inch be 14 pounds; the preſſure on the piſton is 6333 pounds. Let the whole ſtroke be 6 feet, and let the ſteam be ſtopped when the piſton has deſcended 18 inches, or 1,5 feet. The hyperbolic logarithm of $\frac{6}{1,5}$ is 1,3862943. Therefore the accumulated preſſure A B F c D A is $=$ 6333 $\times$ 2,3862943, $=$ 15114 pounds.

As few profeſſional engineers are poſſeſſed of a table of hyperbolic logarithms, while tables of common logarithms are or ſhould be in the hands of every perſon who is much engaged in mechanical calculations, let the following method be practiſed. Take the common logarithm of $\frac{AD}{AE}$, and multiply it by 2,3026; the product is the hyperbolic logarithm of $\frac{AD}{AE}$.

The accumulated preſſure while the piſton moves from A B to E F is 6333 $\times$ 1, or ſimply 6333 pounds. Therefore the ſteam while it expands into the whole cylinder adds a preſſure of 8781 pounds.

Suppoſe that the ſteam had got free admiſſion during the whole deſcent of the piſton, the accumulated preſſure would have been 6333 $\times$ 4, or 25332 pounds.

Here Mr. Watt obſerved a remarkable reſult. The ſteam expended in this caſe would have been four times greater than when it was ſtopped at one-fourth, and yet the accumulated preſſure is not twice as great, being nearly five-thirds. One-fourth of the ſteam performs nearly three-fifths of the work, and an equal quantity performs more than twice as much work when thus admitted during one-fourth of the motion.

This is a curious and an important information, and the advantage of this method of working a ſteam-engine increaſes in proportion as the ſteam is ſooner ſtopped; but the increaſe is not great after the ſteam is rarefied four times. The curve approaches near to the axis, and ſmall additions are made to the area. The expence of ſuch great cylinders is conſiderable, and may ſometimes compenſate this advantage.

Let the ſteam be ſtopped at	Its performance is mult.
$\frac{1}{2}$	1,7
$\frac{1}{3}$	2,1
$\frac{1}{4}$	2,4
$\frac{1}{5}$	2,6
$\frac{1}{6}$	2,8
$\frac{1}{7}$	3,
$\frac{1}{8}$	3,2
&c.	&c.

It is very pleaſing to obſerve ſo many unlooked-for advantages reſulting from an improvement made with the ſole view of leſſening the waſte of ſteam by condenſation. While this purpoſe is gained, we learn how to huſband the ſteam which is not thus waſted. The engine becomes more manageable, and is more eaſily adapted to every variation in its taſk, and all its powers are more eaſily computed.

The active mind of its ingenious inventor did not ſtop here: it had always been matter of regret that one-half of the motion was unaccompanied by any work. It was a very obvious thing to Mr. Watt, that as the ſteam admitted above the piſton preſſed it down, and ſo ſteam admitted below the piſton preſſed it up with the ſame force, provided that a vacuum were made on its upper ſide. This was eaſily done, by connecting the lower end of the cylinder with the boiler and the upper end with the condenſor.

Fig. 1. is a repreſentation of this conſtruction exactly copied from Mr. Watt's figure accompanying his ſpecification. Here B B is a ſection of the cylinder, ſurrounded at a ſmall diſtance by the caſe I I I I. The ſection of the piſton A, and the collar of leathers which embraces the piſton rod, gives a diſtinct notion of its conſtruction, of the manner in which it is connected with the piſton-rod, and how the packing of the piſton and collar contributes to make all tight.

From the top of the cylinder proceeds the horizontal pipe. Above the letter D is obſerved the ſeat of the ſteam valve, communicating with the box above it. In the middle of this may be obſerved a dark ſhaded circle. This is the mouth of the upper branch of the ſteam pipe coming from the boiler. Beyond D, below the letter N, is the ſeat of the upper condenſing valve. The bottom of the cylinder is made ſpherical, fitting the piſton, ſo that they may come into entire contact. Another horizontal pipe proceeds from this bottom. Above the letter E is the ſeat of the lower ſteam valve, opening into the valve box. This box is at the extremity of another ſteam pipe marked C, which branches off from the upper horizontal part, and deſcends obliquely, coming forward to the eye. The lower part is repreſented as cut open, to ſhow its interior conformation. Beyond this ſteam valve, and below the letter F, may be obſerved the ſeat of the lower condenſing valve. A pipe deſcends from hence, and at a ſmall diſtance below unites with another pipe G G, which comes down from the upper condenſing valve N. Theſe two eduction pipes thus united go downwards, and open at L into a rectangular box, of which the end is ſeen at L. This box goes backward from the eye, and at its farther extremity communicates with the air-pump K, whoſe piſton is here repreſented in ſection with its butterfly valves. The piſton delivers the water and air laterally into another rectangular box M, darkly ſhaded, which box communicates with the pump I. The piſton-rods of this and of the air-pump are ſuſpended by chains from a ſmall arch head on the inner arm of the great beam. The lower part of the eduction pipe, the horizontal box L, the air-pump K, with the communicating box M between it and the pump I, are all immerſed in the cold water of the condenſing ciſtern. The box L is made flat, broad, and ſhallow, in order to increaſe its ſurface and accelerate the condenſation. But that this may be performed with the greateſt expedition, a ſmall pipe H, open below (but occaſionally ſtopped by a plug valve), is inſerted laterally into the eduction pipe G, and then divides into two branches; one of which reaches within a foot or two of the upper valve N, and the other approaches as near to the valve F.

As it is intended by this conſtruction to give the piſton a ſtrong impulſe in both directions, it will not be proper to ſuſpend its rod by a chain from the great beam; for it muſt not only pull down that end of the beam, but alſo puſh it upwards. It may indeed be ſuſpended by double chains like the piſtons of the engines for extinguiſhing fires; and Mr. Watt has accordingly done ſo in ſome of his engines. But in his drawing from which this figure is copied, he has communicated the force of the piſton to the beam by means of a toothed rack O O, which engages or works in the toothed ſector Q Q on the end of the beam. The reader will underſtand, without any farther explanation, how the impulſe given to the piſton in either direction is thus tranſmitted to the beam without diminution. The fly X X, with its pinion Y, which alſo works in the toothed arch Q Q, may be ſuppoſed to be removed for the preſent, and will be conſidered afterwards.

We ſhall take the preſent opportunity of deſcribing Mr. Watt's method of communicating the force of the ſteam-en-

gine to any machine of the rotatory kind. V V reprefents the rim and arms of a very large and heavy metalline fly. On its axis is the concentric toothed wheel U. There is attached to the end of the great beam a ftrong and ftiff rod T T, to the lower end of which a toothed wheel W is firmly fixed by two bolts, fo that it cannot turn round. This wheel is of the fame fize and in the fame vertical plane with the wheel U; and an iron link or ftrap (which cannot be feen here, becaufe it is on the other fide of the two wheels) connects the centres of the two wheels, fo that the one cannot quit the other. The engine being in the pofition reprefented in the figure, fuppofe the fly to be turned once round by any external force in the direction of the darts. It is plain, that fince the toothed wheels cannot quit each other, being kept together by the link, the inner half (that is, the half next the cylinder) of the wheel U will work on the inner half of the wheel W, fo that at the end of the revolution of the fly the wheel W muft have got to the top of the wheel U, and the outer end of the beam muft be raifed to its higheft pofition. The next revolution of the fly will bring the wheel W and the beam connected with it to their firft pofitions; and thus every two revolutions of the fly will make a complete period of the beam's reciprocating movements. Now, inftead of fuppofing the fly to drive the beam, let the beam drive the fly. The motions muft be perfectly the fame, and the afcent or defcent of the pifton will produce one revolution of the fly.

A fide view of this apparatus is given in fig. 4. marked by the fame letters of reference This fhows the fituation of parts which were fore-fhortened in fig. 1. particularly the defcending branch C of the fteam pipe, and the fituation and communications of the two pumps K and I. 8, 8 is the horizontal part of the fteam pipe. 9 is a part of it whofe box is reprefented by the dark circle of fig. 1. D is the box of the fteam clack, and the little circle at its corner reprefents the end of the axis which turns it, as will be defcribed afterwards. N is the place of the upper eduction valve. A part only of the upper eduction pipe G is reprefented, the reft being cut off, becaufe it would have covered the defcending fteam pipe C C. When continued down, it comes between the eye and the box E of the lower fteam valve, and the box F of the lower eduction valve.

Let us now trace the operation of this machine through all its fteps. Recurring to fig. 1. let us fuppofe that the lower part of the cylinder B B is exhaufted of all elaftic fluids; that the upper fteam valve D and the lower eduction valve F are open, and that the lower fteam valve E and upper eduction valve N are fhut. It is evident that the pifton muft be preffed toward the bottom of the cylinder, and muft pull down the end of the working beam by means of the toothed rack O O and fector Q Q, caufing the other end of the beam to urge forward the machinery with which it is connected. When the pifton arrives at the bottom of the cylinder, the valves D and F are fhut by the plug frame, and E and N are opened. By this laft paffage the fteam gets into the eduction pipe, where it meets with the injection water, and is rapidly condenfed. The fteam from the boiler enters at the fame time by E, and preffing on the lower fide of the pifton, forces it upwards, and by means of the toothed rack O O and toothed fector Q Q forces up that end of the working beam, and caufes the other end to urge forward the machinery with which it is connected: and in this manner the operation of the engine may be continued for ever.

The injection water is continually running into the eduction pipe, becaufe condenfation is continually going on, and therefore there is a continual atmofpheric preffure to produce a jet. The air which is difengaged from the water, or enters by leaks, is evacuated only during the rife of the pifton of the air-pump K. When this is very copious, it renders a very large air-pump neceffary; and in fome fituations Mr. Watt has been obliged to employ two air-pumps, one worked by each arm of the beam. This in every cafe expends a very confiderable portion of the power, for the air-pump is always working againft the whole preffure of the atmofphere.

It is evident that this form of the engine, by maintaining an almoft conftant and uninterrupted impulfion, is much fitter for driving any machinery of continued motion than any of the former engines, which were inactive during half of their motion. It does not, however, feem to have this fuperiority when employed to draw water: but it is equally fitted for this tafk. Let the engine be loaded with twice as much as would be proper for it if a fingle ftroke engine, and let a fly be connected with it. Then it is plain that the power of the engine during the rife of the fteam pifton will be accumulated in the fly; and this, in conjunction with the power of the engine during the defcent of the fteam pifton, will be equal to the whole load of water.

In fpeaking of the fteam and eduction valves, we faid that they were all puppet valves. Mr. Watt employed cocks, and alfo fliding valves, fuch as the regulator or fteam valve in the old engines. But he found them always lofe their tightnefs after a fhort time. This is not furprifing, when we confider that they are always perfectly dry, and almoft burning hot. He was therefore obliged to change them all for puppet clacks, which, when truly ground and nicely fitted in their motions at firft, are not found to go out of order by any length of time. Other engineers now univerfally ufe them in the old form of the fteam-engine, without the fame reafons, and merely by fervile and ignorant imitation.

The way in which Mr. Watt opens and fhuts thefe valves is as follows. Fig. 5. reprefents a clack with its feat and box. Suppofe it one of the eduction valves. H H is part of the pipe which introduces the fteam, and G G is the upper part of the pipe which communicates with the condenfer. At E E may be obferved a piece more faintly fhaded than the furrounding parts. This is the feat of the valve, and is a brafs or bell-metal ring turned conical on the outfide, fo as to fit exactly into a conical part of the pipe G G. Thefe two pieces are fitted by grinding; and the cone being of a long taper, the ring fticks firmly in it, efpecially after having been there for fome time and united by ruft. The clack itfelf is a ftrong brafs plate D, turned conical on the edge, fo as to fit the conical or floping inner edge of the feat. Thefe are very nicely ground on each other with emery. This conical joining is much more obtufe than the outer fide of the ring; fo that although the joint is air-tight, the two pieces do not ftick ftrongly together. The clack has a round tail D G, which is freely moveable up and down in the hole of a crofs piece F F. On the upper fide of the valve is a ftrong piece of metal D C firmly joined to it, one fide of which is formed into a toothed rack. A is the fection of an iron axle which turns in holes in the oppofite fides of the valve-box, where it is nicely fitted by grinding, fo as to be air-tight. Collets of thick leather, well foaked in melted tallow and rofin, are fcrewed on the outfide of thefe holes to prevent all ingrefs of air. One end of this axis projects a good way without the box, and carries a fpanner or handle, which is moved by the plug frame. To this axis is fixed a ftrong piece of metal B, the edge of which is formed into an arch of a circle having the axis A in its centre, and is cut into teeth, which work in the teeth of the rack D C. K is a cover which is fixed by fcrews to the top of the box H J J H, and may be taken off in order to get at the valve when it needs repairs.

From this defcription it is eafy to fee that by turning the handle which is on the axis A, the fector B muft lift up the

valve by means of its toothed rack D C, till the upper end of the rack touch the knob or button K. Turning the handle in the oppoſite direction brings the valve down again to its ſeat.

This valve is extremely tight. But in order to open it for the paſſage of the ſteam, we muſt exert a force equal to the preſſure of the atmoſphere. This in a large engine is a very great weight. A valve of ſix inches diameter ſuſtains a preſſure not leſs than 400 pounds. But this force is quite momentary, and hardly impedes the motion of the engine; for the inſtant the valve is detached from its ſeat, although it has not moved the 100th part of an inch, the preſſure is over. Even this little inconvenience has been removed by a delicate thought of Mr. Watt. He has put the ſpanner in ſuch a poſition when it *begins* to raiſe the valve, that its mechanical energy is almoſt infinitely great. Let Q R (fig. 6.) be part of the plug frame deſcending, and P one of its pins juſt going to lay hold of the ſpanner N O moveable round the axis N. On the ſame axis is another arm N M connected by a joint with the leader M L, which is connected alſo by a joint with the ſpanner L A that is on the axis A of the ſector within the valve box. Therefore when the pin P puſhes down the ſpanner N O, the arm N M moves ſidewiſe and pulls down the ſpanner A L by means of the connecting rod. Things are ſo diſpoſed, that when the cock is ſhut, L M and M N are in one ſtraight line. The intelligent mechanic will perceive that, in this poſition, the force of the lever O N M is inſuperable. In has this further advantage, that if any thing ſhould tend to force open the valve, it would be ineffectual; for no force exerted at A, and tranſmitted by the rod L M, can poſſibly puſh the joint M out of its poſition. Of ſuch importance is it to practical mechanics, that its profeſſors ſhould be perſons of penetration as well as knowledge. Yet this circumſtance is unheeded by hundreds who have ſervilely copied from Mr. Watt, as may be ſeen in every engine that is puffed on the public as a diſcovery and an improvement. When theſe puppet valves have been introduced into the common engine, we have not ſeen one inſtance where this has been attended to; certainly becauſe its utility has not been obſerved: and there is one ſituation where it is of more conſequence than in Mr. Watt's engine, viz. in the injection cock. Here the valve is drawn back into a box, where the water is ſo aukwardly diſpoſed round it that it can hardly get out of its way, and where the preſſure even exceeds that of the atmoſphere. Indeed this particular ſubſtitution of the button valve for the cock is moſt injudicious.

We poſtponed any account of the office of the fly XX (fig. 1.), as it is not of uſe in an engine regulated by the fly V V. The fly X X is only for regulating the reciprocating motion of the beam when the ſteam is not admitted during the whole deſcent of the piſton. This it evidently muſt render more uniform, accumulating a momentum equal to the whole preſſure of the full ſupply of ſteam, and then ſharing it with the beam during the reſt of the deſcent of the piſton.

When a perſon properly ſkilled in mechanics and chemiſtry reviews theſe different forms of Mr. Watt's ſteam-engine, he will eaſily perceive them ſuſceptible of many intermediate forms, in which any one or more of the diſtinguiſhing improvements may be employed. The firſt great improvement was the condenſation in a ſeparate veſſel. This increaſed the original powers of the engine, giving to the atmoſpheric preſſure and to the counter weight their full energy; at the ſame time the waſte of ſteam is greatly diminiſhed. The next improvement by employing the preſſure of the ſteam inſtead of that of the atmoſphere, aimed only at a ſtill farther diminution of the waſte; but was fertile in advantages, rendering the machine more manageable, and particularly enabling us at all times, and without trouble, to ſuit the power of the engine to its load of work, however variable and increaſing; and brought into view a very intereſting propoſition in the mechanical theory of the engine, viz. that the whole performance of a given quantity of ſteam may be augmented by admitting it into the cylinder only during a part of the piſton's motion. Mr. Watt has varied the application of this propoſition in a thouſand ways; and there is nothing about the machine which gives more employment to the ſagacity and judgment of the engineer. The third improvement of the double impulſe may be conſidered as the finiſhing touch given to the engine, and renders it as uniform in its action as any water-wheel. In the engine in its moſt perfect form there does not ſeem to be above one-fourth of the ſteam waſted by warming the apparatus; ſo that *it is not poſſible* to make it one-fourth part more powerful than it is at preſent. The only thing that ſeems ſuſceptible of conſiderable improvement is the great beam. The enormous ſtrains exerted on its arms require a proportional ſtrength. This requires a vaſt maſs of matter, not leſs indeed in an engine with a cylinder of fifty-four inches than three tons and a half, moving with the velocity of three feet in a ſecond, which muſt be communicated in about half a ſecond. This maſs muſt be brought into motion from a ſtate of reſt, muſt again be brought to reſt, again into motion, and again to reſt, to complete the period of a ſtroke. This conſumes much power; and Mr. Watt has not been able to load an engine with more than ten or eleven pounds on the inch and preſerve a ſufficient quantity of motion, ſo as to make twelve or fifteen ſix-feet ſtrokes in a ſecond. Many attempts have been made to leſſen this maſs by uſing a light framed wheel, or a light frame of carpentry, in place of a ſolid beam. Theſe have generally beeen conſtructed by perſons ignorant of the true ſcientific principles of carpentry, and have fared accordingly. Mr. Watt has made ſimilar attempts; but found, that although at firſt they were abundantly ſtrong, yet after a ſhort time's employment the ſtraps and bolts with which the wooden parts were connected cut their way into the wood, and the framing grew looſe in the joints, and, without giving any warning, went to pieces in an inſtant. A ſolid maſſy ſimple beam, of ſufficient ſtrength, bends, and ſenſibly complains (as the carpenters expreſs it), before it breaks. In all great engines, therefore, ſuch only are employed, and in ſmaller engines he ſometimes uſes caſt-iron wheels or pulleys; nay, he frequently uſes no beam or equivalent whatever, but employs the ſteam piſton-rod to drive the machinery to which the engine is applied.

We preſume that our thinking readers will not be diſpleaſed with this rational hiſtory of the progreſs of this engine in the hands of its ingenious inventor. The public ſee him always aſſociated with the no leſs celebrated mechanic and philoſopher Mr. Boulton of Soho near Birmingham. They have ſhared the royal patent from the beginning; and the alliance is equally honourable to both.

The advantages derived from the patent-right ſhow both the ſuperiority of the engine and the liberal minds of the proprietors. They erect the engines at the expence of the employers, or give working drafts of all the parts, with inſtructions, by which any reſident engineer may execute the work. The employers ſelect the beſt engine of the ordinary kind in the kingdom, compare the quantities of fuel expended by each, and pay to Meſſrs Watt and Boulton one-third of the annual ſavings for a certain term of years. By this the patentees are excited to do their utmoſt to make the engine perfect; and the employer pays in proportion to the advantage he derives from it.

It may not be here improper to ſtate the actual performance of ſome of theſe engines, as they have been aſcertained by experiment.

An engine having a cylinder of thirty-one inches in diameter, and making ſeventeen double ſtrokes per minute, performs the work of forty horſes working night and day (for which three relays or 120 horſes muſt be kept), and burns 11,000 pounds of Staffordſhire coal *per* day. A cylinder of nineteen inches, making twenty-five ſtrokes of four feet each per minute, performs the work of twelve horſes working conſtantly, and burns 3700 pounds of coals *per* day. A cylinder of twenty-four inches, making twenty-two ſtrokes of five feet, burns 5500 pounds of coals, and is equivalent to the conſtant work of twenty horſes. And the patentees think themſelves authorized by experience to ſay in general, that theſe engines will raiſe more than 20,000 cubic feet of water twenty-four feet high for every hundred weight of good pit-coal conſumed by them.

In conſequence of the great ſuperiority of Mr. Watt's engines, both with reſpect to economy and manageableneſs, they have become of moſt extenſive uſe; and in every demand of manufacture on a great ſcale they offer us an indefatigable ſervant, whoſe ſtrength has no bounds. The greateſt mechanical project that ever engaged the attention of man was on the point of being executed by this machine. The States of Holland were treating with Meſſrs. Watt and Boulton for draining the Haerlem Meer, and even reducing the Zuyder Zee: and we doubt not but that it will be accompliſhed whenever that unhappy nation has ſufficiently felt the difference between liberty and democratic tyranny. Indeed ſuch unlimited powers are afforded by this engine, that the engineer now thinks that no taſk can be propoſed to him which he cannot execute with profit to his employer.

No wonder then that all claſſes of engineers have turned much of their attention to this engine; and ſeeing that it has done ſo much, that they try to make it do ſtill more. Numberleſs attempts have been made to improve Mr. Watt's engine; and it would occupy a volume to give an account of them, whilſt that account would do no more than indulge curioſity. Our engineers by profeſſion are in general miſerably deficient in that accurate knowledge of mechanics and of chemiſtry which is neceſſary for underſtanding this machine; and we have not heard of one in this kingdom who can be put on a par with the preſent patentees in this reſpect. Moſt of the attempts of engineers have been made with the humbler view of availing themſelves of Mr. Watt's diſcoveries, ſo as to conſtruct a ſteam-engine ſuperior to Newcomen's, and yet of a form ſufficiently different from Watt's to keep it without the reach of his patent. This they have in general accompliſhed by performing the condenſation in a place which, with a little ſtretch of fancy, not unfrequent in a court of law, may be called *part of the cylinder*.

The ſucceſs of moſt of theſe attempts has interfered ſo little with the intereſt of the patentees, that they have not hindered the erection of many engines which the law would have deemed encroachments. We think it our duty to give our opinion on this ſubject without reſerve. Theſe are moſt expenſive undertakings, and few employers are able to judge accurately of the merits of a project preſented to them by an ingenious artiſt. They may ſee the practicability of the ſcheme, by having a general notion of the expanſion and condenſation of ſteam, and they may be miſled by the ingenuity apparent in the conſtruction. The engineer himſelf is frequently the dupe of his own ingenuity; and it is not always diſhoneſty, but frequently ignorance, which makes him prefer his own invention or (as he thinks it) improvement. It is a moſt delicate engine, and requires much knowledge to ſee what does and what does not improve its performance. We have gone into the preceding minute inveſtigation of Mr. Watt's progreſs with the expreſs purpoſe of making our readers fully maſters of its principles, and have more than once pointed out the real improvements, that they may be firmly fixed and always ready in the mind. By having recourſe to them, the reader may pronounce with confidence on the merits of any new conſtruction, and will not be deceived by the puffs of an ignorant or diſhoneſt engineer.

STEAM-*Kitchen*. Ever ſince Dr. Papin contrived his digeſter (about the year 1690), ſchemes have been propoſed for dreſſing victuals by the ſteam of boiling water. A philoſophical club uſed to dine at Saltero's coffee-houſe, Chelſea, about thirty years ago, and had their victuals dreſſed by hanging them in the boiler of the ſteam-engine which raiſes water for the ſupply of Piccadilly and its neighbourhood. They were completely dreſſed, and both expeditiouſly and with high flavour.

A patent was obtained for an apparatus for this purpoſe by a tin-man in London; we think of the name of Tate. They are made on a much more effective plan by Gregory, an ingenious tradeſman in Edinburgh, and are coming into very general uſe.

It is well known to the philoſopher that the ſteam of boiling water contains a prodigious quantity of heat, which it retains in a latent ſtate ready to be faithfully accounted for, and communicated to any colder body. Every cook knows the great ſcalding power of ſteam, and is diſpoſed to think that it is much hotter than boiling water. This, however, is a miſtake; for it will raiſe the thermometer no higher than the water from which it comes. But we can aſſure the cook, that if he make the ſteam from the ſpout of a tea-kettle paſs through a great body of cold water, it will be condenſed or changed into water; and when one pound of water has in this manner been boiled off, it will have heated the maſs of cold water as much as if we had thrown into it ſeven or eight hundred pounds of boiling hot water.

If, therefore, a boiler be properly fitted up in a furnace, and if the ſteam of the water boiling in it be conveyed by a pipe into a pan containing victuals to be dreſſed, every thing can be cooked that requires no higher degree of heat than that of boiling water: and this will be done without any riſk of ſcorching, or any kind of overheating, which frequently ſpoils our diſhes, and proceeds from the burning heat of air coming to thoſe parts of the pot or pan which is not filled with liquor, and is covered only with a film, which quickly burns and taints the whole diſh. Nor will the cook be ſcorched by the great heat of the open fire that is neceſſary for dreſſing at once a number of diſhes, nor have his perſon and clothes ſoiled by the ſmoke and ſoot unavoidable in the cooking on an open fire. Indeed the whole proceſs is ſo neat, ſo manageable, ſo open to inſpection, and ſo cleanly, that it need neither fatigue nor offend the delicacy of the niceſt lady.

We had great doubts, when we firſt heard of this as a general mode of cookery, as to its economy; we had none as to its efficacy. We thought that the ſteam, and conſequently the fuel expended, muſt be vaſtly greater than by the immediate uſe of an open fire; but we have ſeen a large tavern dinner expeditiouſly dreſſed in this manner, ſeemingly with much leſs fuel than in the common method. The following ſimple narration of facts will ſhow the ſuperiority. In a paper manufacture in this neighbourhood, the vats containing the pulp into which the frames are dipped are about ſix feet diameter, and contain above 200 gallons. This is brought to a proper heat by means of a ſmall cockle or furnace in the middle of the liquor. This

is heated by putting in about one hundred weight of coals about eight o'clock in the evening, and continuing this till four next morning, renewing the fuel as it burns away. This method was lately changed for a ſteam heater. A furnace, having a boiler of five or ſix feet diameter and three feet deep, is heated about one o'clock in the morning with two hundred weight of coals, and the water kept in briſk ebullition. Pipes go off from this boiler to ſix vats, ſome of which are at ninety feet diſtance. It is conveyed into a flat box or veſſel in the midſt of the pulp where it condenſes, imparting its heat to the ſides of the box, and thus heats the ſurrounding pulp. Theſe ſix vats are as completely heated in three hours, expending about three hundred weight of coals, as they were formerly in eight hours, expending near eighteen hundred weight of coals. Mr. Gregory, the inventor of this ſteam heater, has obtained (in company with Mr. Scott plumber, Edinburgh) a patent for the invention; and we are perſuaded that it will come into very general uſe for many ſimilar purpoſes. The dyers, hatmakers, and many other manufacturers, have occaſion for large vats kept in a continual heat; and there ſeems no way ſo effectual.

Indeed when we reflect ſeriouſly on the ſubject, we ſee that this method has immenſe advantages conſidered merely as a mode of applying heat. The ſteam may be applied to the veſſel containing the victuals in every part of its ſurface: it may even be made to enter the veſſel, and apply itſelf immediately to the piece of meat that is to be dreſſed, and this without any riſk of ſcorching or overdoing.—And it will give out about $\frac{499}{500}$ of the heat which it contains, and will do this only if it be wanted; ſo that no heat whatever is waſted except what is required for heating the apparatus. Experience ſhows that this is a mere trifle in compariſon of what was ſuppoſed neceſſary. But with an open fire we only apply the flame and hot air to the bottom and part of the ſides of our boiling veſſels: and this application is hurried in the extreme; for to make a great heat, we muſt have a great fire, which requires a prodigious and moſt rapid current of air. This air touches our pans but for a moment, imparts to them but a ſmall portion of its heat; and, we are perſuaded, that three-fourths of the heat is carried up the chimney, and eſcapes in pure waſte, while another great portion beams out into the kitchen to the great annoyance of the ſcorched cook. We think, therefore, that a page or two of this work will not be thrown away in the deſcription of a contrivance by which a ſaving may be made, and providing the pleaſures of the table prove a leſs fatiguing taſk.

Let A, Plate 19, repreſent a kitchen-boiler, either properly fitted up in a furnace, with its proper fire place, aſh-pit, and flue, or ſet on a tripod on the open fire, or built up in the general fire-place. The ſteam-pipe BC riſes from the cover of this boiler, and then is led away with a gentle aſcent in any convenient direction. C repreſents the ſection of this conducting ſteam-pipe. Branches are taken off from the ſide at proper diſtances. One of theſe is repreſented at CDE, furniſhed with a cock D, and having a taper nozzle E, fitted by grinding into a conical piece F, which communicates with an upright pipe GH, which is ſoldered to the ſide of the ſtewing veſſel PQRS, communicating with it by the ſhort pipe I. The veſſel is fitted with a cover OT, having a ſtaple handle V. The piece of meat M is laid on a tin plate grate KL, pierced with holes like a cullender, and ſtanding on three ſhort feet *n n n*.

The ſteam from the boiler comes in by the pipe I, and is condenſed by the meat and by the ſides of the veſſel, communicating to them all its heat. What is not ſo condenſed eſcapes between the veſſel and its cover. The condenſed water lies on the bottom of the veſſel, mixed with a very ſmall quantity of gravy and fatty matter from the victuals. Frequently, inſtead of a cover, another ſtew-veſſel with a cullender bottom is ſet on this one, the bottom of the one fitting the mouth of the other: and *it is obſerved*, that when this is done, the diſh in the under veſſel is more expeditiouſly and better dreſſed, and the upper diſh is more ſlowly, but as completely ſtewed.

This deſcription of one ſtewing veſſel may ſerve to give a notion of the whole; only we muſt obſerve, that when broths, ſoups, and diſhes, with made ſauces, or containing liquids, are to be dreſſed, they muſt be put into a ſmaller veſſel, which is ſet into the veſſel PQRS, and is ſupported on three ſhort feet, ſo that there may be a ſpace all round it, of about an inch or three quarters of an inch. It is obſerved, that diſhes of this kind are not ſo expeditiouſly cooked as on an open fire, but as completely in the end, only requiring to be turned up now and then to mix the ingredients; becauſe as the liquids in the inner veſſel can never come into ebullition, unleſs the ſteam from the boiler be made of a dangerous heat, and every thing be cloſe confined, there cannot be any of that tumbling motion that we obſerve in a boiling pot.

The performance of this apparatus is far beyond any expectation we had formed of it. In one which we examined, ſix pans were ſtewing together, by means of a boiler 10½ inches in diameter, ſtanding on a briſk open fire. It boiled very briſkly, and the ſteam paſſed frequently through the chinks between the ſtew-pans and their covers. In one of them was a piece of meat conſiderably above thirty pounds weight. This required above four hours ſtewing, and was then very thoroughly and equally cooked; the outſide being no more done than the heart, and it was near two pounds heavier than when put in, and greatly ſwelled. In the mean time, ſeveral diſhes had been dreſſed in the other pans. As far as we could judge, this cooking did not conſume one-third part of the fuel which an open fire would have required for the ſame effect.

When we conſider this apparatus, however, with a little more knowledge of the operation of fire than falls to the ſhare of the cooks (we ſpeak with deference), and conſider the very injudicious manner in which the ſteam is applied, we think that it may conſiderably be improved, ſo as to ſurpaſs any thing that the cook can have a notion of.

When the ſteam enters the ſtew-pan, it is condenſed on the meat and on the veſſel; but we do not want it to be condenſed on the veſſel. And the ſurface of the veſſel is much greater than that of the meat, aud continues much colder; for the meat grows hot, and continues ſo, while the veſſel, made of metal which is a very perfect conductor of heat, is continually robbed of its heat by the air of the kitchen, and carried off by it. If the meat touch the ſide of the pan in any part, no ſteam can be applied to that part of the meat, while it is continually imparting heat to the air by the intermedium of the veſſel. Nay, the meat can hardly be dreſſed, unleſs there be a current of ſteam through it; and we think this confirmed by what is obſerved above, that when another ſtew-pan is ſet over the firſt, and thus gives occaſion to a current of ſteam through its cullender bottom to be condenſed by its ſides and contents, the lower diſh is more expeditiouſly dreſſed. We imagine, therefore, that not leſs than half of the ſteam is waſted on the ſides of the different ſtew-pans. Our firſt attention is therefore called to this circumſtance, and we wiſh to apply the ſteam more economically and effectually.

We would therefore conſtruct the ſteam-kitchen in the following manner:

We would make a wooden cheſt (which we ſhall call the STEW-CHEST) ABCD, fig. 6. This ſhould be made of deal, in very narrow ſlips, not exceeding an inch, that it may not ſhrink. This ſhould be lined with very thin copper, lead, or even ſtrong tinfoil. This will prevent it from becoming a conductor of heat by ſoaking with ſteam. For further ſecurity it might be ſet in another cheſt, with a ſpace of an inch or two

all round, and this ſpace filled with a compoſition of powdered charcoal and clay. This ſhould be made by firſt making a mixture of fine potters'-clay and water, about as thick as poor cream: then as much powdered charcoal muſt be beat up with this as can be made to ſtick together. When this is rammed in and dry, it may be hot enough on one ſide to melt glaſs, and will not diſcolour white paper on the other.

This cheſt muſt have a cover LMNO, alſo of wood, having holes in it to receive the ſtew-pans P,Q,R. Between each pan is a wooden partition, covered on both ſides with milled lead or tinfoil. The whole top muſt be covered with very ſpungy leather or felt, and made very flat. Each ſtew-pan muſt have a bearing or ſhoulder all round it, by which it is ſupported, reſting on the felt, and lying ſo true and cloſe that no ſteam can eſcape. Some of the pans ſhould be ſimple, like the pan F, for dreſſing broths and other liquid diſhes. Others ſhould be like E and G, having in the bottom a pretty wide hole H, K, which has a pipe in its upper ſide, riſing about an inch or an inch and half into the ſtew-pan. The meat is laid on a cullender plate, as in the common way; only there muſt be no holes in the cullender immediately above the pipe.—Theſe ſtew-pans muſt be fitted with covers, or they may have others fitted to their mouths, for warming ſauces or other diſhes, or ſtewing greens, and many other ſubordinate purpoſes for which they may be fitted.

The main-pipe from the boiler muſt have branches (each furniſhed with a cock), which admit the ſteam into theſe diviſions. At its firſt entry ſome will be condenſed on the bottom and ſides; but we imagine that theſe will in two minutes be heated ſo as to condenſe no more, or almoſt nothing. The ſteam will alſo quickly condenſe on the ſtew-pan, and in half a minute make it boiling hot, ſo that it will condenſe no more; all the reſt will now apply itſelf to the meat and to the cover. It may perhaps be adviſable to allow the cover to condenſe ſteam, and even to waſte it. This may be promoted by laying on it flannel ſoaked in water. Our view in this is to create a demand for ſteam, and thus produce a current through the ſtew-pan, which will be applied in its paſſage to the victuals. But we are not certain of the neceſſity of this. Steam is not like common air of the ſame temperature, which would glide along the ſurfaces of bodies, and impart to them a ſmall portion of its heat, and eſcape with the reſt. To produce this effect there *muſt* be a current; for air hot enough to melt lead, will not boil water, if it be kept ſtagnant round the veſſel. But ſteam imparts the *whole* of its latent heat to any body colder than boiling water, and goes no farther till this body be made boiling hot. It is a moſt faithful carrier of heat, and will deliver its whole charge to any body that can take it. Therefore, although there were no partitions in the ſtew-cheſt, and the ſteam were admitted at the end next the boiler, if the pan at the farther end be colder than the reſt, it will all go thither; and will, in ſhort, communicate to every thing impartially according to the demand. If any perſon has not the confidence in the ſteam which we expreſs, he may ſtill be certain that there muſt be a prodigious ſaving of heat by confining the whole in the ſtew-cheſt; and he may make the pans with entire bottoms, and admit the ſteam into them in the common way, by pipes which come through the ſides of the cheſt, and then go into the pan. There will be none loſt by condenſation on the ſides of the cheſt, and the pans will ſoon be heated up to the boiling temperature; and hardly any of their heat will be waſted, becauſe the air in the cheſt will be ſtagnant. The chief reaſon for recommending our method, is the much greater eaſe with which the ſtew-pans can be ſhifted and cleaned. There will be little difference in the performance.

Nay, even the common ſteam-kitchen may be prodigiouſly improved, by merely wrapping each pan in three or four folds of coarſe dry flannel, or making flannel bags of three or four folds fitted to their ſhape, which can be put on or removed in a minute. It will alſo greatly conduce to the good performance, to wrap the main ſteam pipe in the ſame manner in flannel.

We ſaid that this main-pipe is conducted from the boiler with a gentle aſcent. The intention of this is, that the water produced by the unavoidable condenſation of the ſteam, may run back into the boiler. But the rapid motion of the ſteam generally ſweeps it up hill, and it runs into the branch-pipes, and deſcends into the ſtew-pans. Perhaps it would be as well to give the main-pipe a declivity the other way, and allow all the water to collect in a hot well at the farther end, by means of a deſcending pipe, having a loaded valve at the end. This may be ſo contrived as to be cloſe by the fire, where it would be ſo warm that it would not check the boiling, if again poured into the boiler. But the utmoſt attention muſt be paid to cleanlineſs in the whole of this paſſage, becauſe this water is boiled again, and its ſteam paſſes through the heart of every diſh. This circumſtance forbids us to return into the boiler what is condenſed in the ſtew-pans. This would mix the taſtes and flavours of every diſh, and be very diſagreeable. All this muſt remain in the bottom of each ſtew-pan; for which reaſon we put in the pipe riſing up in the middle of the bottom. It might indeed be allowed to fall down into the ſtew-cheſt, and to be collected in a common receptacle, while the fat would float at top, and the clear gravy be obtained below; perhaps fit for many ſauces.

The completeſt method for getting rid of this condenſed ſteam, would be to have a ſmall pipe running along the under ſide of the main conductor, and communicating with it at different places, in a manner ſimilar to the air diſcharger on the mains of water-pipes. In the paper manufacture mentioned above, each ſteam box has a pipe in its bottom, with a float cock, by which the water is diſcharged; and the main-pipe being of great diameter, and laid with a proper acclivity, the water runs back into the boiler.

But theſe precautions are of little moment in a ſteam-kitchen, even for a great table; and for the general uſe of private families, would hurt the apparatus, by making it complex and of nice management. For a ſmall family, the whole apparatus may be ſet on a table four feet long and two broad, which may be placed on caſters, ſo as to be wheeled out of the way when not in uſe. If the main conductor be made of wood, or properly caſed in flannel, it will condenſe ſo little ſteam, that the cooking table may ſtand in the remoteſt corner of the kitchen, without ſenſibly impairing its performance; and if the boiler be properly ſet up in a ſmall furnace, and the flue made ſo that the flame may be applied to a great part of its ſurface, we are perſuaded that three-fourths of the fuel uſed in common cookery will be ſaved. Its only inconvenience ſeems to be the indiſpenſable neceſſity of the moſt anxious cleanlineſs in the whole apparatus. The moſt trifling neglect in this will deſtroy a whole dinner.

We had almoſt forgotten to obſerve, that the boiler muſt be furniſhed with a funnel for ſupplying it with water. This ſhould paſs through the top, and its pipe reach near to the bottom. It will be proper to have a cock on this funnel. There ſhould alſo be another pipe in the top of the boiler, having a valve on the top. If this be loaded with a pound on every ſquare inch, and the fire ſo regulated that ſteam may be obſerved to puff ſometimes from this valve, we may be certain that it is paſſing through our diſhes with ſufficient rapidity; and if we ſhut the cock on the funnel, and load the valve a little

more, we ſhall cauſe the ſteam to blow at the covers of the ſtew-pans. If one of theſe be made very tight, and have a hole alſo furniſhed with a loaded valve, this pan becomes a digeſter, and will diſſolve bones, and do many things which are impracticable in the ordinary cookery.

STEATITES, or *Soap-earth*, a genus of the magneſian order of earths. Of this genus there are ſeveral ſpecies, for which ſee MINERALOGY. According to the analyſis of Bergman, 100 parts of ſteatites contain eighty of ſilex, ſeventeen of mild magneſia, two of argillaceous earth, and nearly one of iron in a ſemioxidated ſtate. This ſubſtance may be formed into a paſte with water, ſufficiently ductile to be worked on the potter's wheel; and by expoſure to a great heat, it is hardened ſo as to ſtrike fire with ſteel. It has alſo the property of FULLERS'-*Earth*, in cleanſing cloths from greaſe: but it does not diffuſe in water ſo well as clays do; and when digeſted with vitriolic acid, it does not form alum, as clays do, but a ſalt ſimilar to Epſom ſalt. From its ſoftneſs and ductility, it may be eaſily formed into pots for the kitchen; and hence it has got the name of *lapis ollaris*.

STEATOMA, a kind of encyſted tumor, conſiſting of a matter like ſuet or lard, ſoft, without pain, and without diſcolouring the ſkin.

STEEL, iron united with carbone. See IRON. Steel has properties diſtinct from thoſe of iron, which render it of ſuperior value. From its higher degree of hardneſs, it admits a finer poliſh and aſſumes a brighter colour. When tempered, it poſſeſſes a higher degree of elaſticity, and is alſo more ſonorous. It is more weakly attracted by the loadſtone, it receives more ſlowly the magnetic power, but it preſerves it longer. When expoſed to a moiſt air, it does not contract ruſt ſo eaſily as iron. It is alſo heavier, increaſing in weight, according to Chaptal, one hundred and ſeventieth part. M Rinman has given, as the reſult of ſeveral accurate experiments on different kinds of ſteel, the following ſpecific gravity 7,795, while he makes ductile iron 7,700, and crude iron 7,251.

All iron is convertible into ſteel, by expoſing it to a certain degree of heat for a certain time, along with a quantity of charcoal. Chemiſts differ in opinion concerning the nature and effects of this proceſs. Some ſay that ſteel is produced by abſorbing a quantity of caloric or heat in a latent ſtate, as the older chemiſts had ſaid it was formed by abſorbing phlogiſton. Lavoiſier ſeems to have aſcribed the qualities of ſteel to a ſlight degree of oxidation, others to a combination with plumbago or black lead, and others to an union with carbone. In agreeing with thoſe who ſay the formation of ſteel is owing to carbone, we do not differ eſſentially from thoſe who attribute it to plumbago; for the art of chemiſtry has now found that theſe ſubſtances are very nearly allied. Plumbago is a true charcoal combined with a little iron. The brilliant charcoal of certain vegetable ſubſtances, more eſpecially when formed by diſtillation in cloſe veſſels, poſſeſſes all the characters of plumbago. The charcoal of animal ſubſtances poſſeſſes characters ſtill more peculiarly reſembling it. Like it they are difficult to incinerate, they leave the ſame impreſſion on the hands and upon paper; they likewiſe contain iron, and become converted into carbonic acid by combuſtion. When animal ſubſtances are diſtilled by a ſtrong fire, a very fine powder ſublimes, which attaches itſelf to the inner part of the neck of the retort, and this ſubſtance may be made into excellent black lead pencils.

There are two ways of making ſteel, namely, by fuſion and by cementation. The firſt way is uſed to convert iron into ſteel immediately from the ore, or from crude or caſt-iron. By the ſecond way, bar-iron is expoſed to a long continued heat, ſurrounded by charcoal. Each of theſe ways has advantages peculiar to itſelf; but the ſame cauſes in fact predominate in both, for both kinds of ſteel are produced by heat and charcoal. The only difference between the two methods is this: in making ſteel by fuſion, the charcoal is not ſo equally defended from the acceſs of air, as in the other way.

Swedenborgius has given the following deſcription of the method uſed in Dalecarlia, for making ſteel from caſt-iron. The ore from which the crude iron to be converted into ſteel is obtained, is of a good kind. It is black, friable, and compoſed of many ſmall grains, and it produces very tough iron. The converſion into ſteel is made upon a forge hearth, ſomething ſmaller than common. The ſides and bottom are made of caſt iron. The tuyere is placed, with very little inclination, on one of the ſide-plates. The breadth of the fire-place is fourteen inches; its length is greater. The lower part of the tuyere is ſix inches and a half above the bottom. In the interior part of the fire-place, there is an oblong opening for the flowing of the ſuperfluous ſcoriæ. The workmen firſt put ſcoriæ on the bottom, then charcoal and powder of charcoal, and upon theſe the caſt-iron run or cut into ſmall pieces They cover the iron with more charcoal, and excite the fire. When the pieces of iron are of a red white, and before they begin to melt, they ſtop the bellows, and carry the maſs under a large hammer, where they break it into pieces of three or four pounds each. The pieces are again brought to the hearth, and laid within reach of the workman, who plunges ſome of them into the fire, and covers them with coal. The bellows are made to blow ſlowly till the iron is liquefied. Then the fire is increaſed; and when the fuſion has been long enough continued, the ſcoriæ are allowed to flow out; and at that time the iron hardens. The workman adds more of the pieces of crude iron, which he treats in the ſame manner; and ſo on a third and a fourth time, till he obtains a maſs of ſteel of about a hundred pounds, which is generally done in about four hours. This maſs is raiſed and carried to the hammer, where it is forged, and cut into four pieces, which are farther beat into ſquare bars four or five feet long. When the ſteel is thus forged, it is thrown into water that it may be eaſily broken; for it is yet crude and coarſe grained. The ſteel is then carried to another hearth ſimilar to the former, and there broken in pieces. Theſe pieces are laid regularly in the fire-place, firſt two parallel, upon which ſeven or eight others are placed acroſs; then a third row acroſs the ſecond, in ſuch a manner, that there is ſpace left between thoſe of the ſame row. The whole is then covered with charcoal, and the fire is excited. In about half or three quarters of an hour, the pieces are made hot enough, and are then taken from the fire, one by one, to the hammer, to be forged into little bars from half a foot to two feet long, and while hot are thrown into water to be hardened. Of theſe pieces, fixteen or twenty are put together, ſo as to make a bundle, which is heated and welded, and afterwards forged into bars four inches thick, which are then broken into pieces of convenient length for uſe.

The method of converting iron into ſteel by cementation, is a very ſimple proceſs. It conſiſts ſolely in expoſing it for a certain time to a ſtrong degree of heat, while cloſely covered with charcoal, and defended from the external air. The furnaces employed for converting iron into ſteel (ſays a manufacturer of this metal), are of different ſizes; ſome capable of converting only three or four tons weight, while others are capacious enough to contain from ſeven to eight or ten tons. The outſides of theſe furnaces riſe up in the form of a cone, or ſugar-loaf, to the height of a very conſiderable number of feet. In the inſide, oppoſite to each other, are placed two very long cheſts, made either of ſtone, or of bricks, capable of bearing the ſtrongeſt fire; which is placed between the two cheſts. The bars of iron, after the bottom is furniſhed with a neceſſary quantity of charcoal duſt, are laid in *ſtratum ſuper ſtratum*, with intermediate beds of the charcoal duſt, to ſuch a height

of the chefts, as only to admit of a good bed at top; which is then all covered over, to prevent the admiffion of the common air; which, could it procure an entrance, would greatly injure the operation. The iron being thus fituated, the fire is lighted; which is fome time before it can be raifed to a fufficient degree of heat to produce any confiderable effect. After which it is continued for fo many days as the operator may judge proper; only now and then drawing out what they call a proof bar. This is done by openings fit for the purpofe at the ends of the cheft, which are eafily and with expedition ftopped up again, without occafioning any injury to the contents left behind. When the operator apprehends the converfion is fufficiently completed, the fire is fuffered to go out, and the furnace, with its contents, is left gradually to cool. This may take up feveral days: after which the furnace is difcharged, by taking out the bars of fteel and the remainder of the charcoal duft.

There is a manufactory eftablifhed in the parifh of Cramond, about five miles from Edinburgh, in which this method is practifed with great fuccefs. Great quantities of fteel are made there, which we have reafon to believe is of as excellent a quality as any that can be procured from other countries.

When the charcoal is taken out, it is found as black as before it was introduced into the furnace, unlefs by accident the external air has got admittance. The bars preferve their exterior form only; the furface frequently exhibits a great number of tumors or blifters, whence they are called *bliftered fteel*.

The hardnefs of fteel is much increafed by tempering. This confifts in heating it to a red heat, and then plunging it fuddenly into cold water. If it be allowed to cool flowly, it ftill preferves its ductility; or if it be heated again after being tempered, it lofes its hardnefs, and again becomes ductile. In heating fteel for tempering it, the moft remarkable circumftance is, the different colours it affumes, according to the degree of heat it has received. As it is gradually heated, it becomes white, then yellow, orange, purple, violet, and at laft of a deep blue colour.

According to Reaumur, the fteel which is moft heated in tempering is generally the hardeft. Hence it is believed, that the more violent the heat to which fteel is expofed, and the more fuddenly it is plunged into cold water, the harder the fteel will be. Rinman, again, has deduced a conclufion directly oppofite, that the fteel which is naturally hardeft demands the leaft degree of heat to temper it. Different methods have been propofed to determine what degree of heat is moft proper; but the eafieft method is to take a bar of fteel, fo long, that while one end is expofed to a violent heat, the other may be kept cold. By examining the intermediate portions, it may be found what degree of heat has produced the greateft hardnefs.

By tempering, fteel is faid to increafe both in bulk and in weight. Reaumur fays, that a fmall bar fix inches long, fix lines broad, and half an inch thick, was increafed at leaft a line in length after being tempered to a reddifh white colour; that is, fuppofing the dilatation proportional in all dimenfions increafing at the rate of forty-eight to forty-nine. Iron alfo expands when heated; but when the heat paffes off, it returns to its former dimenfions. That the weight of fteel is alfo augmented by tempering, has been found by experiment. Rinman having weighed exactly in an hydroftatic balance two kinds of fine fteel made by cementation, and not tempered, found their denfity to be to that of water as 7,991 to 1; after being tempered, the denfity of the one was 7,553, and that of the other 7,708. M. de Morveau took three bars juft of a fize to enter a certain caliber twenty-eight lines long, and each fide two lines broad; one of the bars was foft iron, and the two others were taken from the fame piece of fine fteel. In order to communicate an equal degree of heat to each, in an earthen veffel in the midft of a wind furnace, the bar of foft iron and one of the bars of fteel were thrown into cold water; the other bar of fteel was cooled flowly over fome pieces of charcoal at a diftance from the furnace. The bar of iron and the one of fteel that was allowed to cool flowly paffed eafily into the caliber again; but the bar of tempered fteel was lengthened almoft one-ninth of a line.

There is no doubt but tempering changes the grain; that is, the appearance of the texture of a piece of fteel when broken. This is the mark which is ufually obferved in judging of the quality of fteel, or of the tempering which fuits it beft. The tempered bar is broken in feveral places after having received different degrees of heat in different places. What proves completely the effect of heat upon the grain, at leaft in fome kinds of fteel, is, that a bar of fteel expofed to all the intermediate degrees of heat, from the fmalleft fenfible heat to a red heat, is found to increafe in finenefs of grain from the flightly heated to the ftrongly heated end. The celebrated Rinman has made many experiments on the qualities of fteel expofed to different degrees of heat in tempering, but particularly to three kinds, viz. fteel heated to an obfcure red, to a bright red, and to a red white. Hard brittle fteel, made by cementation, and heated to an obfcure red and tempered, exhibited a fine grain, fomewhat fhining, and was of a yellow white colour. When tempered at a bright red heat, the grain was coarfer and more fhining; when tempered at a red white heat, the grain was alfo coarfe and fhining.

With a view to determine how far fteel might be improved in its grain by tempering it in different ways, M. de Morveau took a bar of bliftered fteel, and broke it into four parts nearly of the fame weight. They were all heated to a red heat in the fame furnace, and withdrawn from the fire at the fame inftant. One of the pieces was left at the fide of the furnace to cool in the air, the fecond was plunged into cold water, the third into oil, and the fourth into mercury. The piece of fteel that was cooled in the air refifted the hammer a long time before it was broken; it was neceffary to notch it by the file, and even then it was broken with difficulty. It fhowed in its fracture a grain fenfibly more fine and more fhining than it was before. The fecond piece, which had been plunged into water, broke eafily; its grain was rather finer than the firft, and almoft of the fame white colour. The third piece, which was tempered in oil, appeared very hard when tried by the file; it was fcarcely poffible to break it. Its grain was as fine, but not quite fo bright, as that which was tempered in water. The fourth piece, which was dipped into mercury, was evidently fuperior to all the reft in the finenefs and colour of the grain. It broke into many fragments with the firft ftroke of the hammer, the fractures being generally tranfverfe.

M. de Morveau was not altogether fatisfied with thefe experiments, and therefore thought it neceffary to repeat them with finer fteel. He took a bar of fteel two lines fquare, fuch as is ufed in Germany for tools by engravers and watchmakers; he divided it into four pieces, and treated them in the fame way as he had done the bliftered fteel. The firft piece, which was cooled in the air, it was very difficult to break: the fracture appeared in the midft of the grain very fine, but white and fhining. The fecond, which was tempered in water, was broken into three fragments at the firft blow; its grain was perfectly equal, of a grey afh-colour, and of remarkable finenefs. One of its fides was polifhed, and a drop of the nitrous acid which was poured upon it left a black fpot, but not deep. But when a drop of the fame acid was poured on the middle of the fracture, after it had been equally polifhed, it left a black fpot much deeper. The third piece, which was plunged in oil, bent as eafily as the piece which was cooled in the air; the file made an impreffion on it with difficulty; it was

necessary to break it with a vice: its grain was inferior in fineness to the second, but it was of a darker colour. The fourth, which was tempered in mercury, exhibited a grain of an intermediate fineness between the second and the third. From these experiments, it appears that steel may be hardened by tempering it, not only with water, but with any other liquid which is capable of accelerating its cooling.

Steel may be unmade, or reduced to the state of iron, by a management similar to that by which it is made, that is, by cementation. But the cement used for this purpose must be composed of substances entirely free from inflammable matter, and rather capable of absorbing it, as calcareous earth or quicklime. By a cementation with calcareous earth, continued during eight or ten hours, steel is reduced to the state of iron. After it has been tempered, it may be again untempered, and softened to any degree that we think proper; for which purpose we have only to heat it more or less, and to let it cool slowly. By this method we may soften the hardest-tempered steel.

STEEL-*Bow Tenants*. See TENURE.

STEEL-*Yard*, is one of the most ancient presents which science has made to society; and though long in desuetude in this country, is in most nations of the world the only instrument for ascertaining the weight of bodies. What is translated *balance* in the Pentateuch, is in fact steelyard, being the word used by the Arabs to this day for their instrument, which is a steel-yard. It is in common use in all the Asiatic nations. It was the *statera* of the Greeks and Romans, and seems to have been more confided in by them than the balance; for which reason it was used by the goldsmiths, while the balance was the instrument of the people.—*Non aurificis statera sed populari trutina examinare*. Cic. de Or. 238.

The steelyard is a lever of unequal arms, and, in its most perfect form, is constructed much like a common balance. It hangs in sheers E (3d Pl. 21. fig. 1.) resting on the nail C, and the scale L for holding the goods hangs by a nail D on the short arm B C. The counter weight P hangs by a ring of tempered steel, made sharp in the inside, that it may bear by an edge on the long arm C A of the steelyard. The under edge of the centre nail C, and the upper edge of the nail D, are in the straight line formed by the upper edge of the long arm. Thus the three points of suspension are in one straight line. The needle or index of the steelyard is perpendicular to the line of the arms, and plays between the sheers. The short arm may be made so massive, that, together with the scale, it will balance the long arm unloaded. When no goods are in the scale, and the counter weight with its hook are removed, the steelyard acquires a horizontal position, in consequence of its centre of gravity being below the axis of suspension. The rules for its accurate construction are the same as for a common balance.

The instrument indicates different weights in the following manner: The distance C D of the two nails is considered as an unit, and the long arm is divided into a number of parts equal to it; and these are subdivided as low as is thought proper: or, in general, the long arm is made a scale of equal parts, commencing at the edge of the nail C; and the short arm contains some determined number of those equal parts. Suppose, then, that a weight A of ten pounds is put into the scale L. The counterpoise P must be of such a weight, that, when hanging at the division 10, it shall balance this weight A. Now let any unknown weight W be put into the scale. Slide the hook of the counterpoise along the long arm till it balances this weight. Suppose it then hanging at the division 38. We conclude that there is thirty-eight pounds in the scale. This we do on the authority of the fundamental property of the lever, that forces acting on it, and balancing each other, are in the inverse proportion of the distances from the fulcrum to their lines of direction. Whatever weight the counterpoise is, it is to A as C D to 10, and it is to the weight W as C D to 38; therefore A is to the weight W as 10 to 38, and W is thirty-eight pounds: and thus the weight in the scale will always be indicated by the division at which it is balanced by the counterpoise.

Our well informed readers know that this fundamental property of the lever was discovered by the renowned Archimedes, or at least first demonstrated by him; and that his demonstration, besides the defect of being applicable only to commensurable lengths of the arms, has been thought by metaphysicians of the first note to proceed on a postulate which seems equally to need a demonstration. It has accordingly employed the utmost refinement of the first mathematicians of Europe to furnish a demonstration free from objection. Mr. D'Alembert has given two, remarkable for their ingenuity and subtlety: Foncenex has done the same; and Professor Hamilton of Trinity college, Dublin, has given one which is thought the least exceptionable. But critics have even objected to this, as depending on a postulate which should have been demonstrated.

In the Philosophical Transactions for 1794, there is a demonstration by Mr. Vince, of such simplicity, that it is astonishing that it has not occurred to any person who thinks on the subject. Let A E (fig. 2.) be a mathematical lever, or inflexible straight line, resting on the prop A, and supported at E by a force acting upwards. Let two equal weights *b* and *d* be hung on at B and D, equidistant from A and E. Pressures are now exerted at A and E; and because every circumstance of weight and distance is the same, the pressure at E, arising from the action of the weight *b* on the point B, must be the same with the pressure at A, arising from the action of the weight *d* on the point D; and the pressure at E, occasioned by the weight *d*, must be the same with the pressure at A, occasioned by the weight *b*. This must be the case wherever the weights are hung, provided that the distance A B and D E are equal. Moreover, the sum of the pressures at A and E is unquestionably equal to the sum of the weights, because the weights are supported solely at A and E. Let the two weights be hung on at C the middle point; the pressure at E is still the same. Therefore, in general, the pressure excited at the point E, by two equal weights hanging at any points B and D, is the same as if they were hung on at the middle point between them: but the pressure excited at E is a just measure of the effort or energy of the weights *b* and *d* to urge the lever round the point A. It is, at least, a measure of the opposite force which must be applied at E to sustain or balance this pressure. A very fastidious metaphysician may still say, that the demonstration is limited to a point E, whose distance from A is twice A C, or $=$ A B $+$ A D. But it extends to any other point, on the authority of a postulate which cannot be refused, viz. that in whatever proportion the pressure at E is augmented or diminished, the pressure at this other point must augment or diminish in the same proportion. This being proved, the general theorem may be demonstrated in all proportions of distance, in the manner of Archimedes, at once the most simple, perspicuous, and elegant of all.

We cannot help observing, that all this difficulty (and it is a real one to the philosopher who aims at rendering mechanics a demonstrative science) has arisen from an improper search after simplicity. Had Archimedes taken a lever as it really exists in nature, and considered it as *material*, consisting of atoms united by cohesion; and had he traced the intermediate

preſſures by whoſe means the two external weights are put in oppoſition to each other, or rather to the ſupport given to the fulcrum; all difficulty would have vaniſhed.

The quantity of goods which may be weighed by this inſtrument depends on the weight of the counterpoiſe, and on the diſtance C D from the fulcrum at which the goods are ſuſpended. A double counterpoiſe hanging at the ſame diviſion will balance or indicate a double quantity of goods hanging at D; and any counterpoiſe will balance and indicate a double quantity of goods, if the diſtance C D be reduced to one-half. Many ſteelyards have two or more points of ſuſpenſion D, to which the ſcale may occaſionally be attached. Fig. 1. of Plate 45. Vol. I. repreſents one of theſe. It is evident, that in this caſe the value or indication of the diviſions of the long arm will be different, according to the point from which the ſcale is ſuſpended. The ſame diviſion which would indicate twenty pounds when C D is three inches, will indicate thirty pounds when it is two inches. As it would expoſe to chance of miſtakes, and be otherwiſe troubleſome to make this reduction, it is uſual to make as many divided ſcales on the long arm as there are points of ſuſpenſion D on the ſhort arm; and each ſcale having its own numbers, all trouble and all chance of miſtake is avoided.

But the range of this inſtrument is not altogether at the pleaſure of the maker. Beſides the inability of a ſlender beam to carry a great load, the diviſions of the ſcale anſwering to pounds or half-pounds become very minute when the diſtance C D is very ſhort; and the balance becomes leſs delicate, that is, leſs ſenſibly affected by ſmall differences of weight. This is becauſe in ſuch caſes the thickneſs which it is neceſſary to give the edges of the nails does then bear a ſenſible proportion to the diſtance C D between them; ſo that when the balance inclines to one ſide, that arm is ſenſibly ſhortened, and therefore the energy of the perponderating weight is leſſened.

We have hitherto ſuppoſed the ſteelyard to be in equilibrio when not loaded. But this is not neceſſary, nor is it uſual in thoſe which are commonly made. The long arm commonly preponderates conſiderably. This makes no difference, except in the beginning of the ſcale. The preponderancy of the long arm is equivalent to ſome goods already in the ſcale, ſuppoſe four pounds. Therefore when there are really ten pounds in the ſcale, the counterpoiſe will balance it when hanging at the diviſion 6. This diviſion is therefore reckoned 10, and the reſt of the diviſions are numbered accordingly.

A ſcientific examination of the ſteelyard will convince us that it is inferior to the balance of equal arms in point of ſenſibility: but it is extremely compendious and convenient; and when accurately made and attentively uſed, it is abundantly exact for moſt commercial purpoſes. We have ſeen one at Leipzig which has been in uſe ſince the year 1718, which is very ſenſible to a difference of one pound, when loaded with nearly three tons on the ſhort arm; and we ſaw a waggon loaded with more than two tons weighed by it in about ſix minutes.

The ſteelyard in common uſe in the different countries of Europe is of a conſtruction ſtill ſimpler than what we have deſcribed. It conſiſts of a batten of hard wood, having a heavy lump A (fig. 3. in 3d Pl. 21.) at one end, and a ſwivel-hook B at the other. The goods to be weighed are ſuſpended on the hook, and the whole is carried in a loop of whip-cord C, in which it is ſlid backward and forward, till the goods are balanced by the weight of the other end. The weight of the goods is eſtimated by the place of the loop on a ſcale of diviſions in harmonic progreſſion. They are marked (we preſume) by trial with known weights.

The chief uſe that is now made of the ſteelyard in theſe kingdoms is for the weighing of loaded waggons and carts. For this it is extremely convenient, and more than ſufficiently exact for the purpoſe in view. We ſhall deſcribe one or two of the moſt remarkable; and we ſhall begin with that at Leipzig already mentioned.

This ſteelyard is repreſented in fig. 4. as run out, and juſt about to be hooked for lifting up the load. The ſteelyard itſelf is O P Q, and is about twelve feet long. The ſhort arm P Q has two points of ſuſpenſion *c* and *b*; and the ſtirrup which carries the chains for holding the load is made with a double hook, inſtead of a double eye, that it may be eaſily removed from the one pin to the other. For this purpoſe the two hooks are connected above by an haſp or ſtaple, which goes over the arm of the ſteelyard like an arch. This is repreſented in the little figure above the ſteelyard. The ſuſpenſion is ſhifted when the ſteelyard is run in under cover, by hooking to this ſtaple the running block of a ſmall tackle which hangs in the door through which the ſteelyard is run out and in. This operation is eaſy, but neceſſary, becauſe the ſtirrup, chains, and the ſtage on which the load is placed, weigh ſome hundreds.

The outer pin *b* is fourteen inches, and the inner one *c* is ſeven inches, diſtant from the great nail which reſts in the ſheers. The other arm is about ten and a half feet long, formed with an obtuſe edge above. On the inclined plane on each ſide of the ridge is drawn the ſcale of weights adapted to the inner pin *c*. The ſcales correſponding to the outer pin *b* are drawn on the upright ſides. The counterpoiſe ſlides along this arm, hanging from a ſaddle-piece made of braſs, that it may not contract ruſt. The motion is made eaſy by means of rollers. This is neceſſary, becauſe the counterpoiſe is greatly above a hundred weight. This ſaddle-piece has like two laps on each ſide, on which are engraved vernier ſcales, which divide their reſpective ſcales on the arm to quarters of a pound. Above the ſaddle is an arch, from the ſummit of which hangs a little plummet, which ſhows the equilibrium of the ſteelyard to the weigher, becauſe the ſheers are four feet out of the houſe, and he cannot ſee their coincidence with the needle of the ſteelyard. Laſtly, near the end of the long arm are two pins *d* and *e*, for ſuſpending occaſionally two eke-weights for continuing the ſcale. Theſe are kept hanging on adjoining hooks, ready to be lifted on by a little tackle, which is alſo hooked immediately above the pins *d* and *e*.

The ſcales of weights are laid down on the arm as follows. Let the eke-weights appropriated to the pins *d* and *e* be called D and E, and call the counterpoiſe C. Although the ſtirrup with its chains and ſtage weigh ſome hundreds, yet the length and ſize of the arm O P give it a preponderancy of 300 pounds. Here, then, the ſcale of weights muſt commence. The counterpoiſe weighs about 125 pounds. Therefore,

1. When the load hangs by the pin *b*, fourteen inches from the centre, the diſtance from one hundred to another on the ſcale is about eleven inches, and the firſt ſcale (on the ſide of the arm) reaches from 300 to 1200. In order to repeat or continue this, the eke-weight E is hung on the pin *e*, and the counterpoiſe C is brought back to the mark 300; and the two together balance 1100 pounds hanging at *b*. Therefore a ſecond ſcale is begun on the ſide of the arm, and continued as far out as the firſt, and therefore its extremity marks 2000; that is, the counterpoiſe C at 2000 and the eke-weight E at *e* balance 2000 hanging at *b*.

2. To continue the ſcale beyond 2000, the load muſt be hung on the inner pin *c*. The eke-weight E is taken off, and

the eke-weight D is hung on its pin *d*. The general counterpoiſe being now brought cloſe to the ſheers, it, together with the weight E at *d*, balance 2000 pounds hanging at *c*. A ſcale is therefore begun on one of the inclined planes a-top, and continued out to 4000, which falls very near to the pin *d*, each hundred pounds occupying about five inches on the arm. To complete the ſcale, hang on the eke-weight E on its pin *e*, and bring back the counterpoiſe to the ſheers, and the three together balance 3800 hanging at *c*. Therefore when the counterpoiſe is now ſlid out to 4000, it muſt complete the balance with 5800 hanging at *c*.

It required a little conſideration to find out what proportion of the three weights, C, D, and E, would make the repetitions of the ſcale extend as far as poſſible, having very little of it expreſſed twice, or upon two ſcales, as is the caſe here. We ſee that the ſpace correſponding to a ſingle pound is a very ſenſible quantity on both ſcales, being one-ninth of an inch on the firſt two ſcales, and one-twentieth on the laſt two.

This very ponderous machine, with its maſſy weights, cannot be eaſily managed without ſome aſſiſtance from mechanics. It is extremely proper to have it ſuſceptible of motion out and in, that it may be protected from the weather, which would ſoon deſtroy it by ruſt. The contrivance here is very effectual, and abundantly ſimple.

When the ſteelyard is not in uſe, it is ſupported at one end by the iron-rod F, into which the upper end of the ſheers is hooked. The upper end of this rod has a ſtrong hook E, and a little below at *a* it is pierced with a hole, in which is a very ſtrong bolt or pin of tempered ſteel, having a roller on each end cloſe to the rod on each ſide. Theſe rollers reſt on two joiſts, one of which is repreſented by M N, which traverſe the building, with juſt room enough between them to allow the rod F to hang freely down. The other end O of the ſteelyard reſts in the bight of a large flat hook at the end of a chain W, which hangs down between the joiſts, and is ſupported on them by a frame with rollers H. This is connected with the rollers at G, which carry the ſheers by means of two iron-rods, of which one only can be ſeen. Theſe connect the two ſets of rollers in ſuch a manner that they muſt always move together, and keep their diſtance invariable. This motion is produced by means of an endleſs rope H I Z L K V H paſſing over the pulleys I and K, which turn between the joiſts, and hanging down in a bight between them. It is evident by pulling on the part LZ we pull the frame of rollers in the direction G H, and thus bring the whole into the houſe in the poſition marked by the dotted figure. It is alſo plain, that by pulling on the part L K we force the roller-frame and the whole apparatus out again.

It remains to ſhow how the load is raiſed from the ground and weighed. When the ſteelyard is run out for uſe, the upper hook E juſt enters into the ring D, which hangs from the end of the great oaken lever B C A about twenty-two feet long, turning on gudgeons at C about five feet from this end. From the other end A deſcends a long iron-rod S R, which has one ſide formed into a toothed rack that is acted on by a frame of wheel-work turned by an endleſs ſcrew and winch Q. Therefore when the hook E is well engaged in the ring D, a man turns the winch, and thus brings down the end A of the great lever, and raiſes the load two or three inches from the ground. Every thing is now at liberty, and the weigher now manages his weights on the arm of the ſteelyard till he has made an equilibrium.

We need not deſcribe the operation of letting down the load, diſengaging the ſteelyard from the great lever, and bringing it again under cover. The whole of this ſervice is performed by two men, and may be done in ſucceſſion by one, and is over in five or ſix minutes.

The moſt compendious and economical machine of this kind that we have ſeen is one, firſt uſed (we have heard) for weighing the riders of race-horſes, and afterwards applied to the more reputable ſervice of weighing loaded carriages.

Fig. 5. is a plan of the machine. K L M N is the plan of a rectangular box, which has a platform lid or cover, of ſize ſufficient for placing the wheels of a cart or waggon. The box is about a foot deep, and is ſunk into the ground till the platform-cover is even with the ſurface. In the middle of the box is an iron lever ſupported on the fulcrum pin *i k*, formed like the nail of balance, which reſts with its edge on arches of hardened ſteel firmly faſtened to the bottom of the box. This lever goes through one ſide of the box, and is furniſhed at its extremity with a hard ſteel pin *l m*, alſo formed to an edge below. In the very middle of the box it is croſſed by a third nail of hardened ſteel *g h*, alſo formed to an edge, but on the upper ſide. Theſe three edges are in one horizontal plane, as in a well made balance.

In the four corners A, A′, E′, E, of the box are firmly fixed four blocks of tempered ſteel, having their upper ſurfaces formed into ſpherical cavities, well poliſhed and hard tempered. A B C D E repreſents the upper edge of an iron bar of conſiderable ſtrength, which reſts on the cavities of the ſteel blocks in A and E, by means of two hard ſteel ſtuds projecting from its under edge, and formed into obtuſe-angled points or cones. Theſe points are in a ſtraight line parallel to the ſide K N of the box. The middle part C of this crooked bar is faced with hard-tempered ſteel below, and is there formed into an edge parallel to A E and K N, by which it reſts on the upper edge of the ſteel pin *g h* which is in the lever. In a line parallel to A E, and on the upper ſide of the crooked bar A C E, are fixed two ſtuds or points of hardened ſteel B and D projecting upwards above half an inch. The platform-cover has four ſhort feet like a ſtool, terminated by hard ſteel ſtuds, which are ſhaped into ſpherical cavities and well poliſhed. With theſe it reſts on the four ſteel points B, B′, D′, D. The bar A C E is kneed in ſuch a manner vertically, that the points A, B, D, E, and the edge C, are all in a horizontal plane. Theſe particulars will be better underſtood by looking at the elevation in fig. 6. What has been ſaid of the bar A C E muſt be underſtood as alſo ſaid of the bar A′C′E′.

Draw through the centre of the box the line *a b c* perpendicular to the line A E, B D. It is evident that the bar A C E is equivalent to a lever *a b c*, having the fulcrum or axis A E reſting with its extremity C on the pin *h g* and loaded at *b*. It is alſo evident that *a* C is to *a b* as the load on this lever to the preſſure which it exerts on the pin *g h*, and that the ſame proportion ſubſiſts between the whole load on the platform and the preſſure which it exerts on the pin *g h*. It will alſo appear, on an attentive conſideration, that this proportion is nowiſe deranged in whatever manner the load is placed on the platform. If very unequably, the two ends of the pin *g h* may be unequally preſſed, and the lever wrenched and ſtrained a little; but the total preſſure is not changed.

If there be now placed a balance or ſteelyard at the ſide L K, in ſuch a manner that one end of it may be directly above the pin *l m* in the end of the lever E O F, they may be connected by a wire or ſlender rod, and a weight on the other arm of the balance or ſteelyard may be put in equilibrio with any load that can be laid on the platform. A ſmall counterpoiſe being firſt hung on to balance the apparatus when unloaded, any additional weight will meaſure the load really laid on the platform. If *a b* be to *a c* as 1 to 8, and EO to EF alſo as 1 to 8, and if a common balance be uſed above, 64 pounds on the platform will be balanced by one pound in the ſcale, and every pound will be balanced by one-fourth of an ounce. This would be a very convenient partition for moſt

purpofes, as it would enable us to ufe a common balance and common weights to complete the machine: or it may be made with a balance of unequal arms, or with a fteelyard.

Some have thought to improve this inftrument by ufing edges like thofe of the nails of a balance inftead of points. But unlefs made with uncommon accuracy, they will render the balance very dull. The fmall deviation of the two edges A and E, or of B and D, from perfect parallelifm to K N, is equivalent to a broad furface equal to the whole deviation. We imagine that, with no extraordinary care, the machine may be made to weigh within $\frac{1}{2000}$th of the truth, which is exact enough for any purpofe in commerce.

It is neceffary that the points be attached to the bars. Some have put the points at A and E in the blocks of fteel faftened to the bottom, becaufe the cavity there lodged water or dirt, which foon deftroyed the inftrument with ruft. But this occafions a change of proportion in the firft lever by any fhifting of the crooked bars; and this will frequently happen when the wheels of a loaded cart are pufhed on the platform. The cavity in the fteel ftud fhould have a little rim round it, and it fhould be kept full of oil. In a nice machine a quarter of an inch of quickfilver would effectually prevent all thefe inconveniences.

The fimpleft and moft economical form of this machine is to have no balance or fecond fteelyard; but to make the firft fteelyard E O F a lever of the firft kind, viz. having the fulcrum between O and F, and allow it to project far beyond the box. The long or outward arm of this lever is then divided into a fcale of weights, commencing at the fide of the box. A counterpoife muft be chofen, fuch as will, when at the beginning of the fcale, balance the fmalleft load that will probably be examined. It will be convenient to carry on this fcale by means of eke weights hung on at the *extremity* of the lever, and to ufe but one moveable weight. By this method the divifions of the fcale will have always one value. The beft arrangement is as follows: place the mark O at the beginning of the fcale, and let it extend only to 100, if for pounds; or to 112, if for cwts.; or to 10, if for ftones; and let the eke-weights be numbered 1, 2, 3, &c. Let the loweft weight be marked on the beam. This is always to be added to the weight fhown by the operation. Let the eke-weights ftand at the end of the beam, and let the general counterpoife always hang at O. When the cart is put on the platform, the end of the beam tilts up. Hang on the heavieft eke-weight that is not fufficient to prefs it down. Now complete the balance by fliding out the counterpoife. Suppofe the conftant load to be 312 lb. and that the counterpoife ftands at 86, and that the eke-weight is 9; we have the load$=986+312,=1298$ lbs.

STEELE (Sir Richard), was born about the year 1676 in Dublin; in which kingdom one branch of the family was poffeffed of a confiderable eftate in the county of Wexford. His father, a counfellor at law in Dublin, was private fecretary to James duke of Ormond; but he was of Englifh extraction: and his fon, while very young, being carried to London, he put him to fchool at the Charter-houfe, whence he was removed to Merton College in Oxford. Our author left the univerfity, which he did without taking any degree, in the full refolution to enter into the army. This ftep was highly difpleafing to his friends; but the ardour of his paffion for a military life rendered him deaf to any other propofal. Not being able to procure a better ftation, he entered as a private gentleman in the horfe-guards, notwithftanding he thereby loft the fucceffion to his Irifh eftate. However, as he had a flow of good-nature, a generous opennefs and franknefs of fpirit, and a fparkling vivacity of wit, thefe qualities rendered him the delight of the foldiery, and procured him an enfign's commiffion in the guards. In the mean time, as he had made choice of a profeffion which fet him free from all the ordinary reftraints in youth, he fpared not to indulge his inclinations in the wildeft exceffes. Yet his gaieties and revels did not pafs without fome cool hours of reflection; it was in thefe that he drew up his little treatife intitled *The Chriftian Hero*, with a defign, if we may believe himfelf, to be a check upon his paffions. For this purpofe it had lain fome time by him, when he printed it in 1701, with a dedication to Lord Cutts, who had not only appointed him his private fecretary, but procured for him a company in Lord Lucas's regiment of Fufileers.

The fame year he brought out his comedy called *The Funeral*, or *Grief à la mode*. This play procured him the regard of King William, who refolved to give him fome effential marks of his favour; and though, upon that prince's death, his hopes were difappointed, yet, in the beginning of queen Anne's reign, he was appointed to the profitable place of gazetteer. He owed this poft to the friendfhip of lord Halifax and the earl of Sunderland, to whom he had been recommended by his fchool-fellow Mr. Addifon. That gentleman alfo lent him an helping hand in promoting the comedy called *The Tender Hufband*, which was acted in 1704 with great fuccefs. But his next play, the Lying Lover, had a very different fate. Upon this rebuff from the ftage, he turned the fame humorous current into another channel; and early in the year 1709, he began to publifh the Tatler: which admirable paper was undertaken in concert with Dr. Swift. His reputation was perfectly eftablifhed by this work; and, during the courfe of it, he was made a commiffioner of the ftamp-duties in 1710. Upon the change of the miniftry the fame year, he joined the duke of Marlborough, who had feveral years entertained a friendfhip for him; and upon his Grace's difmiffion from all employments in 1711, Mr. Steele addreffed a letter of thanks to him for the fervices which he had done to his country. However, as our author ftill continued to hold his place in the ftamp-office under the new adminiftration, he forbore entering with his pen upon political fubjects; but, adhering more clofely to Mr. Addifon, he dropt the Tatler, and afterwards, by the affiftance chiefly of that fteady friend, he carried on the fame plan much improved, under the title of *The Spectator*. The fuccefs of this paper was equal to that of the former; which encouraged him, before the clofe of it, to proceed upon the fame defign in the character of the *Guardian*. This was opened in the beginning of the year 1713, and was laid down in October the fame year. But in the courfe of it his thoughts took a ftronger turn to politics: he engaged with great warmth againft the miniftry; and being determined to profecute his views that way by procuring a feat in the houfe of commons, he immediately removed all obftacles thereto. For that purpofe he took care to prevent a forcible difmiffion from his poft in the ftamp-office, by a timely refignation of it to the earl of Oxford; and at the fame time gave up a penfion, which had been till this time paid him by the queen as a fervant to the late prince George of Denmark. This done, he wrote the famous Guardian upon the demolition of Dunkirk, which was publifhed Auguft 7, 1713; and the parliament being diffolved next day, the Guardian was foon followed by feveral other warm political tracts againft the adminiftration. Upon the meeting of the new parliament, Mr. Steele having been returned a member for the borough of Stockbridge in Dorfetfhire, took his feat accordingly in the houfe of commons; but was expelled thence in a few days after, for writing the clofe of the paper called the *Englifhman*, and one of his political pieces intitled the *Crifis*. Prefently after his expulfion, he publifhed propofals for writing the hiftory of the duke of Marlborough: at the fame time he alfo wrote the *Spinfter*; and in oppofition to the *Examiner*, he fet

up a paper called the *Reader*, and continued publiſhing ſeveral other things in the ſame ſpirit till the death of the queen Immediately after which, as a reward for theſe ſervices, he was taken into favour by her ſucceſſor to the throne, king George I. He was appointed ſurveyor of the royal ſtables at Hampton-Court, governor of the royal company of comedians, put into the commiſſion of the peace for the county of Middleſex, and in 1715 received the honour of knighthood. In the firſt parliament of that king, he was choſen member for Boroughbridge in Yorkſhire; and, after the ſuppreſſion of the rebellion in the north, was appointed one of the commiſſioners of the forfeited eſtates in Scotland. In 1718 he buried his ſecond wife, who had brought him a handſome fortune and a good eſtate in Wales; but neither that, nor the ample additions lately made to his income, were ſufficient to anſwer his demands. The thoughtleſs vivacity of his ſpirit often reduced him to little ſhifts of wit for its ſupport; and the project of the Fiſh-pool this year owed its birth chiefly to the projector's neceſſities. This veſſel was intended to carry fiſh alive, and without waſting, to any part of the kingdom: but notwithſtanding all his towering hopes, the ſcheme proved very ruinous to him; for after he had been at an immenſe expence in contriving and building his veſſel, beſides the charge of the patent, which he had procured, it turned out upon trial to be a mere project. His plan was to bring ſalmon alive from the coaſt of Ireland; but theſe fiſh, though ſupplied by this contrivance with a continual ſtream of water while at ſea, yet uneaſy at their confinement, ſhattered themſelves to pieces againſt the ſides of the pool; ſo that when they were brought to market they were worth very little.

The following year he oppoſed the remarkable peerage bill in the houſe of commons; and, during the courſe of this oppoſition to the court, his licence for acting plays was revoked, and his patent rendered ineffectual, at the inſtance of the lord chamberlain. He did his utmoſt to prevent ſo great a loſs; and finding every direct avenue of approach to his royal maſter effectually barred againſt him by his powerful adverſary, he had recourſe to the method of applying to the public, in hopes that his complaints would reach the ear of his ſovereign, though in an indirect courſe, by that canal. In this ſpirit he formed the plan of a periodical paper, to be publiſhed twice a-week, under the title of the *Theatre:* the firſt number of which came out on the 2d of January, 1719-20. In the mean time, the misfortune of being out of favour at court, like other misfortunes, drew after it a train of more. During the courſe of this paper, in which he had aſſumed the feigned name of *Sir John Edgar*, he was outrageouſly attacked by Mr. Dennis, the noted critic, in a very abuſive pamphlet, intitled *The Character and Conduct of Sir John Edgar*. To this inſult our author made a proper reply in the Theatre.

While he was ſtruggling with all his might to ſave himſelf from ruin, he found time to turn his pen againſt the miſchievous South-ſea ſcheme, which had nearly brought the nation to ruin in 1720; and the next year he was reſtored to his office and authority in the play-houſe in Drury-lane. Of this it was not long before he made an additional advantage, by bringing his celebrated comedy called the *Conſcious Lovers* upon that ſtage, where it was acted with prodigious ſucceſs; ſo that the receipt muſt have been very conſiderable, beſides the profits accruing by the ſale of the copy, and a purſe of 500 l. given to him by the king, to whom he dedicated it. Yet notwithſtanding theſe ample ſupplies, about the year following, being reduced to the utmoſt extremity, he ſold his ſhare in the play-houſe; and ſoon after commenced a law-ſuit with the managers, which in 1726 was determined to his diſadvantage. Having now again, for the laſt time, brought his fortune, by the moſt heedleſs profuſion, into a deſperate condition, he was rendered altogether incapable of retrieving the loſs, by being ſeized with a paralytic diſorder, which greatly impaired his underſtanding. In theſe unhappy circumſtances, he retired to his ſeat in Languanor near Caermarthen in Wales, where he paid the laſt debt to nature on the 21ſt of September, 1729, and was privately interred, according to his own deſire, in the church of Caermarthen. Among his papers were found the manuſcripts of two plays, one called *The Gentlemen*, founded upon the eunuch of Terence, and the other intitled *The School of Action*, both nearly finiſhed.

Sir Richard was a man of undiſſembled and extenſive benevolence, a friend to the friendleſs, and, as far as his circumſtances would permit, the father of every orphan. His works are chaſte and manly. He was a ſtranger to the moſt diſtant appearance of envy or malevolence; never jealous of any man's growing reputation and ſo far from arrogating any praiſe to himſelf from his conjunction with Mr. Addiſon, that he was the firſt who deſired him to diſtinguiſh his papers. His greateſt error was want of economy: however, he was certainly the moſt agreeable, and (if we may be allowed the expreſſion) the moſt innocent rake that ever trod the rounds of diſſipation.

STEEPLE, an appendage erected generally on the weſtern end of churches, to hold the bells. Steeples are denominated from their form, either ſpires or towers: the firſt are ſuch as aſcend continually diminiſhing either conically or pyramidally; the latter are merely parallelopipeds, and are covered a-top platform-like

STEERAGE, on board a ſhip, that part of the ſhip next below the quarter-deck, before the bulk-head of the great cabin where the ſteerſman ſtands, in moſt ſhips of war. See STEERING.

STEERING, in navigation, the art of directing the ſhip's way by the movements of the helm; or of applying its efforts to regulate her courſe when ſhe advances. The perfection of ſteering conſiſts in a vigilant attention to the motion of the ſhip's head, ſo as to check every deviation from the line of her courſe in the firſt inſtant of its motion; and in applying as little of the power of the helm as poſſible. By this ſhe will run more uniformly in a ſtraight path, as declining leſs to the right and left; whereas, if a greater effort of the helm is employed, it will produce a greater declination from the courſe, and not only increaſe the difficulty of ſteering, but alſo make a crooked and irregular tract through the water. See HELM.—The helmſman ſhould diligently watch the movements of the head by the land, clouds, moon, or ſtars; becauſe, although the courſe is in general regulated by the compaſs, yet the vibrations of the needle are not ſo quickly perceived as the ſallies of the ſhip's head to the right or left, which, if not immediately reſtrained, will acquire additional velocity in every inſtant of their motion, and demand a more powerful impulſe of the helm to reduce them; the application of which will operate to turn her head as far on the contrary ſide of her courſe. —The phraſes uſed in ſteering a ſhip vary according to the relation of the wind to her courſe. Thus, if the wind is fair or large, the phraſes uſed by the pilot or officer who ſuperintends the ſteerage are, *port*, *ſtarboard*, and *ſteddy*. The firſt is intended to direct the ſhip's courſe farther to the right; the ſecond is to guide her farther to the left; and the laſt is deſigned to keep her exactly in the line whereon ſhe advances, according to the courſe preſcribed. The exceſs of the firſt and ſecond movement is called *hard-a-port*, and *hard-a-ſtarboard*; the former of which gives her the greateſt poſſible inclination to the right, and the latter an equal tendency to the left.—If, on the contrary, the wind is foul or ſcant, the phraſes are

luff, thus, and *no nearer*: the firſt of which is the order to keep her cloſe to the wind; the ſecond, to retain her in her preſent ſituation; and the third to keep her ſails full.

In a ſhip of war, the exerciſe of ſteering the ſhip is uſually divided amongſt a number of the moſt expert ſailors, who attend the helm in their turns; and are accordingly called *timoneers*, from the French term *timonier*, which ſignifies "helmſman." The ſteerage is conſtantly ſupervifed by the quarter-maſters, who alſo attend the helm by rotation. In merchant ſhips every ſeamen takes his turn in this ſervice, being directed therein by the mate of the watch, or ſome other officer.—As the ſafety of a ſhip, and all contained therein, depends in a great meaſure on the ſteerage or effects of the helm, the apparatus by which it is managed ſhould often be diligently examined by the proper officers. Indeed, a negligence in this important duty appears almoſt unpardonable, when the fatal effects which may reſult from it are duly conſidered.

STEGANIUM. See SLATE.

STEGANOGRAPHY, the art of ſecret writing, or of writing in ciphers, known only to the perſons correſponding. See CIPHER.

STELLARIA, STICHWORT, in botany: a genus of plants belonging to the claſs of *decandria*, and order of *trigynia*, and in the natural ſyſtem arranged under the 22d order, *Caryophylleæ*. The calyx is pentaphyllous and ſpreading. There are five petals, each divided into two ſegments. The capſule is oval, unilocular and polyſpermous. There are nine ſpecies, the nemorum, dichotoma, radians, holoſtea, graminea, ceraſtoides, undulata, biflora, and arenaria. Three of theſe are Britiſh plants. 1. *Nemorum*, broad-leaved ſtichwort. The ſtalks are about a foot or eighteen inches high, and branched in a panicle at the top. The leaves are heart-ſhaped, and of a paler green on the under than on the upper ſide; the lower ones being ſupported by footſtalks which are hairy and channelled; the upper ones are ſeſſile. The calyx is erect, ſomewhat hairy and white on the margins. The petals are bifid almoſt to the baſe. There is a ſmall nectarium between the longer ſtamina and the calyx.—2. *Holoſtea*, greater ſtichwort. The ſtalks are about two feet long; the petals are nearly twice the length of the calyx, and divided half way to the baſe. It is common in woods and hedges.—3. *Graminea*, leſs ſtichwort. The ſtem is near a foot high. The leaves are linear and entire, and the flowers grow in looſe panicles. It is frequent in dry paſtures. There is a variety of this ſpecies called *bog ſtichwort*, with ſmooth, oval, ſeſſile leaves, and few leaves, which grows often in wet marſhy places. The ſtalk is quadrangular; the petals ſcarcely longer than the calyx, and bifid to the baſe.

STELLATE, among botaniſts, expreſſes leaves which grow not leſs than ſix at a joint, and are arranged like the rays of a ſtar.

STELLERA, GERMAN GROUNDSEL, in botany: a genus of plants belonging to the claſs of *octandria*, and order of *monogynia*; and in the natural ſyſtem arranged under the 31ſt order, *Vepreculæ*. There is no calyx. The corolla is quadrifid. The ſtamina are very ſhort. There is only one ſeed, which is black. The ſpecies are two in number, paſſerina and chamaejaſme.

STELLIONATE, in the civil law, a kind of crime committed by a fraudulent bargain, where one of the parties ſells a thing for what it is not: as if I ſell an eſtate for my own which belongs to another, or convey a thing as free and clear which is already engaged to another, or put off copper for gold, &c.

STEM, in botany, that part of a plant ariſing out of the root, and which ſuſtains the leaves, flowers, fruits, &c. By waſhing and rubbing the ſtems of trees, their annual increaſe is promoted. See the article TREE.

STEM *of a Ship*, a circular piece of timber into which the two ſides of a ſhip are united at the fore-end: the lower end of it is ſcarfed to the keel, and the bowſprit reſts upon its upper end. The ſtem is formed of one or two pieces, according to the ſize of the veſſel; and as it terminates the ſhip forward, the ends of the wales and planks of the ſides and bottom are let into a groove or channel, in the midſt of its ſurface, from the top to the bottom; which operation is called *rabiting*. The outſide of the ſtem is uſually marked with a ſcale, or diviſion of feet, according to its perpendicular height from the keel. The intention of this is to aſcertain the draught of water at the fore-part, when the ſhip is in preparation for a ſea-voyage, &c. The ſtem at its lower end is of equal breadth and thickneſs with the keel, but it grows proportionally broader and thicker towards its upper extremity. See SHIP-*Building*.

STEMMATA, in the hiſtory of inſects, are three ſmooth hemiſpheric dots, placed generally on the top of the head, as in moſt of the hymenoptera and other claſſes. The name was firſt introduced by Linnæus.

STEMODIA, in botany: a genus of plants belonging to the claſs of *didynamia*, and order of *angioſpermia*; and in the natural ſyſtem ranging under the 40th order, *Perſonatæ*. The calyx is quinquepartite; the corolla bilabiated; there are four ſtamina; each of the filaments are bifid, and have two antheræ. The capſule is bilocular. There is only one ſpecies, the maritima.

STEMPHYLA, a word uſed by the ancients to expreſs the huſks of grapes, or the remains of the preſſings of wine. The ſame word is alſo uſed by ſome to expreſs the remaining maſs of the olives, after the oil is preſſed out.

STEMPHYLITES, a name given by the ancients to a ſort of wine preſſed hard from the huſks.

STEMPLES, in mining, croſs bars of wood in the ſhafts which are ſunk to mines. In many places the way is to ſink a perpendicular hole, or ſhaft, the ſides of which they ſtrengthen from top to bottom with wood-work, to prevent the earth from falling in: the tranſverſe pieces of wood uſed to this purpoſe they call *ſtemples*, and by means of theſe the miners in ſome places deſcend, without uſing any rope, catching hold of theſe with their hands and feet.

STEMSON, in a ſhip, an arching piece of timber fixed within the apron, to reinforce the ſcarf thereof, in the ſame manner as the apron ſupports the ſcarf of the ſtern. In large ſhips it is uſually formed of two pieces.

STENOGRAPHY *.

CHAP. I.

THE art of ftenography, or fhort writing, was known and practifed by moft of the ancient civilized nations. The Egyptians, who were diftinguifhed for learning at an early period, at firft expreffed their words by a delineation of figures called *hieroglyphics*. A more concife mode of writing feems to have been afterwards introduced, in which only a part of the fymbol or picture was drawn. This anfwered the purpofe of fhort-hand in fome degree. After them the Hebrews, the Greeks, and the Romans, adopted different methods of abbreviating their words and fentences, fuited to their refpective languages. The initials, the finals, or radicals, often ferved for whole words; and various combinations of thefe fometimes formed a fentence. Arbitrary marks were likewife employed to determine the meaning, and to affift legibility; and it feems probable that every writer, and every author of antiquity, had fome peculiar method of abbreviation, calculated to facilitate the expreffion of his own fentiments, and intelligible only to himfelf.

It is alfo probable, that fome might by thefe means take down the heads of a difcourfe or oration; but few, very few, it is prefumed, could have followed a fpeaker through all the meanders of rhetoric, and noted with precifion every fyllable, as it dropt from his mouth, in a manner legible even to themfelves.

To arrive at fuch confummate perfection in the art was referved for more modern times, and is ftill an acquifition by no means general.

In every language of Europe, till about the clofe of the 16th century, the Roman plan of abbreviating (viz. fubftituting the initials or radicals, with the help of arbitraries, for words) appears to have been employed. Till then no regular alphabet had been invented exprefsly for ftenography, when an Englifh gentleman of the name of *Willis* invented and publifhed one. His plan was foon altered and improved, or at leaft pretended to be fo. One alteration fucceeded another; and at intervals, for a feries of years paft, fome men of ingenuity and application have compofed and publifhed fyftems of ftenography, and doubtlefs have themfelves reaped all the advantages that attend it. But among the various methods that have been propofed, and the different plans that have been adopted by individuals, none has yet appeared fortunate enough to gain general approbation; or proved fufficiently fimple, clear, and concife, to be univerfally ftudied and practifed.

Some fyftems are replete with unmeaning fymbols, perplexing arbitraries, and ill-judged contractions; which render them fo difficult to be attained by a common capacity, or ordinary application, that it is not to be wondered at if they have funk into neglect, and are now no longer known. Other fyftems, by being too prolix, by containing a multiplicity of characters, and thofe characters not fimple or eafily remembered, become ineffectual to the purpofe of expedition, and are only fuperior in obfcurity to a common hand. Some, again, not only reject all arbitraries and contractions, but even prepofitions and terminations; which laft, if not too lavifhly employed and badly devifed, highly contribute to promote both expedition and legibility; and though they reduce their characters to fewer than can poffibly exprefs the various modifications of found, yet they make nearly one half of them complex. In the difpofition of the vowels, there is the greateft perplexity in moft fyftems. A dot is fometimes fubftituted for all the vowels indifcriminately, and the judgment is left to determine which letter out of fix any dot is intended to exprefs; or a minute fpace is allotted them; fo that unlefs they be arranged with mathematical precifion they cannot be diftinguifhed from one another; but fuch a minute attention is inconfiftent with the nature of fhort-hand, which fhould teach us to write down in a fhort time, as well as in fmall bounds, what we wifh to preferve of what we hear. Nor is the plan of lifting the pen and putting the next confonant in the vowel's place, in the middle of words, lefs liable to objections; or that of reprefenting all the vowels by diftinct characters, being obvioufly ill calculated for facility and difpatch, and confequently inadmiffible into any ufeful fyftem.

It is to be confeffed, that the perfon who firft propofed the omiffion of vowels in the middle of words (A), which it is obvious are not wanted, and invented letters, which could be connected as in a running hand without lifting the pen in the middle of the word, made a real improvement on the works of his predeceffors. But, in fine, moft fyftems, either in their plan or execution, labour under fome capital defect, attended with circumftances highly difcouraging to the learner, and which in a great meafure defeat the end of their invention, by being too complicated to be learned with eafe and remembered with accuracy, or to be practifed with the expedition which is requifite; and fo difficult to be deciphered, that a man can fcarcely read what he has juft written.

To obviate thefe defects; to provide againft prolixity and concifenefs, which might occafion obfcurity; to exhibit a fyftem founded on the fimpleft principles, which might be eafily learned and read, and yet be capable of the utmoft expedition—were the motives that gave rife to the prefent attempt.

This method will be found different from any yet publifhed, and fuperior to all in the difpofition of the vowels and the facility of arranging them; the confufion in placing which feems to detract from the merit of the beft performances on the fubject; and it may be affirmed, without oftentation, that characters fimpler in their form, and more perfect in their union, have not been applied to the art of ftenography.

As well as it could be determined, the fimpleft characters are appropriated to the letters moft ufually employed: indeed, as far as poffible, thofe which are complex have been rejected; but as it was an object always kept in view that the writing fhould be on a line, a few are admitted into the alphabet for that reafon.

The characters for the double and triple confonants are the

* From Dr. Mavor's excellent work entitled, "*Univerfal Stenography.*"

(A) Mr. Byrom rejected vowels entirely in the middle of words, as others before him had only done partially. Without critically examining the executive part of his performance, which is very defective, it muft be owned, that it is above the reach of human ingenuity to exceed his general plan; which for ever muft be the bafis of every future rational fyftem.

easiest that could be invented, consistent with perspicuity (B); for care has been taken to provide against all obscurity which might arise by adopting letters too similar in their formation; and with respect to the prepositions and terminations, those which occur most frequently are expressed by the simplest characters, which will be found perfectly easy in their application.

The arbitraries are few in number (C), and the arbitrary abbreviations, as they are entirely from the letters of the alphabet, and chosen from some thousands of words in common use, will well repay the learner for an hour's trouble in committing them to memory.

The last chapter lays down a scheme of abbreviation, comprised in a few rules, perfectly easy to be understood and practised by proficients in this art, which we hope will answer the expectation of the author, and will be found free from the perplexity complained of in many systems where abbreviation is admitted. The principal rules are new, are so easy, so extensive in their use, and so consistent with expedition and legibility, if applied with judgment, that they alone might suffice. The learner is however advised by no means to adopt any of them, till experience has convinced him that they may be used without error or injury to legibility. All abbreviating rules are suited to those only who have made some progress in the stenographic art; for although they certainly promote expedition in a wonderful manner, and afford the greatest ease to a proficient, yet a learner, as expedition is not his first, though his ultimate view, should admit of nothing that in the least renders the reading difficult.

CHAP. II.

THE English alphabet consists of twenty-six letters; six of which are vowels, *a, e, i, o, u*, and *y*; and the other twenty consonants, *b, c, d, f, g, h, j, k, l, m, n, p, q, r, s, t, v, w, x*, and *z*.

This alphabet, as is observed by the best grammarians that have written on the language, is both defective and redundant in expressing the various modifications of sound.

Custom or prejudice has assigned some letters a place, when others would with much more propriety express the same sound: and to this may be added, that several letters, sometimes in one word, seem to be admitted for no other reason than to perplex a young beginner or a foreigner, as an obstruction to true pronunciation, and to add to the apparent length of the word, when they are entirely quiescent and useless. That this is the genius of the orthography of our language must be perceived by the most superficial observer; but no modern tongue is absolutely free from the same exceptions. In particular, the French has a great number of dormant letters, which, it is obvious, render the pronunciation more difficult and perplexing to learners (D).

But as it is neither our business nor our intention to propose a mode of spelling different from that in common use, when applied to printing or long-hand writing (since several innovators in orthography have fallen into contempt, and their plans have been only preserved as beacons to warn others of the folly of endeavouring to subvert established principles); we shall only observe, that in stenography, where the most expeditious and concise method is the best, if consistent with perspicuity, the following simple rules are studiously to be regarded and practised.

RULE I. All quiescent consonants in words are to be dropped; and the orthography to be directed only by the pronunciation: which being known to all, will render this art attainable by those who cannot spell with precision in long hand.

RULE II. When the absence of consonants, not entirely dormant, can be easily known, they may often be omitted without the least obscurity.

RULE III. Two or sometimes more consonants may, to promote greater expedition, be exchanged for a single one of nearly similar sound; and no ambiguity as to the meaning ensue (E).

RULE IV. When two consonants of the same kind or same sound come together, without any vowel between them, only one is to be expressed; but if a vowel or vowels intervene, both are to be written: only observe, if they are perpendicular, horizontal, or oblique lines, they must only be drawn a size longer than usual; and characters with loops must have the size of their heads doubled. See Plate 22.

Might is to be written *mit*, fight *fit*, machine *mashin*, enough *enuf*, laugh *laf*, prophet *profet*, physics *fisiks*, through *thro'*, foreign *foren*, sovereign *soveren*, psalm *sam*, receipt *reset*, write *rite*, wright *rit*, island *iland*, knavery *navery*, temptation *temtation*, knife *nife*, stick *stik*, thigh *thi*, honour *onour*, indictment *inditement*, acquaint *aquaint*, chaos *kaos*, &c.

Strength *strenth*, length *lenth*, friendship *frenship*, connect *conek*, commandment *comanment*, conjunct *conjunt*, humble *humle*, lumber *lumer*, slumber *slumer*, number *numer*, exemplary *exemlary*, &c.

Rocks *rox*, acts *aks* or *ax*, facts *faks* or *fax*, districts *distriks* or *distrix*, affects *afeks* or *afex*, afflicts *afliks* or *aflix*, conquer *konkr*, &c.

Letter *leter*, little *litle*, command *comand*, error *eror*, terror *teror*, &c. But in *remember*, *moment*, *sister*, and such like words, where two consonants of the same name have an intervening vowel, both of them must be written.

These four rules, with their examples, being carefully considered by the learner, will leave him in no doubt concerning the disposition and management of the consonants in this scheme of short-writing; we shall therefore proceed to lay down rules for the application of the vowels with ease and expedition.

RULE I. Vowels, being only simple articulate sounds, though they are the connectives of consonants, and employed in every word and every syllable, are not necessary to be inserted in the middle of words; because the consonants, if fully pronounced, with the assistance of connection, will always discover the meaning of a word, and make the writing perfectly legible.

RULE II. If a vowel is not strongly accented in the incipient syllable of a word, or if it is mute in the final, it is likewise to be omitted; because the sound of the incipient vowel is often implied in that of the first consonant, which will consequently supply its place.

(B) Those for *th* and *ch* may be either made upright or sloping to the right.

(C) These are not by any means prescribed; they may be employed or not according to the fancy of the learner.

(D) The Latin and Greek claim a just superiority over every modern tongue in this respect. In them no confusion or doubt can arise from the manner of spelling: and the reader can scarcely be wrong (unless in quantity) in sounding all the letters he sees.

(E) By this rule likewise *q* and *v* in the middle of words, but never in the beginning, may be exchanged for *k* and *f*, when they admit of an easier connection with the following character, or will make the writing appear neater.

Rule III. But if the vowel conſtitutes the firſt or laſt ſyllable of a word, or is ſtrongly accented at its beginning or end, that vowel is continually to be written.

Rule IV. If a word begins or ends with two or more vowels though ſeparated, or when there is a coalition of vowels, as in dipthongs and tripthongs; only one of them is to be expreſſed, which muſt be that which agrees beſt with the pronounciation.

Rule V. In monoſyllables, if they begin or end with a vowel, it is always to be inſerted, unleſs the vowel be *e* mute at the end of a word.

Such are the general principles of this art; in vindication and ſupport of which it will be needleſs to offer any arguments, when it is conſidered that brevity and expedition are the chief objects, if conſiſtent with legibility; and the ſubſequent ſpecimens in the orthography recommended will, we hope, be ſufficient to ſhow that there is no real deficiency in the laſt mentioned particular.

He who md us mſt be etrnl, grt, nd mnptnt. It is ur dty, as rſnl bngs, to ſrv, lv, nd oby hm.—A mn tht wd avd blm, ſhd be ſrkmſpk in al hs axns, nd ndvr wth al hs mt to pls evry bdy.—I wd nt frm any knxns wth a mn who hd no rgrd fr hmslf; nthr wd I blv a mn who hd ons tld me a li.—Onr is of al thngs the mſt dfklt to prſrv ntrnſhd; nd whn ons mpchd, lk the chſtty of a wmn, nvr ſhns wth its wntd lſtr.—Wth gd mnrs, kmplſns nd an eſy plt adrs, mny mk a fgr in the wrl, whs mntl ablts wd ſkrſly hv rsd thm abv the rnk of a ſtmn.—Idlns is the prnt of a thſnd mſfrtns, wch ar nvr ſlt by the ndſtrs: it is a pn nd a puſhmnt of itslf, nd brngs wnt nd bgry in its trn.—Vrtu is the frſt thng tht ſhd be rgrdd; it is a rwrd of itslf; mks a mn rſpktbl hr, nd wl mk hm etrnly hpy hrftr.—Prd is a mſt prnſs psn, wch yt ws plntd by hvn in ur ntr, to rs ur emlsn to imtt grt nd wrthy krktrs or axns, to xt in us a sl fr wht is rt nd gſt, nd a ldbl ndgnſn gnſt oprſrs nd wrkrs of any knd of nkty; in ſhrt, to mk us ſt a prpr vlu upn urſlvs, nd dſps a wrthls flo, hu evr xltd. Ths fr prd is a vrtu, nd my gſtly be kld a grtns of ſl. Bt prd, lk othr pſns, gnrly ſxs upn rng obgks, or is apld in rng prprſns. Hu kmn is it to ſe a rtch whm evry vs hs rndrd mſrbl, nd evry ſly kntmtbl, vlng hmſlf on hs hi brth, nd bſtng ths ilſtrs nſſtrs, of whm he nhrts nthng bt the nm or ttl! nſſtrs who if thy nu hm, wd dſn thr dpndnt wth kntmt. But al prd of this ſrt is ſly, nd evr to be avdd.

CHAP. III.

As the whole of this art depends upon a regular method and a ſimple alphabet, we have not only endeavoured to eſtabliſh the former on ſatisfactory principles, but have been careful to appropriate, according to the comparative frequency of their occurrence, ſuch characters for the letters as, after repeated trials and alterations, were conceived to be the beſt adapted for diſpatch.

The ſtenographic alphabet conſiſts of eighteen diſtinct characters (viz. two for the vowels and the reſt for the conſonants), taken from lines and ſemicircular curves; the formation and application of which we ſhall now explain, beginning with the vowels.

For the three firſt vowels, *a*, *e*, and *i*, a comma is appropriated in different poſitions; and for the other three, *o*, *u*, and *y*, a point. The comma and point, when applied to *a* and *o*, is to be placed, as in Plate 22. at the top of the next character; when for *e* and *u*, oppoſite to the middle; and when for *i* and *y*, at the bottom.

This arrangement of the vowels is the moſt ſimple and diſtinct that can eaſily be imagined. Places at the top, the middle, and the bottom of characters, which make three different poſitions, are as eaſily diſtinguiſhed from one another as any three ſeparate characters could be; and a comma is made with the ſame facility as a point.

Simple lines may be drawn four different ways; perpendicular, horizontal, and with an angle of about forty-five degrees to the right and left. An aſcending oblique line to the right, which will be perfectly diſtinct from the reſt when joined to any other character, may likewiſe be admitted. Theſe characters being the ſimpleſt in nature, are aſſigned to thoſe five conſonants which moſt frequently occur, viz. *l*, *r*, *t*, *c* hard or *k*, and *c* ſoft or *s*.

Every circle may be divided with a perpendicular and horizontal line, ſo as to form likewiſe four diſtinct characters. Theſe being the next to lines in the ſimplicity of their formation, we have appropriated them for *b*, *d*, *n*, and *m*.

The characters expreſſing nine of the conſonants are all perfectly diſtinct from one another; eight only remain which are needful, viz. *f*, *g* or *j*, *h*, *p*, *q*, *v*, *w*, and *x*. To find characters for which we muſt have recourſe to mixed curves and lines. The characters which we have adopted are the ſimpleſt in nature after thoſe already applied, admit of the eaſieſt joining, and tend to preſerve lineality and beauty in the writing.

It muſt be obſerved that we have no character for *c* when it has a hard ſound, as in *caſtle*; or ſoft, as in *city*; for it naturally takes the ſound of *k* or *s*, which in all caſes will be ſufficient to ſupply its place.

R likewiſe is repreſented by the ſame character as *l*; only with this difference, *r* is written with an aſcending ſtroke (F), and *l* with a deſcending; which is always to be known from the manner of its union with the following character; but in a few monoſyllables where *r* is the only conſonant in the word, and conſequently ſtands alone, it is to be made as is ſhown in the alphabet for diſtinction's ſake.

Z, as it is a letter ſeldom employed in the Engliſh language, and only a coarſer and harder expreſſion of *s*, muſt be ſupplied by *s* whenever it occurs; as for *Zedekiah*, write *Sedekiah*, &c.

CHAP. IV.

The prepoſitions and terminations in this ſcheme are ſo ſimple, that the greateſt benefit may be reaped from them, and very little trouble required to attain them; as the incipient letter of the incipient conſonant of all the prepoſitions and of ſeveral of the terminations is uſed to expreſs the whole. But although in Plate 22. ſufficient ſpecimens are given of the manner of their application, that the learner of leſs ingenuity or more ſlow perception may have every aſſiſtance, we have ſubjoined the following directions.

Rule I. The prepoſition is always to be written without joining, yet ſo near as plainly to ſhow what word it belongs to; and the beſt way is to obſerve the ſame order as if the whole was to be connected.

Rule II. A prepoſition, though the ſame letters that conſtitute it may be met with in the middle or end of a word, is never to be uſed, becauſe it would expoſe to obſcurity.

(F) The character for *h*, when lineality requires it, may be made from the bottom and inverted (ſee Plate 22). And often *h* may be omitted entirely, or a vowel may be ſubſtituted in its ſtead, without any injury to legibility, it being rather a breathing than letter.

Rule III. Obſerve that the prepoſition *omni* is expreſſed by the vowel *o* in its proper poſition; and for *anti*, *anta*, *ante*, by the vowel *a*, which the radical part of the word will eaſily diſtinguiſh from being only ſimple vowels.

The firſt rule for the prepoſitions is (allowing ſuch exceptions as may be ſeen in the Plate) to be obſerved for the terminations; and alſo the ſecond *mutatis mutandis*; except that whenever *ſis*, *ſus*, *ſys*, *cious*, *tious*, and *ces*, occur, they are to be expreſſed as directed in the fourth rule for the conſonants, whether in the beginning, middle, or end of words (G).

Rule IV. The terminative character for *tion*, *ſion*, *cion*, *cian*, *tian*, is to be expreſſed by a ſmall circle joined to the neareſt letter, and turned to the right; and the plurals, *tions*, *ſions*, *cions*, *cians*, *tians*, *tienee*, by a dot on the ſame ſide.

Rule V. The terminative character for *ing*, is to be expreſſed likewiſe by a ſmall circle, but drawn to the left hand; and its plural *ings* by a dot (H).

Rule VI The plural ſign *s* is to be added to the terminative characters when neceſſary.

Rule VII. The ſeparated terminations are never to be uſed but in polyſyllables or words of more ſyllables than one.

Theſe rules duly obſerved will point out a method as conciſe and elegant as can be deſired, for expreſſing the moſt frequent and longeſt prepoſitions and terminations in the Engliſh language. If it ſhould be thought neceſſary to increaſe their number by the addition of others, it will be an eaſy matter for any one of the leaſt diſcernment to do ſo, by proceeding on the principles before laid down.

CHAP. V.

Though a more conciſe method of writing, or more numerous abbreviations, may not be indiſpenſably neceſſary, if the foregoing directions be practiſed for a conſiderable time, yet contractions will be found extremely uſeful and convenient to thoſe who have attained a proper knowledge of the ſubject, and lead to a greater degree of expedition, at the ſame time that they diminiſh the labour of writing. It has been obſerved in the introduction, that abbreviations are only to be employed by proficients in this art; becauſe expedition is not the firſt, though the ultimate, object in view: and that an eaſy legibility is of the utmoſt conſequence to the learner; which, however, cannot be preſerved, if he adopts too ſoon thoſe very rules, which in time will afford him the greateſt eaſe when applied with judgment.

The following ſhort and practical rules will be found, we hope, fully adequate to every purpoſe for which they were intended, and are far ſuperior in the facility of their application to any which we have ſeen.

Rule I. The uſual abbreviations in long-hand, are always to be followed; as Mr. for Maſter, M.D. for Doctor of Phyſic, and Abp. for Archbiſhop, &c.

Rule II. Subſtantives, adjectives, verbs, and participles, when the ſenſe will direct to the meaning, are to be expreſſed by their initial conſonant with the diſtinguiſhing marks exhibited in Plate 22, viz. a ſubſtantive muſt have the dot exactly over its initial conſonant; an adjective muſt have a dot under it; a verb is to be expreſſed by a comma over its initial conſonant; and a participle by a comma under (I). Theſe being the four principal parts of ſpeech, will be ſufficient; and an adept will never be at a loſs to know when he can with ſafety apply this rule to them.

Rule III. To render the writing more legible, the laſt letter of the word may be joined to the firſt, and the proper mark applied.

Rule IV. The conſtituent or radical part of words, eſpecially if they are long, will often ſerve for the whole, or ſometimes the firſt ſyllable; as, we ought to moderate our *ex.* by our *circum.*; a man's *man.* commonly ſhape his *for.*

Rule V. All long words without exception may have their prepoſitions or terminations expreſſed by the incipient conſonant of ſuch prepoſition or termination.

Rule VI. When there is a great dependence between the parts of a ſentence, the initial letter will often ſuffice: as *L.* is the capital of Great *B.*; the eldeſt *S.* of the king of Great *B.* is ſtyled prince of *W.* Every one, it is preſumed, will allow this to be perfectly legible in long-hand, then why may it not in ſtenography?

Rule VII. The terminations *neſs* and *leſs* may be omitted; as *faithfulneſs* is only to be written *faithful; forwardneſs, forward; heedleſs, heed; ſtubbornneſs, ſtubborn*, &c.

Rule VIII. The ſecond and third perſons of verbs, ending in *eth* and *eſt*, may be expreſſed by *s;* as, he *loves*, thou *teaches*; inſtead of he *loveth*, thou *teacheſt:* or even without *s;* as, he *love*, &c.

Rule IX. Words may often be entirely omitted, and yet no ambiguity enſue; as, *In beginning God created heaven and earth*, for In *the* beginning God created *the* heaven and *the* earth.

Rule X. When there is an immediate repetition of a ſentence or word, a line is to be drawn under the ſentence or word to be repeated; as, Amen, Amen, is to written <u>*Amen;*</u> but if any words intervene before a word or ſentence is to be repeated, the line muſt be drawn as before, and a ʌ or mark of omiſſion placed where the repetition ſhould begin; as, <u>*Is it juſt the innocents ſhould be*</u> condemned ʌ reviled?

The Contents *of the* Stenographic Plate 23.

Fabricius's Reply to Pyrrhus.

As to my poverty, you have indeed, Sir, been rightly informed. My whole eſtate conſiſts in a houſe of but mean appearance, and a little ſpot of ground, from which by my own labour I draw my ſupport. But if by any means you have been perſuaded to think, that this poverty makes me leſs conſidered in my country, or in any degree unhappy, you are extremely deceived. I have no reaſon to complain of fortune, ſhe ſupplies me with all that nature requires; and if I am without ſuperfluities, I am alſo free from the deſire of them. With theſe I confeſs I ſhould be more able to ſuccour the neceſſitous, the only advantage for which the wealthy are to be envied; but as ſmall as my poſſeſſions are, I can ſtill contribute ſomething to the ſupport of the ſtate and the aſſiſtance of my friends. With regard to honours, my country places me, poor as I am, upon a level with the richeſt: for Rome knows no qualifications for great employments but virtue and ability.

(G) But in a few words where three horizontal characters meet, it will be better to expreſs the *ſis*, &c. by the ſemielliptical character in Plate 22. oppoſite *tious*.

(H) In horizontal characters, by the left hand is meant the top, and by the right the ſpace below the letter (ſee *ing* joined, Plate 22.) In all other characters the right and left poſitions will naturally be known.

(I) The dot or comma being placed thus, will never occaſion them to be miſtaken for vowels, becauſe they ſhould always be on one ſide or other; whereas the mark for parts of ſpeech muſt conſtantly be placed exactly over or under.

She appoints me to officiate in the most august ceremonies of religion; she entrusts me with the command of her armies; she confides to my care the most important negotiations. My poverty does not lessen the weight and influence of my counsels in the senate; the Roman people honour me for that very poverty which you consider as a disgrace; they know the many opportunities I have had in war to enrich myself, without incurring censure; they are convinced of my disinterested zeal for their prosperity; and if I have any thing to complain of in the return they make, it is only the excess of their applause. What value then can I set upon your gold and silver! What king can add any thing to my fortune! Always attentive to discharge the duties incumbent on me, I have a mind free from self-reproach, and I have an honest fame. *Dodsley's Preceptor.*

Letter to a Friend against Waste of Time.

Converse often with yourself, and neither lavish your time, nor suffer others to rob you of it. Many of our hours are stolen from us, and others pass insensibly away; but of both these losses the most shameful is that which happens through our own neglect. If we take the trouble to observe, we shall find that one considerable part of our life is spent in doing evil, and the other in doing nothing, or in doing what we should not do. We don't seem to know the value of time, nor how precious a day is; nor do we consider that every moment brings us nearer our end. Reflect upon this, I entreat you, and keep a strict account of time. Procrastination is the most dangerous thing in life. Nothing is properly ours but the instant we breathe in, and all the rest is nothing; it is the only good we possess; but then it is fleeting, and the first comer robs us of it. Men are so weak, that they think they oblige by giving of trifles, and yet reckon that time as nothing for which the most grateful person in the world can never make amends. Let us therefore consider time as the most valuable of all things; and every moment spent, without some improvement in virtue or some advancement in goodness, as the greatest sublunary loss.

St. Paul's Speech before Agrippa and Festus.

I think myself happy, king Agrippa, that I shall answer for myself this day before thee, touching all things whereof I am accused of the Jews; especially because I know thee to be expert in all customs and questions which are among the Jews, wherefore I beseech thee to hear me patiently. My manner of life from my youth, which was at first among my own nation at Jerusalem, know all the Jews, which knew me from the beginning (if they would testify), that, after the straitest sect of our religion I lived a Pharisee. And now I stand and am judged for the hope of the promise made by God unto our fathers: unto which promise our twelve tribes instantly serving God day and night hope to come; for which hope's sake, king Agrippa, I am accused of the Jews. Why should it be thought a thing incredible with you, that God should raise the dead, when God himself has given assurance of it unto all men, in that he hath raised Christ from the dead? As for my own part, most noble Festus, I own I once verily thought that even I myself ought to do many things contrary to the name of Jesus of Nazareth. Which thing I also did in Jerusalem. I punished the saints oft in every synagogue, and compelled them to blaspheme; and being exceedingly mad against them, I persecuted them even unto strange cities. In pursuit of which, as I went to Damascus, with authority and commission from the chief priests: at mid-day, O king, I saw in the way a light from heaven, above the brightness of the sun, shining about me, and them which journeyed with me. And when we were all fallen to the earth, I heard a voice speaking unto me, and saying in the Hebrew tongue, Saul, Saul, why persecutest thou me? It is hard for thee to kick against the pricks. And I said, Who art thou, Lord? And he said, I am Jesus whom thou persecutest. But rise, and stand upon thy feet: for I have appeared unto thee for this purpose, to make thee a minister and a witness both of these things which thou hast seen, and of those things in which I will appear unto thee. Whereupon, O king Agrippa, I was not disobedient to the heavenly vision: but shewed first unto them of Damascus, and at Jerusalem, and throughout all the coasts of Judea, and then to the Gentiles, that they should repent and turn to God. For these causes the Jews caught me in the temple, and went about to kill me. Having therefore obtained help of God, I continue unto this day, witnessing both to small and great, saying none other things than those which the prophets and Moses did say should come: that Christ should suffer, and that he should be the first that should rise from the dead, and should show light unto the people, and to the Gentiles. This is the real truth: believe me, I am no pestilent fellow, nor mover of sedition; but always endeavour all that lies in me to preserve a conscience void of offence towards God and towards man: nor can the Jews prove the things whereof they now accuse me. Neither am I, Festus, besides myself; but speak thus freely before the king, because he knows these things to be fact; yea, I am fully persuaded the king knows them all to be fact; for they were not done in a corner. King Agrippa, believest thou the prophets? I know that thou believest. And would to God that not only thou but also all that hear me this day, were altogether such as I am except these bonds. *Holmes's Rhetoric.*

Pope to Atterbury.

Once more I write to you as I promised, and this once I fear will be the last; the curtain will soon be drawn between my friend and me, and nothing left but to wish you a long good night; may you enjoy a state of repose in this life, not unlike that sleep of the soul which some have believed is to succeed it, where we lie utterly forgetful of that world from which we are gone, and ripening for that to which we are to go. If you retain any memory of the past, let it only image to you what has pleased you best; sometimes present a dream of an absent friend, or bring you back an agreeable conversation. But, upon the whole, I hope you will think less of the time past than the future; as the former has been less kind to you than the latter infallibly will be. Do not envy the world your studies: they will tend to the benefit of men, against whom you have no complaint; I mean, of all posterity: and, perhaps, at your time of life, nothing else is worth your care. What is every year of a wise man's life, but a censure or critic on the past? Those whose date is the shortest, live long enough to laugh at one half of it: the boy despises the infant, the man the boy, the philosopher both, and the Christian all. You may now begin to think your manhood was too much a puerility; and you will never suffer your age to be but a second infancy. The toys and baubles of your childhood, are hardly now more below you than those toys of our riper and our declining years; the drums and rattles of ambition, and the dirt and bubbles of avarice. At this time, when you are cut off from a little society, and made a citizen of the world at large, you should bend your talents not to serve a party, or a few, but all mankind. Your genius should mount above that mist, in which its participation and neighbourhood with earth hath long involved it: to shine abroad, and to heaven, ought to be the business and the glory of your present situation. Remem-

ber it was at ſuch a time that the greateſt lights of antiquity dazzled and blazed the moſt; in their retreat, in their exile, or in their death. But why do I talk of dazzling or blazing? it was then that they did good, that they gave light, and that they became guides to mankind. Thoſe aims alone are worthy of ſpirits truly great, and ſuch I therefore hope will be yours. Reſentment indeed may remain, perhaps cannot be quite extinguiſhed, in the nobleſt minds; but revenge will never harbour there: higher principles than thoſe of the firſt, and better principles than thoſe of the latter, will infallibly influence men whoſe thoughts and whoſe hearts are enlarged, and cauſe them to prefer the whole to any part of mankind, eſpecially to ſo ſmall a part as one's ſingle ſelf. Believe me, my Lord, I look upon you as a ſpirit entered into another life, as one juſt upon the edge of immortality, where the paſſions and affections muſt be much more exalted, and where you ought to deſpiſe all little views and all mean retroſpects. Nothing is worth your looking back; and therefore look forward, and make (as you can) the world look after you; but take care it be not with pity, but with eſteem and admiration. I am, with the greateſt ſincerity and paſſion for your fame as well as happineſs, your, &c.

The above moſt charming and moſt affectionate letter, was written about a month before Atterbury, biſhop of Rocheſter, was ſent into baniſhment, and is univerſally admired.

STENTOROPHONIC TUBE, a ſpeaking trumpet; thus called from Stentor, a perſon mentioned by Homer. See TRUMPET.

STEP, in a ſhip, a block of wood fixed on the decks or bottom of a ſhip, and having a hole in its upper ſide, fitted to receive the heel of a maſt or capſtern. The ſteps of the main and foremaſts of every ſhip reſt upon the kelſon, to which they are firmly ſecured by knees, bolts, or ſpike-nails. The ſtep of the mizen-maſt uſually reſts upon the lower deck.

STEPHANIUM, in botany: a genus of the *monogynia* order, belonging to the *pentandria* claſs of plants; and in the natural method ranking under the 47th order, *Stellatæ*. The calyx is monophyllous, turbinated, and quinquepartite; the corolla is monopetalous, funnel-ſhaped, having its tubes curved and ventricoſe: the pericarpium is a bilocular berry containing two ſeeds, flattened on one ſide and round on the other. This genus is nearly allied to that of *Pſychotria*. There is only one ſpecies, viz. *Guianenſe*, a native of the warmer parts of America.

STEPHANOPHORUS, in antiquity, the chief prieſt of Pallas, who preſided over the reſt. It was uſual for every god to have a chief prieſt; that of Pallas was the Stephanophorus juſt mentioned, and that of Hercules was called Dadouchus.—Stephanophorus was alſo a prieſt that aſſiſted the women in the celebration of the feſtival Theſmophoria.

STEPHANUS (Byzantinus), an able grammarian, who lived in the fifth or ſixth century. He wrote a Dictionary, in which he made a great number of obſervations, borrowed from mythology and hiſtory, which ſhowed the origin of cities and colonies, of which we have nothing remaining but a mean abridgment by Hermolaus the grammarian; but from that work the learned have received great light; and Sigonius, Caſaubon, Scaliger, Salmaſius, &c. have employed themſelves in illuſtrating it.

STEPHEN, or *St. Stephen's Day*, a feſtival of the Chriſtian church, obſerved on the 26th of December, in memory of the firſt martyr St. Stephen.

STEPHENS, a family of printers, deſervedly celebrated. They flouriſhed at the revival of learning, and contributed a great deal towards diſpelling the cloud of ignorance which had ſo long overſhadowed Europe. Some of the claſſics before the ſixteenth century were in a great meaſure loſt, and all of them were exceedingly corrupted. By their abilities and indefatigable induſtry theſe defects were ſupplied, and the learned were furniſhed with beautiful and correct editions of the Greek and Roman authors. Thus the world was not only ſupplied with an inexhauſtible fund of amuſement and inſtruction in theſe ancient writings; but it is to the ardour which they inſpired, and to the model of elegance which they diſplayed, that the preſent advanced ſtate of literature is in a great meaſure owing.

HENRY STEPHENS, the firſt of theſe illuſtrious men, was born in France, ſoon after the diſcovery of printing, perhaps about the year 1465. He ſettled as a printer at Paris, and was probably patronized by Louis XII. A great proportion of the books which he publiſhed, were Latin: they are printed in the Roman letter, and are not inelegant, though ſome of them abound rather too much in contractions. He died about the year 1520, and left behind him three ſons, Francis, Robert, and Charles. His widow married Simon de Colines (*Colinæus* in Latin), who thus got poſſeſſion of Henry's printing-houſe, and continued the profeſſion till his death.

Of FRANCIS, the eldeſt ſon, little more is known than that he carried on buſineſs along with his father-in-law Colinæus, and that he died at Paris in 1550.

ROBERT STEPHENS, the ſecond ſon, was born in 1503. In his youth he made great proficiency in the Roman, Greek, and Hebrew languages, and at the age of nineteen had acquired ſo much knowledge, that his father-in-law entruſted him with the management of his preſs. An edition of the New Teſtament was publiſhed under his inſpection, which gave great offence to the Paris divines, who accuſed him of hereſy, and threatened to prevent the ſale of the book. Soon after he began buſineſs himſelf, and married Perrete, the daughter of Jodocus Badius, a printer and an author. She was a woman of learning, and underſtood Latin, which indeed was the neceſſary conſequence of her ſituation. Her huſband always entertained a number of learned men as correctors of the preſs: being foreigners, and of different nations, they made uſe of no other language but Latin; which Perrete being accuſtomed to hear, was able in a ſhort time not only to underſtand, but even to ſpeak with tolerable eaſe.

In 1531 he publiſhed his Latin "Theſaurus;" a work of great importance, which he laboured at for two years. The mark which he put upon all his books was a tree branched, with a man looking upon it, and theſe words *noli altum ſapere*, to which he ſometimes added *ſed time*. In 1539 Francis I. made him his printer, and ordered a new ſet of elegant types to be founded for him. His frequent editions of the New Teſtament gave great offence to the doctors of the Sorbonne, who accuſed him of hereſy for his annotations, and inſiſted upon the ſuppreſſion of ſome of his books. Although Henry, the French king, in ſome meaſure protected him, the perſecution of theſe divines rendered him ſo unhappy, not to mention the expence and loſs of time which an almoſt conſtant attendance at court unavoidably occaſioned, that in 1552 he

abandoned his country and went to Geneva. Here he embraced the Proteſtant religion, and thus juſtified in ſome meaſure the ſuſpicions of his theological enemies. It has been affirmed by ſeveral writers that he carried along with him the royal types, and the moulds alſo in which they were caſt; but it is certain that he never afterwards made uſe of thoſe types. Beſides, is it poſſible that the author of ſo daring a theft could have been not only protected in Geneva, but even courted and honoured by the moſt eminent men of the age? Is it credible that ſuch a crime could have been concealed for ſixty years; or that Henry, the ſon and heir of the perpetrator, would have enjoyed the favour of the French king, if Robert Stephens had acted ſuch a ſhameful part? If he was burnt in effigy at Paris, it was not for theft, but for having changed his religion. After his arrival at Geneva, he publiſhed an account of the diſpute between him and the Paris divines, which does as much honour to his abilities, as his *Theſaurus* does to his learning. He died in 1559, after a life of the moſt extraordinary induſtry. The books of which he was the editor, were not fewer than 360. Many of them were ancient claſſics in different languages. Several were accompanied with annotations which he collected, and all of them were corrected by collating manuſcripts. He was ſo anxious to attain perfect accuracy, that he uſed to expoſe his proofs in public, and reward thoſe who diſcovered a miſtake. His books conſequently were very correct. It is ſaid that his New Teſtament, called *O Mirificam* (becauſe the preface begins with theſe words), has not a ſingle fault.

It was Robert Stephens who firſt divided the New Teſtament into verſes, during a journey between Paris and Lyons. The advantages of this improvement are fully counterbalanced by its defects. It has deſtroyed the unity of the books, and induced many commentators to conſider every verſe as a diſtinct and independent aphoriſm. To this in ſome meaſure is to be aſcribed the many abſurd interpretations and creeds that have been forced out of that book.

By his laſt will his eſtate was left excluſively to ſuch of his children as ſhould ſettle at Geneva. He left behind him three ſons, Henry, Robert, and Francis.

Charles Stephens, the third ſon of Henry, was, like the reſt of his family, familiarly acquainted with the learned languages. This recommended him to Lazarus de Baif, who made him tutor to his ſon, and in 1540 carried him along with him to Germany. He ſtudied medicine, and practiſed it with ſucceſs in France. He did not, however, forſake the profeſſion of his family, but exerciſed it in Paris, where he became the editor of many books remarkable for neatneſs and elegance. He wrote above thirty treatiſes on different ſubjects, particularly on botany, anatomy, and hiſtory. He died in 1564.

Robert Stephens, the ſon of Robert the firſt of that name, did not accompany his father to Geneva, but continued to profeſs the Catholic religion, and to reſide at Paris. His letter was remarkably beautiful.—He was made king's printer, and died about 1589.

His brother Francis was alſo a printer. He embraced the Proteſtant religion, and reſided at Geneva.

Henry Stephens, the remaining ſon of Robert, was born at Paris in 1528. He became the moſt learned and moſt celebrated of all his family. From his very birth almoſt he gave proofs of uncommon abilities, and diſplayed an ardent paſſion for knowledge. The Medea of Euripides, which he ſaw acted while at ſchool, firſt kindled his love for poetry, and inſpired him with the deſire of acquiring the language in which that tragedy is written. He intreated his father not to condemn him to ſtudy Latin, which he already underſtood from converſation, but to initiate him at once into the knowledge of Greek. His father willingly granted his requeſt; and Henry applied with ſuch vigour, that in a ſhort time he could repeat the Medea by art. He afterwards ſtudied Greek under Peter Daneſius, who was tutor to the Dauphin, and finally heard the lectures of Tuſanus and Turnebus. He became eager at an early age to underſtand aſtrology, and accordingly attended a profeſſor of that myſterious art; but he was not long in diſcovering its abſurdity. At nineteen he began his travels, which he undertook in order to examine foreign libraries, and to become acquainted with learned men. He ſpent two years in Italy, and returned into France completely maſter of Italian, and bringing along with him copies of ſeveral ſcarce authors, particularly a part of Anacreon, which before was thought loſt.

He found his father publiſhing an edition of the New Teſtament, to which he prefixed ſome Greek verſes.—Soon after, he viſited England and the Netherlands, where he met with John Clement, an Engliſhman, to whom he was indebted for the remaining odes of Anacreon. During this journey he learned the Spaniſh language, which was very much ſpoken at that time in the Low Countries.

Whether Henry accompanied his father to Geneva or not, is uncertain; at leaſt he muſt have returned immediately to France, for we find him ſoon after eſtabliſhed at Paris, and publiſhing the odes of Anacreon. In 1554 he went to Rome, and thence to Naples. This journey was undertaken at the requeſt, and in the ſervice, of the French government. He was diſcovered, and would have been arreſted as a ſpy, had he not by his addreſs and ſkill in the language of the country, been able to paſs himſelf for a native of Italy. On his return to France, he aſſumed the title of printer to Ulric Fugger, a very rich and learned German nobleman, who allowed him a conſiderable penſion.

In 1560 he married a relation, as is generally ſuppoſed, of Henry Scrimigeour, a Scotch nobleman, with whom he was intimately acquainted. She was a woman, as he himſelf informs us, endowed with the nobleſt ſpirit and the moſt amiable diſpoſitions. Her death, which happened in 1566, brought on a diſeaſe that had twice attacked him before. It was a diſguſt at all thoſe purſuits which had formerly charmed him, an averſion to reading and the ſight of books. It was probably occaſioned by too conſtant and ſevere an application to literary purſuits. In 1572 he publiſhed his *Theſaurus Linguæ Græcæ*, one of the greateſt works, perhaps, that ever was executed by one man, if we conſider the wretched materials which more ancient dictionaries could furniſh, if we conſider the ſize and perfection of the work, and the immenſe labour and learning which muſt have been employed in the compilation. This work had been carried on at a greater expence than he could well bear. He expected to be reimburſed by the ſale of the book, but he was unfortunately diſappointed. John Scapula, one of his own ſervants, extracted from it whatever he thought would be moſt ſerviceable to ſtudents, and publiſhed it beforehand in 4to. By this act of treachery Henry was reduced to poverty.

About this time he was much beloved by Henry III. of France, who treated him ſo kindly, and made him ſuch flattering promiſes, that he reſided frequently at court. But theſe promiſes were never fulfilled, owing to the civil wars which ſoon after diſtracted France, and the unfortunate death of king Henry himſelf. During the remainder of his life his ſituation was very unſettled. We find him ſometimes at Paris, ſometimes in Geneva, in Germany, and even in Hungary. He died at Lyons in 1598, at the age of ſeventy. He was fond of poetry from his very infancy. It was a cuſtom of his to compoſe verſes on horſeback, and even to write them, though he generally rode a very mettleſome ſteed. His

Thesaurus was his great work, but he was alſo the author of ſeveral other treatiſes. His poems are numerous: his Apology for Herodotus is a witty ſatire on the Roman Catholics. His Concordance to the New Teſtament muſt have been a laborious work, and has deſervedly endeared him to every Chriſtian who wiſhes to acquire a rational and critical knowledge of the Scriptures. The number of books which he publiſhed, though fewer than his father, was great, and ſuperior in elegance to any thing which the world had then ſeen. A great proportion of them were Greek; he was the editor, however, of many Roman and even of ſome eaſtern writings. His Greek claſſics are remarkably correct; the principal of them are Homer, Anacreon, Æſchylus, Maximus Tyrius, Diodorus Siculus, Pindar, Xenophon, Thucydides, Herodotus, Sophocles, Diogenes Laertius, Plutarch, Plato, Apollonius Rhodius, Æſchynes, Lyſias, Callimachus, Theocritus, Herodian, Dionyſius Hallicarnaſſenſis, Dion Caſſius, Iſocrates, Appian, Xiphilin, &c. His temper in the latter part of his life is repreſented as haughty and ſevere, owing probably to his diſappointments. He left behind him a ſon and two daughters, one of whom was married to the learned Iſaac Caſaubon.

Paul Stephens, the ſon of Henry, continued his father's profeſſion at Geneva. He was a man of learning, and wrote tranſlations of ſeveral books, and publiſhed a conſiderable number of the ancient claſſics; but his editions poſſeſs little of his father's elegance. He died in 1627, at the age of ſixty, after ſelling his types to one Chouet a printer.—His ſon Antony, the laſt printer of the family, abandoned the Proteſtant religion, and returned to France, the country of his anceſtors. He received letters of naturalization in 1612, and was made printer to the king; but managing his affairs ill, he was reduced to poverty, and obliged to retire into an hoſpital, where he died in 1674, miſerable and blind, at the age of eighty.

STERCORARIANS, or Stercoranistæ, formed from *ſtercus* "dung," a name which thoſe of the Romiſh church anciently gave to ſuch as held that the hoſt was liable to digeſtion, and all its conſequences, like other food.

STERCULIA, in botany: a genus of plants belonging to the claſs of *monœcia*, and order of *monodelphia*; and in the natural ſyſtem ranging under the 38th order, *tricoccece*. The male calyx is quinquepartite; there is no corolla, but there are fifteen filaments. The female calyx is quinquepartite; there is no corolla; the germen is placed on a pillar, and the capſule is quinquelocular, and many-ſeeded. There are three ſpecies, the balanghas, fœtida, and platanifolium, all foreign plants.

STEREOGRAPHIC projection, is the projection of the circles of the ſphere on the plane of ſome one great circle, the eye being placed in the pole of that circle. See Projection *of the Sphere*.

STEREOMETRY, Στερεομετρια, formed of ϛερεος *ſolid*, and μετρον *meaſure*, that part of geometry which teaches how to meaſure ſolid bodies, *i. e.* to find the ſolidity or ſolid contents of bodies; as globes, cylinders, cubes, veſſels, ſhips, &c.

STEREOTOMY, formed from ϛερεος, and τομη, *ſection*, the art or act of cutting ſolids, or making ſections thereof; as walls and other membranes in the profiles of architecture.

STERILITY, barrenneſs, in oppoſition to fertility. It has been aſſerted by many authors, that all monſters produced by a mixture of different ſpecies of animals, ſuch as mules, are barren; but this does not hold univerſally, even with the mule, which is the inſtance moſt generally adduced. See Mule. Sterility in women ſometimes happens from a miſcarriage, or violent labour injuring ſome of the genital parts; but one of the moſt frequent cauſes is the ſuppreſſion of the menſtrual flux.—There are other cauſes ariſing from various diſeaſes incident to thoſe parts; by which the uterus may be unfit to receive or retain the male ſeed;—from the tubæ fallopianæ being too ſhort, or having loſt their erective power; in either of which caſes no conception can take place;—from univerſal debility and relaxation; or a local debility of the genital ſyſtem; by which means, the parts having loſt their tone or contractile power, the ſemen is thrown off immediately *poſt coitum*;—from imperforation of the vagina, the uterus, or the *tubæ*, or from diſeaſed ovas, &c. Hence medical treatment can only avail in caſes ariſing from topical or univerſal debility; in correcting irregularities of the menſtrual flux, or in removing tumors, cicatrices, or conſtrictions of the paſſage, by the art of ſurgery.

STERIS, in botany: a genus of plants belonging to the claſs of *pentandria*, and order of *digynia*. The calyx is quinquepartite; the corolla wheel-ſhaped; the berry is unilocular, and many-ſeeded. There is only one ſpecies, the javana, a foreign plant.

STERLING, an epithet by which genuine Engliſh money is diſtinguiſhed. It is unneceſſary to mention the various conjectures of antiquaries about the origin and meaning of this appellation. The moſt probable opinion ſeems to be this, that ſome artiſts from Germany, who were called *Eſterlings*, from the ſituation of their country, had been employed in fabricating our money, which conſiſted chiefly of ſilver pennies; and that from them the penny was called an *eſterling*, and our money *eſterling* or *ſterling* money.

STERN, the poſterior face of a ſhip; or that part which is repreſented to the view of a ſpectator, placed on the continuation of the keel behind, as exhibited in Plate 12. fig. 5, 6. The ſtern, fig. 5. is terminated above by the taffarel, and below by the counters: it is limited on the ſides by the quarter-pieces; and the intermediate ſpace comprehends the galleries and windows of the different cabins. This figure exhibits the ſtern of a 74-gun ſhip A, the keel, with *a* the falſe keel beneath it. A B, the ſtern-poſt. C, the rail which determines the height of the counters. D D, the upper and lower quarter-galleries, with their baluſtrades and windows. E, the quarter-pieces: and P F P, the taffarel. K G K, the lower counter, with H H, its gun-ports. G, the rail which ſeparates the lower counter from the ſecond or upper counter; which laſt is included between G and C. K K, the wing-tranſom. L L, the deck-tranſom. M, N, O, firſt, ſecond, and third tranſoms; the 4th, 5th, and 6th tranſoms are placed immediately under theſe: and that which lies between the wing and deck tranſoms, is called the *filling-tranſom*. O M L K P, the direction of the faſhion-piece, whoſe upper part is expreſſed by the dotted lines K P. Q, the cove, a ſort of arched canopy, ſerving as a roof to the ſtern-gallery. R Q R, the ſcreen bulk-head, or partition, containing the cabin-windows. R S S R, the baluſtrade of the ſtern-gallery, with S S, the foot pace-rail, which determines the height of its floor, or platform, S C S, the ward-room windows. T, the lower finiſhing of the quarter gallery.

Fig. 6. exhibits a ſtern-view of a 60-gun ſhip, with the curve of the frame-timbers on one ſide, and the diſpoſition of all the planks of the bottom. See Quarter *of a Ship*, Ship, and Ship-building.

Stern-*Faſt*, a rope uſed to confine the ſtern of a ſhip or boat to any wharf or jetty-head, &c.

Stern-*Moſt*, in ſea language, uſually denotes that part of a fleet of ſhips which is in the rear, or fartheſt a-ſtern, as oppoſed to head-moſt.

Stern-*Poſt*, a long ſtraight piece of timber erected on the extremity of the keel, to ſuſtain the rudder and terminate the ſhip behind. This piece, which is expreſſed by B in the pieces of the hull, Plate 12. fig. 3. ought to be well ſecured

and ſupported; becauſe the ends of all the lower planks of the ſhip's bottom are fixed in a channel, cut on its ſurface; and the whole weight of the rudder is ſuſtained by it.

Stern-*Sheets*, that part of a boat which is contained between the ſtern and the aftmoſt or hindmoſt ſeat of the rowers. It is generally furniſhed with benches to accommodate the paſſengers. See Boat.

STERNA, the Tern; a genus of birds arranged under the order of *palmipedes*. The marks of this genus are a ſtraight, ſlender, pointed bill, linear noſtrils, a ſlender and ſharp tongue, very long wings, a ſmall back toe, and a forked tail. There are twenty-five ſpecies, according to Dr. Latham; the caſpia, cayana, ſurinamenſis, fuliginoſa, africana, ſtolida, philippina, ſimplex, nilotica, boyſii, ſtriata, vittata, ſpadicea, piſcata, hirundo, panaya, cinerea, alba, minuta, ſinenſis, auſtralis, metopoleucos, fiſſipes, nigra, and obſcura. Three of theſe only are found in Great Britain; the hirundo, minuta, and fiſſipes.

1. The *hirundo*, common tern, or great ſea-ſwallow, weighs four ounces one quarter; the length is fourteen inches; the breadth thirty; the bill and feet are of a fine crimſon; the former tipt with black, ſtraight, ſlender, and ſharp-pointed; the crown, and hind part of the head, black; the throat, and whole underſide of the body, white; the upper part, and the coverts of the wings, a fine pale grey. The tail conſiſts of twelve feathers; the exterior edges of the three outmoſt are grey, the reſt white; the exterior on each ſide is two inches longer than the others: in flying, the bird frequently cloſes them together, ſo as to make them appear one ſlender feather.

This is a very common ſpecies; frequents our ſea-coaſts and banks of lakes and rivers during the ſummer, but moſt common in the neighbourhood of the ſea. It is found alſo in various parts of Europe and Aſia, according to the ſeaſon; in the ſummer as far as Greenland and Spitzbergen, migrating in turn to the ſouth of Auſtria and Greece. It lays three or four eggs about the month of June, of a dull olive colour, an inch and three quarters in length, marked with irregular black ſpots, intermixed with ſome others of a ſmaller ſize and leſs bright; the little end is almoſt free from any markings. Theſe are laid among the graſs or moſs. The young are hatched in July, and quit the neſt very ſoon after. They are carefully fed by their parents, and fly in about ſix weeks. This bird appears to have all the actions on the water which the ſwallow has on land, ſkimming on the ſurface, and ſeizing on every inſect which comes in its way; beſides which, the moment it ſpies a fiſh in the water, it darts into that element, and ſeizing its prey ariſes as quickly to the place from which it dipped.

Theſe birds are alſo found in America; come into New England in May, and go away in autumn, and are called there the mackarel gull. At Hudſon's Bay they are known by the name of black-head. They are obſerved to lay their eggs in ſmall hollows on the ſhore, ſometimes lined with a few leaves. They are often found in great numbers on the iſlets in the middle of the rivers, and are thought good eating. The natives of Hudſon's Bay call them *Kenouch cne ou keaſk*. They are bold, not fearing mankind, and in the time of incubation will attack any one, frequently darting down ſo as to touch a perſon's hat, without his giving the leaſt offence.

2. The *minuta*, or ſmaller ſea ſwallow (called by Linnæus *larus minuta*), weighs only two ounces five grains; the length eight inches and a half; the breadth nineteen and a half. The bill is yellow, tipt with black; the forehead and cheeks white; from the eyes to the bill is a black line; the top of the head and hind part black; the breaſt and under ſide of the body clothed with feathers ſo cloſely ſet together, and of ſuch an exquiſite rich gloſs and ſo fine a white, that no ſatin can be compared to it: the back and wings of a pale grey: the tail ſhort, leſs forked than that of the former, and white: the legs yellow: the irides duſky.—Theſe two ſpecies are very delicate, and ſeem unable to bear the inclemency of the weather on our ſhores during winter, for we obſerve that they quit their breeding places at the approach of it, and do not return till ſpring. The manners, haunts, and food, of this ſpecies are the ſame with thoſe of the former; but they are far leſs numerous.

3. The *fiſſipes*, or black tern, is of a middle ſize between the firſt and ſecond ſpecies. The uſual length is ten inches; the breadth 24; the weight two ounces and a half. The head, neck, breaſt, and belly, as far as the vent, are black; beyond is white; the male has a white ſpot under its chin; the back and wings are of a deep aſh colour: the tail is ſhort and forked; the exterior feather on each ſide is white; the others aſh-coloured: the legs and feet of a duſky red. Mr. Ray calls this a *cloven-footed gull*, as the webs are depreſſed in the middle, and form a creſcent. Theſe birds frequent freſh waters, breed on their banks, and lay three ſmall eggs of a deep olive colour, much ſpotted with black. They are found during ſpring and ſummer in vaſt numbers in the Fens of Lincolnſhire, make an inceſſant noiſe, and feed on flies as well as water inſects and ſmall fiſh. Birds of this ſpecies are ſeen very remote from land. Kalm ſaw flocks of hundreds in the Atlantic Ocean, midway between England and America, and a later voyager ſaw one 240 leagues from the Lizard, in the ſame ocean.

STERNE (Laurence), an Engliſh writer of a very peculiar caſt, was born at Clomwell, in the ſouth of Ireland, on 24th November, 1713. His father, Roger Sterne, was the grandſon of Sterne archbiſhop of York, who has been ſuppoſed, we know not upon what grounds, to have been the author of the excellent book intitled "The Whole Duty of Man." Laurence inherited nothing of his anceſtor's manner of writing, but rather reſembled Rabelais, whoſe wit he carried with him even into the pulpit.

In 1722 he was ſent to ſchool at Halifax in Yorkſhire, where he continued till 1732, when he was removed to Jeſus College in Cambridge. How long he reſided in college, or what progreſs he made in literature or ſcience, is not known: his works diſplay rather native genius than profound erudition. Upon quitting the univerſity he went to York, and being in orders was preſented to the living of Sutton by the intereſt of his uncle Dr. Sterne, a prebendary of that church. In 1741 he married, and was ſoon afterwards made a prebendary of York, by the intereſt alſo of his uncle, who was then upon very good terms with him; but "quickly quarrelled with him (he ſays), and became his bittereſt enemy, becauſe he would not be a party man, and write paragraphs in the newſpapers." By his wife's means he got the living of Stillington, but remained near twenty years at Sutton, doing duty at both places. He was then in very good health, which, however, ſoon after forſook him; and books, painting, fiddling, and ſhooting, were, as he tells us, his amuſements.

In 1760 he went to London to publiſh his two firſt volumes of "Triſtram Shandy;" and was that year preſented to the curacy of Coxwold. In 1762 he went to France, and two years after to Italy, for the recovery of his health; but his health never was recovered. He languiſhed under a conſumption of the lungs, without the ſlighteſt depreſſion of ſpirits, till 1768, when death put a period to his terreſtrial exiſtence.

The works of Sterne are very generally read. They conſiſt of, 1. The Life and Opinions of Triſtram Shandy; 2. Sermons; 3. A Sentimental Journey; 4. Letters, publiſhed ſince his death. In every ſerious page, and in many of much

levity, the author writes in praiſe of benevolence, and declares that no one who knew him could ſuppoſe him one of thoſe wretches who heap misfortune upon misfortune: but we have heard anecdotes of him extremely well authenticated, which proved that it was eaſier for him to praiſe this virtue than to practiſe it. His wit is univerſally allowed; but many readers have perſuaded themſelves that they found wit in his blank pages, while it is probable that he intended nothing but to amuſe himſelf with the idea of the ſage conjectures to which theſe pages would give occaſion. Even his originality is not ſuch as is generally ſuppoſed by thoſe fond admirers of the Shandean manner, who have preſumed to compare him with Swift, Arbuthnot, and Butler. He has borrowed both matter and manner from various authors, as every reader may be convinced by the learned, elegant, and candid comments on his works, publiſhed by Dr. Ferrier, in the fourth volume of the Memoirs of the Literary and Philoſophical Society of Mancheſter.

STERNOCOSTALES, commonly called the *muſculi triangulares ſterni*, in anatomy, are five pairs of fleſhy planes, diſpoſed more or leſs obliquely on each ſide the ſternum, on the inſides of the carlilages of the ſecond, third, fourth, fifth, and ſixth true ribs.

STERNO-HYOIDÆUS, in anatomy. See *Table of the Muſcles*, under the article ANATOMY.

STERNOMANTIS, in antiquity, a deſignation given to the Delphian prieſteſs, more uſually called PYTHIA.—Sternomantis is alſo uſed for any one that had a propheſying demon within him.

STERNOMASTOIDÆUS, a muſcle. See *Table of the Muſcles*, under ANATOMY.

STERNOTHYRCIDEUS, a muſcle. See *Table of the Muſcles*, under ANATOMY.

STERNUM. See ANATOMY.

STERNUTATIVE, or STERNUTATORY, a medicine proper to produce ſneezing. See SNEEZING.

STETTIN, a town of Germany, in the circle of Upper Saxony, in Anterior Pomerania, and capital of that part which belongs to Pruſſia, ſituated on the river Oder, which here divides it into four branches. It is large, handſome, and well fortified, with ſeveral manufactures; a dock for building of ſhips. The inhabitants carry on a great trade with England, Holland, France, Spain, Denmark, Sweden, Norway, Pruſſia, Dantzig, Mecklenburg, Lubeck, and Hamburg. Stettin contains five pariſh churches, a college of phyſicians, with a board of health, a chamber of commerce, a court of admiralty, &c. 1400 houſes, and about 20,000 inhabitants: fourteen miles WNW. Stargard, and ſeventy-four W. New Stettin. Long. 32. 18. E. Ferro. Lat. 53. 23. N.

STEW, a ſmall kind of fiſh-pond, the peculiar uſe of which is to maintain fiſh, and keep them in readineſs for the daily uſe of the family, &c.

STEWS (from the French *eſtuves*, i. e. *thermæ, balneum*), thoſe places which were permitted in England to women of profeſſed incontinency, and that for hire would proſtitute their bodies to all comers; ſo called, becauſe diſſolute perſons are wont to prepare themſelves for venereous acts by bathing; and hot baths were by Homer reckoned among the effeminate ſort of pleaſures. Theſe ſtews were ſuppreſſed by King Hen. VIII. about the year 1546.

STEWARD (*ſeneſcallus*, compounded of the Saxon *ſteda*, i. e. "room;" or *ſtead* and *weard*, "a ward" or "keeper"), an officer appointed in another's ſtead or place, and always taken for a principal officer within his juriſdiction. Of theſe there are various kinds. The greateſt officer under the crown is the lord high-ſteward of England, an office that was anciently the inheritance of the earls of Leiceſter, till forfeited by Simon de Mountfort to King Henry III. But the power of this officer is ſo very great, that it has not been judged ſafe to truſt it any longer in the hands of a ſubject, excepting only *pro hac vice*, occaſionally: as to officiate at a coronation, at the arraignment of a nobleman for high-treaſon, or the like. During his office, the ſteward bears a white ſtaff in his hand; and the trial, &c. ended, he breaks the ſtaff, and with it his commiſſion expires. There is likewiſe a lord-ſteward of the king's houſehold, who is the chief officer of the king's court, has the care of the king's houſe, and authority over all the officers and ſervants of the houſehold, except ſuch as belong to the chapel, chamber, and ſtable.

STEWARD, an officer in a ſhip of war, appointed by the purſer to diſtribute the different ſpecies of proviſions to the officers and crew; for which purpoſe he is furniſhed with a mate and proper aſſiſtants.

Court of the Lord High STEWARD *of Great Britain*, is a court inſtituted for the trial of peers indicted for treaſon or felony, or for miſpriſion of either. The office of this great magiſtrate is very ancient, and was formerly hereditary, or at leaſt held for life, or *dum bene ſe geſſerit*: but now it is uſually, and hath been for many centuries paſt, granted *pro hac vice* only; and it hath been the conſtant practice (and therefore ſeems now to have become neceſſary) to grant it to a lord of parliament, elſe he is incapable to try ſuch delinquent peer. When ſuch an indictment is therefore found by a grand jury of freeholders in the King's-bench, or at the aſſizes before the juſtices of *oyer* and *terminer*, it is to be removed by a writ of *certiorari* into the court of the lord high-ſteward, which has the only power to determine it. A peer may plead a pardon before the court of King's-bench, and the judges have power to allow it, in order to prevent the trouble of appointing an high-ſteward merely for the purpoſe of receiving ſuch plea: but he may not plead in that inferior court any other plea, as guilty or not guilty of the indictment, but only in this court; becauſe, in conſequence of ſuch plea, it is poſſible that judgment of death might be awarded againſt him. The king, therefore, in caſe a peer be indicted of treaſon, felony, or miſpriſion, creates a lord high-ſteward *pro hac vice* by commiſſion under the great ſeal; which recites the indictment ſo found, and gives his Grace power to receive and try it *ſecundum legem et conſuetudinem Angliæ*. Then when the indictment is regularly removed by writ of *certiorari*, commanding the inferior court to certify it up to him, the lord high-ſteward directs a precept to a ſergeant at arms, to ſummon the lords to attend and try the indicted peer. This precept was formerly iſſued to ſummon only eighteen or twenty ſelected from the body of the peers; then the number came to be indefinite; and the cuſtom was for the lord high-ſteward to ſummon as many as he thought proper (but of late years not leſs than twenty-three); and that thoſe lords only ſhould ſit upon the trial; which threw a monſtrous weight of power into the hands of the crown, and this its great officer, of ſelecting only ſuch peers as the then predominant party ſhould moſt approve of. And accordingly, when the earl of Clarendon fell into diſgrace with Charles II. there was a deſign formed to prorogue the parliament, in order to try him by a ſelect number of peers; it being doubted whether the whole houſe could be induced to fall in with the views of the court. But now, by ſtatute 7 W. III. c. 3. upon all trials of peers for treaſon or miſpriſion, all the peers who have a right to ſit and vote in parliament ſhall be ſummoned at leaſt twenty days before ſuch trial, to appear and vote therein; and every lord appearing ſhall vote in the trial of ſuch peer, firſt taking the oaths of allegiance and ſupremacy, and ſubſcribing the declaration againſt popery.

During the ſeſſion of parliament, the trial of an indicted

peer is not properly in the court of the lord high-ſteward, but before the court laſt mentioned of our lord the king in parliament. It is true, a lord high-ſteward is always appointed in that caſe to regulate and add weight to the proceedings: but he is rather in the nature of a ſpeaker *pro tempore*, or chairman of the court, than the judge of it; for the collective body of the peers are therein the judges both of law and fact, and the high-ſteward has a vote with the reſt in right of his peerage. But in the court of the lord high-ſteward, which is held in the receſs of parliament, he is the ſole judge of matters of law, as the lords triors are in matters of fact; and as they may not interfere with him in regulating the proceedings of the court, ſo he has no right to intermix with them in giving any vote upon the trial. Therefore, upon the conviction and attainder of a peer for murder in full parliament, it hath been holden by the judges, that in caſe the day appointed in the judgment for execution ſhould lapſe before execution done, a new time of execution may be appointed by either the high court of parliament during its ſitting, though no high-ſteward be exiſting, or, in the receſs of parliament, by the court of King's bench, the record being removed into that court.

It has been a point of ſome controverſy, whether the biſhops have now a right to ſit in the court of the lord high-ſteward to try indictments of treaſon and miſpriſion. However, there is no inſtance of their ſitting on trials for capital offences, even upon impeachments or indictments in full parliament, much leſs in the court we are now treating of; for indeed they uſually withdraw voluntarily, but enter a proteſt, declaring their right to ſtay.

STEWARTIA, in botany: a genus of plants belonging to the claſs of *monodelphia*, and order of *polyandria*; and in the natural ſyſtem ranging under the 37th order, *Columniferæ*. The calyx is ſimple; the ſtyle is ſimple, with a quinquefid ſtigma; the apple is without juice, quinquelobed, monoſpermous, burſting open with a ſpring five ways. There is only one ſpecies, the *malacodendron*, which is a foreign plant.

STIBADIUM, among the Romans, a low kind of table couch or bed of a circular form, which ſucceeded to the triclinia, and was of different ſizes, according to the number of gueſts they were deſigned for. They were called *hexaclina*, *octaclina*, or *enneaclina*, according as they held ſix, eight, or nine gueſts, and ſo of any other number.

STIBIUM, a name for Antimony.

STICHOS, a name given by the old writers to a pectoral confection, the principal ingredient of which was the herb *marrubium* or horehound.

STICKLEBACK, in ichthyology. See Gasterosieus.

Foot-STICKS, in printing, ſlips of wood that lie between the foot of the page and the chaſe, to which they are wedged faſt by the quoins, to keep the form firm, in conjunction with the ſide-ſticks, which are placed at the ſide of the page, and fixed in the ſame manner by means of quoins.

STIFFLE, or great muscle, in the manege, is the part of the hind leg of a horſe which advances towards his belly. This is a moſt dangerous part to receive a blow upon.

STIGMA, a brand or impreſſion with a hot iron; a mark of infamy. See Stigmatizing.

Stigma, in botany, the ſummit or top of the ſtyle, accounted by the ſexualiſts the female organ of generation in plants, which receives the fecundating duſt of the tops of the ſtamina, and tranſmits its vapour or effluvia through the ſtyle into the heart of the ſeed-bud, for the purpoſe of impregnating the ſeeds.

STIGMATA, in natural hiſtory, the apertures in different parts of the bodies of inſects communicating with the tracheæ or air-veſſels, and ſerving for the office of reſpiration.

Stigmata, in antiquity, certain marks impreſſed on the left ſhoulders of the ſoldiers when liſted.

Stigmata, were alſo a kind of notes or abbreviations, conſiſting only of points, diſpoſed various ways; as in triangles, ſquares, croſſes, &c.

Stigmata, is alſo a term introduced by the Franciſcans, to expreſs the marks or prints of our Saviour's wounds, ſaid to have been miraculouſly impreſſed by him on the body of their ſeraphic father St. Francis.

STIGMATIZING, among the ancients, was inflicted upon ſlaves as a puniſhment, but more frequently as a mark to know them by: in which caſe, it was done by applying a red-hot iron marked with certain letters to their fore-heads, till a fair impreſſion was made; and then pouring ink into their furrows, that the inſcription might be the more conſpicuous. Soldiers were branded in the hand with the name or character of their general. After the ſame manner, it was cuſtomary to ſtigmatize the worſhippers and votaries of ſome of the gods. The marks uſed on theſe occaſions were various; ſometimes they contained the name of the god, ſometimes his particular enſign, as the thunderbolt of Jupiter, the trident of Neptune, the ivy of Bacchus, &c. or they marked themſelves with ſome myſtical number, whereby the god's name was deſcribed. To theſe three ways of ſtigmatizing St. John is ſuppoſed to refer (Rev. chap. xiii. ver. 16, 17.). Theodoret is of opinion, that the Jews were forbidden to brand themſelves with ſtigmata, becauſe the idolaters, by that ceremony, uſed to conſecrate themſelves to their falſe gods. Among ſome nations, ſtigmatizing was conſidered as a diſtinguiſhing mark of honour and nobility. In Thrace, as Herodotus tells us (Lib. v.), it was practiſed by none but perſons of credit, nor omitted by any but perſons of the meaneſt rank. The ancient Britons are alſo ſaid to have imprinted on the bodies of their infants the figures of animals, and other marks, with hot irons.

STIL de grain, in the colour trade, the name of a compoſition uſed for painting in oil or water, and is made of a decoction of the lycium or Avignon berry, in alum-water, which is mixed with whiting into a paſte, and formed into twiſted ſticks. It ought to be choſen of a fine gold yellow, very fine, tender, and friable, and free from dirt.

STILAGO, in botany: a genus of plants belonging to the claſs of *gynandria*, and order of *triandria*. There is one female. The calyx is monophyllous, and almoſt three-lobed. There is no corolla, and the berry is globular. There is only one ſpecies, the bunius.

STILBE, in botany: a genus of plants belonging to the claſs of *polygamia*, and order of *diœcia*. The exterior calyx of the hermaphrodite flower is triphyllous; the interior is quinquedentate and cartilaginous. The corolla is funnel-ſhaped and quinquefid. There are four ſtamina; and there is one ſeed in the interior calyx calyptrate. The female flower is ſimilar, has no interior calyx nor fruit. There are three ſpecies, the pinaſtra, ericoides, and cornua, all foreign plants.

STILE. See Style.

STILL, the name of an apparatus uſed in chemiſtry and in the diſtillation of ardent ſpirits. See Chemistry-*Index* at *Diſtillation* and *Still*.

Still-*Bottoms*, in the diſtillery, a name given by the traders to what remains in the ſtill after working the waſh into low wines. Theſe bottoms are procured in the greateſt quantity from the malt-waſh, and are of ſo much value to the diſtiller in the fattening of hogs, &c. that he often finds them one of the moſt valuable articles of the buſineſs.

STILLINGFLEET (Edward), biſhop of Worceſter, was the ſon of Samuel Stillingfleet gentleman, and was born at Cranborn in Dorſetſhire in 1635. He was educated at St,

John's College, Cambridge; and having received holy orders, was, in 1657, prefented to the rectory of Sutton in Nottinghamfhire. By publifhing his *Origines Sacræ*, one of the ableft defences of revealed religion that has ever been written, he foon acquired fuch reputation, that he was appointed preacher of the Rolls chapel; and in January 1665 was prefented to the rectory of St. Andrew's, Holborn. He was afterwards chofen lecturer at the Temple, and appointed chaplain in ordinary to king Charles II. In 1668 he took the degree of doctor of divinity; and was foon after engaged in a difpute with thofe of the Romifh religion, by publifhing his difcourfe concerning the idolatry and fanaticifm of the church of Rome, which he afterwards defended againft feveral antagonifts. In 1680 he preached at Guildhall chapel a fermon on Phil. iii. 26. which he publifhed under the title of *The Mifchief of Separation*; and this being immediately attacked by feveral writers, he in 1683 publifhed his *Unreafonablenefs of Separation*. In 1685 appeared his *Origines Britannicæ*, or the Antiquities of the Britifh Church, in folio. During the reign of king James II. he wrote feveral tracts againft popery, and was prolocutor of the convocation, as he had likewife been under Charles II. After the revolution he was advanced to the bifhopric of Worcefter, and was engaged in a difpute with the Socinians, and alfo with Mr. Locke; in which laft conteft he is generally thought to have been unfuccefsful. He died at Weftminfter in 1699, and was interred in the cathedral of Worcefter, where a monument was erected to his memory by his fon. Dr. Stillingfleet wrote other works befides thofe here mentioned, which, with the above, have been reprinted in 6 vols. folio.

Stillingfleet (Benjamin), an ingenious naturalift, was grandfon of the preceding. His father Edward was fellow of St. John's College in Cambridge, F.R.S. M.D. and Grefham profeffor of phyfic: but marrying in 1692, he loft his lucrative offices and his father's favour; a misfortune that affected both himfelf and his pofterity. However, going into orders, he obtained, by his father's means, the living of Newington-Butts, which he immediately exchanged for thofe of Wood-Norton and Swanton in Norfolk. He died in 1708.

Benjamin, his only fon, was educated at Norwich fchool, which he left in 1720, with the character of an excellent fcholar. He then went to Trinity College in Cambridge, at the requeft of Dr. Bentley, the mafter, who had been private tutor to his father, domeftic chaplain to his grandfather, and much indebted to the family. Here he was a candidate for a fellowfhip, but was rejected by the mafter's influence. This was a fevere and unexpected difappointment, and but little alleviated afterwards by the doctor's apology, that it was a pity that a gentleman of Mr. Stillingfleet's parts fhould be buried within the walls of a college.

Perhaps, however, this ingratitude of Dr. Bentley was not of any real differvice to Mr. Stillingfleet. By being thrown into the world, he formed many honourable and valuable connections. He dedicated fome tranflations of Linnæus to the late lord Lyttleton, partly, he fays, from motives of private refpect and honour. Lord Barrington gave him, in a very polite manner, the place of the mafter of the barracks at Kenfington; a favour to which Mr. Stillingfleet, in the dedication of his Calendar of Flora to that nobleman, alludes with equal politenefs, as well as with the warmeft gratitude. His Calender of Flora was formed at Stratton in Norfolk in the year 1755, at the hofpitable feat of his very worthy and ingenious friend Mr. Marfham, who had made feveral obfervations of that kind, and had communicated to the public his curious obfervations on the growth of trees. But it was to Mr. Wyndham of Felbrig in Norfolk that he appears to have had the greateft obligations: he travelled abroad with him, fpent much of his time at his houfe, and was appointed one of his executors (Mr. Garrick was another), with a confiderable addition to an annuity which that gentleman had fettled upon him in his life-time.

Mr. Stillingfleet's genius feems, if we may judge from his works, to have led him principally to the ftudy of natural hiftory; which he profecuted as an ingenious philofopher, an ufeful citizen, and a good man. In this walk of learning he mentions, as his friends, Dr. Watfon, Mr. (afterwards Dr.) Solander, Mr. Hudfon, Mr. Price of Foxley, and fome others; to whom may be added the ingenious Mr. Pennant. Nor can we omit the flattering mention which the late Mr. Gray makes of him in one of his letters, dated from London in 1761: "I have lately made an acquaintance with this philofopher, who lives in a garret here in the winter, that he may fupport fome near relations who depend upon him. He is always employed, confequently (according to my old maxim) always happy, always cheerful, and feems to me a very worthy honeft man. His prefent fcheme is to fend fome perfons, properly qualified, to refide a year or two in Attica, to make themfelves acquainted with the climate, productions, and natural hiftory of the country, that we may underftand Ariftotle, Theophraftus, &c. who have been heathen Greek to us for fo many ages; and this he has got propofed to lord Bute, no unlikely perfon to put it in execution, as he is himfelf a botanift."

Mr. Stillingfleet publifhed a volume of mifcellaneous tracts, which is in much efteem, and does great honour to his head and heart. They are chiefly tranflations of fome effays in the *Amœnitates Academicæ*, publifhed by Linnæus, interfperfed with fome obfervations and additions of his own. In this volume he fhows alfo a tafte for claffical learning, and entertains us with fome elegant poetical effufions of his own. But his Effay on Converfation, publifhed in the firft volume of Dodfley's Collection of Poems, entitles him to a diftinguifhed rank among our Englifh poets. This poem is addreffed to Mr. Wyndham, with all that warmth of friendfhip which diftinguifhes Mr. Stillingfleet. As it is chiefly didactic, it does not admit of fo many ornaments as fome compofitions of other kinds. However, it contains much good fenfe, fhows a confiderable knowledge of mankind, and has feveral paffages that in point of harmony and eafy verfification would not difgrace the writings of our moft admired poets. Here more than once Mr. Stillingfleet fhows himfelf ftill fore for Dr. Bentley's cruel treatment of him; and towards the beautiful and moral clofe of it (where it is fuppofed he gives us a fketch of himfelf), feems to hint at a mortification of a more delicate nature, which he is faid to have fuffered from the other fex.

To thefe difappointments it was perhaps owing that Mr. Stillingfleet neither married nor went into orders. His London refidence was at a fadler's in Piccadily; where he died in 1771, aged above feventy, leaving feveral valuable papers behind him. He was buried in St. James's church, without the flighteft monument of his having exifted.

STILLINGIA, in botany: a genus of plants belonging to the clafs of *monœcia*, and to the order of *monodelphia*. The male calyx is hemifpherical and multiflorous. The corolla is tubulous, and erofe or gnawed. The female calyx is uniflorous and inferior. The corolla is fuperior. The ftyle is trifid, and the capfule three-grained. There is only one fpecies, the fylvatica.

STILPO, a celebrated philofopher of Megara, flourifhed under the reign of Ptolemy Euergetes. In his youth he had been addicted to licentious pleafures, from which he religioufly refrained from the moment that he ranked himfelf among philofophers. When Ptolemy Soter, at the taking of Megara, offered him a large fum of money, and requefted that

he would accompany him into Egypt, he accepted but a ſmall part of the offer, and retired to the iſland of Ægina, whence, on Ptolemy's departure, he returned to Megara. That city being again taken by Demetrius the ſon of Antigonus, and the philoſopher required to give an account of any effects which he had loſt during the hurry of the plunder, he replied that he had loſt nothing; for no one could take from him his learning and eloquence. So great was the fame of Stilpo, that the moſt eminent philoſophers of Athens took pleaſure in attending upon his diſcourſes. His peculiar doctrines were, that ſpecies or univerſals have no real exiſtence, and that one thing cannot be predicated of another. With reſpect to the former of theſe opinions, he ſeems to have taught the ſame doctrine with the ſect afterwards known by the appellation of *Nominaliſts*. To prove that one thing cannot be predicated of another, he ſaid, that *goodneſs* and *man*, for inſtance, are different things, which cannot be conſounded by aſſerting the one to be the other: he argued farther, that goodneſs is an univerſal, and univerſals have no real exiſtence; conſequently, ſince nothing cannot be predicated of any thing, goodneſs cannot be predicated of man. Thus, whilſt this ſubtle logician was, through his whole argument, predicating one thing of another, he denied that any one thing could be the accident or predicate of another. If Stilpo was ſerious in this reaſoning: if he meant any thing more than to expoſe the ſophiſtry of the ſchools, he muſt be confeſſed to have been an eminent maſter of the art of wrangling; and it was not wholly without reaſon that Glycera, a celebrated courtezan, when ſhe was reproved by him as a corrupter of youth, replied, that the charge might be juſtly retorted upon himſelf, who ſpent his time in filling their heads with ſophiſtical quibbles and uſeleſs ſubtleties. In ethics he ſeems to have been a Stoic, and in religion he had a public and a private doctrine, the former for the multitude, and the latter for his friends. He admitted the exiſtence of a ſupreme divinity, but had no reverence for the Grecian ſuperſtitions.

STILOBATUM, in architecture, denotes the body of the pedeſtal of any column.

STILTON, a town of England, in the county of Huntingdonſhire, ſeventy-five miles from London, ſouth-weſt of Yaxley, on the Roman highway from Caſtor to Huntingdon, called *Ermine-ſtreet*, ſome parts of which, in this neighbourhood, appear ſtill paved with ſtone. This place is famous for cheeſe, which is called *Engliſh Parmeſan*, and is brought to table full of mites or maggots. For making Stilton cheeſe, we have the following receipt in the firſt volume of the *Repoſitory of Arts and Manufactures*: "Take the night's cream, and put it to the morning's new milk, with the rennet; when the curd is come, it is not to be broken, as is done with other cheeſes, but take it out with a ſoil-diſh altogether, and place it in a ſieve to drain gradually; and as it drains, keep gradually preſſing it till it becomes firm and dry: then place it in a wooden hoop; afterwards to be kept dry on boards, turned frequently, with cloth binders round it, which are to be tightened as occaſion requires, and changed every day until the cheeſe become firm enough to ſupport itſelf; after the cloth is taken off, the cheeſe is rubbed every day all over, for two or three months, with a bruſh; and if the weather be damp or moiſt twice a-day; and even before the cloth is taken off, the top and bottom are well rubbed every day."

STIMULANTS, in medicine, ſubſtances which increaſe the action of certain parts of the body. In particular, they quicken the motion of the blood, increaſe the action of the muſcular fibres, and affect the nervous ſyſtem.

STIMULI, in botany: a ſpecies of armature or offenſive weapon, with which ſome plants, as nettle, caſſada, acalypha, and tragia, are furniſhed. Their uſe, ſays Linnæus, is by their venomous punctures to keep off naked animals that would approach to hurt them.

STING, an apparatus in the bodies of certain inſects, in form of a little ſpear, ſerving them as a weapon of offence.

Sting-*Ray*, in ichthyology. See Raia.

STINK-pot, an earthen jar or ſhell, charged with powder, grenadoes, and other materials of an offenſive and ſuffocating ſmell. It is frequently uſed by privateers in the weſtern ocean, in the attack of an enemy whom he deſigns to board; for which purpoſe it is furniſhed with a light ſuſe at the opening or touch-hole. See Boarding.

STINT, a ſpecies of the Tringa.

STIPA, Feather Grass, in botany: a genus of plants belonging to the claſs of *triandria*, and order of *digynia*; and in the natural ſyſtem ranging under the 4th order, *Gramina*. The calyx is bivalved. The exterior valve of the corolla is terminated by an awn; the baſe is jointed. There are nine ſpecies, the pennata, juncea, capillata, ariſtella, tenaciſſima, avenacea, membranacea, arguens, and ſpicata. Of theſe one only is Britiſh, the *pennata* or common feather graſs. The beards are feathered. The plant riſes to the height of ten inches, grows on mountains, and flowers in July or Auguſt.

STIPEND, among the Romans, ſignifies the ſame with tribute; and hence *ſtipendarii* were the ſame with *tributarii*.

STIPULA, in botany, one of the fulcra or props of plants, defined by Linnæus to be a ſcale, or ſmall leaf, ſtationed on each ſide the baſe of the footſtalks of the flower and leaves, at their firſt appearance, for the purpoſe of ſupport. Elmgren reſtricts it to the footſtalks of the leaves only.

STIPULATION, in the civil law, the act of ſtipulating, that is, of treating and concluding terms and conditions to be inſerted in a contract. Stipulations were anciently performed at Rome, with abundance of ceremonies; the firſt whereof was, that one party ſhould interrogate, and the other anſwer, to give his conſent, and oblige himſelf. By the ancient Roman law, nobody could ſtipulate but for himſelf; but as the Tabelliones were public ſervants, they were allowed to ſtipulate for their maſters; and the notaries ſucceeding the Tabelliones have inherited the ſame privilege.

STIRIA, a province of Germany, in the circle of Auſtria, with the title of a duchy. It is bounded on the north by the archduchy of Auſtria, on the eaſt by Hungary, on the ſouth by Carniola, and on the weſt by Carinthia and the archbiſhopric of Saltſburg; being 125 miles in length and ſeventeen in breadth. It is ſaid to contain twenty-two cities, ninety-five towns, 338 caſtles, fifteen convents, and 200,000 inhabitants. Though it is a mountainous country, yet there is a great deal of land fit for tillage, and the ſoil is ſo good, that the inhabitants never were in want of corn. It contains mines of very good iron; whence the arms made there are in great eſteem. The women differ greatly from the Auſtrians, and are very plain and downright. They have all ſwellings on their throats, called *bronchoceles*. The men are alſo very ſimple, and are very zealous worſhippers of the Virgin Mary. They delight to ſit at home in the chimney-corner, never troubling their heads about foreign affairs. The chief town in Gratz.

STIRLING, a town of Scotland, and capital of a county, to which it gives name, ſituated on the right bank of the Forth, on an eminence which terminates in a rock: ſuppoſed to be of conſiderable antiquity, and incorporated as early as the twelfth century, about the middle of which it became a royal reſidence, when David I. kept his court here, that he might be near the abbey of Cambuſkenneth, which he then founded. It is a royal burgh, and probably was made ſo in the ninth century. The town-council conſiſts of a provoſt, four bailies,

a dean of guild, treasurer, seven merchant counsellors, and seven deacons of trade. A bye-law of this corporation, made in the year 1695, redounds to their credit; it obliges the members of council annually to take an oath, by which they bind themselves to take no lease of any part of the public property under their management, nor to purchase any part of it; neither to receive any gratification out of the public funds, under pretence of a reward for their trouble, in going about the affairs of the borough, or of the hospitals founded in it. As far back as the end of the sixteenth century, shalloons, manufactured in Stirling, to a considerable extent, were sent over to the Low Countries. Bruges was then the staple port for Scotch commodities. The manufacturers mistaking their own interest, and debasing the quality of their shalloons, soon lost, however, the advantages of that gainful branch of trade, and the town became miserably poor: though the manufacture was greatly hurt by such conduct, yet it was never entirely dropped. Coarse shalloons continue to be manufactured in Stirling and its neighbourhood. Towards the beginning of this century, and during the decay of the shalloon manufacture, that of the tartan started up in its place: it continued to flourish till about the year 1760, but is now almost dwindled away. At present the carpet manufacture flourishes, and the cotton manufacture also begins to take place here. The river Forth runs so level in the neighbourhood of Stirling, that mills cannot be erected for the purpose of manufactures: in every other respect Stirling is favourable for them, and coals are plentiful. The salmon-fishery belonging to the town, which but a few years ago brought a revenue of 30l. now brings 405l. It is let to a company, who send the fish chiefly to the London and Edinburgh markets. Stirling castle is by some supposed to owe its first foundation to Agricola: it was often the residence of the kings of Scotland. Almost the whole minority of James VI. was spent here, under his tutor Buchanan. The outside of the palace, which is now converted into barracks, is richly and curiously adorned with grotesque figures. Stirling is one of the seats of the circuit-court, and the county meetings are usually held here, though there is no public room or hall for the purpose. Only small vessels can come up to the town; the navigation is difficult, and the river winds so much, that the distance from Stirling to Alloa, which by land is only four miles, is twenty by water: 19 miles NE. Glasgow, and 28 N.W. Edinburgh.

STIRLINGSHIRE, a county of Scotland, bounded on the north by Perthshire and Clackmananshire, on the east by the Forth and the county of Linlithgow, on the south by the county of Dunbarton, and on the west by Loch Lomond; thirty-six miles long, and eight or nine in its general breadth. The south parts of this county are mountainous, but that part which is near the Forth is fertile, and abounds with coal. This county produces corn, pasture, black cattle, sheep, and horses, besides salmon, and other fish, from the rivers. The Forth, which is the most famous, though not the largest, river in Scotland, runs from west to east, into the Firth of Forth, receiving a great number of smaller streams: this country is likewise watered by the Carron and Avon, besides the new canal from Glasgow, which runs through it to the Carron mouth Its principal towns are Stirling and Falkirk.

STIRRUP, in the manege, a rest or support for the horseman's foot, for enabling him to mount, and for keeping him firm in his seat. Stirrups were unknown to the ancients. The want of them in getting upon horseback was supplied by agility or art. Some horses were taught to stoop to take their riders up; but the riders often leapt up by the help of their spears, or were assisted by their slaves, or made use of ladders for the purpose. Gracchus filled the highways with stones, which were intended to answer the same end. The same was also required of the surveyors of the roads in Greece as part of their duty. Menage observes, that St. Jerome is the first author who mentions them. But the passage alluded to is not to be found in his epistles; and if it were there it would prove nothing, because St. Jerome lived at a time when stirrups are supposed to have been invented, and after the use of saddles. Montfaucon denies the authenticity of this passage; and, in order to account for the ignorance of the ancients with regard to an instrument so useful and so easy of invention, he observes, that while cloths and housings only were laid upon the horses' backs, on which the riders were to sit, stirrups could not have been used, because they could not have been fastened with the same security as upon a saddle. But it is more probable, that in this instance, as in many others, the progress of human genius and invention is uncertain and slow, depending frequently upon accidental causes.

STIRRUP *of a Ship*, a piece of timber put upon a ship's keel, when some of her keel happens to be beaten off, and they cannot come conveniently to put or fit in a new piece; then they patch in a piece of timber, and bind it on with an iron, which goes under the ship's keel, and comes up on each side of the ship, where it is nailed strongly with spikes; and this they call a stirrup.

STOBÆUS (John), a laborious Greek writer, who lived at the end of the fourth century, composed many works, of which there are only his Collections remaining, and even these are not as he composed them; many things being inserted by later authors. This work contains many important sentiments collected from the ancient writers, poets, and philosophers.

STOCK, in gardening, &c. the stem or trunk of a tree. What stock is most proper for each kind of fruit, ought as well to be considered and known, as what soil is most suitable to trees: for on these two things the future vigour of trees, and the goodness of fruit, equally depend. The best way for those who intend to plant, is to raise their own stocks, by which they will be better assured of what they do; but if they should buy their trees of nurserymen, they should diligently inquire upon what stocks they were propagated. See GRAFTING.

STOCK, in trade. See CAPITAL *Stock*.

STOCK-*Broker*. See BROKER and STOCKS.

STOCK-*Dove*, in zoology. See COLUMBA.

STOCK-*Jobbing*, the art or mystery of trafficking in the public stocks or funds. See FUND and *Stock*-JOBBING.

STOCK *Gilly-flower*, in botany. See CHEIRANTHUS.

STOCKHOLM, a city and capital of Sweden, situated on seven islands, between the Baltic and the Malar Lake, from one of which the city receives its name. The harbour is of sufficient depth to receive the largest vessels up to the quay. It is generally supposed to have been founded in the year 1252, or 1260, by Birgir Jarl, regent of the kingdom, though others date the foundation a century before; but the court was not removed from Upsal before the last century. At the extremity of the harbour several streets rise one above another, in the form of an amphitheatre, with the palace, a magnificent building, at the summit. Except in the suburbs, where are some houses of wood, the buildings for the most part are of stone, or of bricks stuccoed white, and most of them built on piles. A communication is formed between the several parts of Stockholm by means of twelve bridges. The royal academy of sciences at Stockholm owes its institution to Linnæus and a few other learned men, and was incorporated in the year 1741: the royal academy of painting and sculpture contains a fine collection of casts, from the antique statues at Rome,

fent by Lewis XIV. to Charles XI. and prefented by the late king Adolphus Frederic to the academy. The arfenal contains an immenfe number of ftandards and trophies, taken from the Imperialifts, Poles, Ruffians, and Danes. A national bank was eftablifhed at Stockholm towards the clofe of the laft century. In Stockholm are manufactures of glafs, china, woollen, filk, linen, &c. The number of inhabitants is eftimated at 60,000. Long. 17. 55. E. Greenwich. Lat. 59. 29. N.

STOCKING, that part of the clothing of the leg and foot which immediately covers and fcreens them from the rigour of the cold. Anciently, the only ftockings in ufe were made of cloth, or of milled ftuffs fewed together; but fince the invention of knitting and weaving ftockings of filk, wool, cotton, thread, &c. the ufe of cloth ftockings is quite difcontinued. Dr. Howel, in his Hiftory of the World (vol. ii. p. 222), relates, that queen Elizabeth, in 1501, was prefented with a pair of black knit filk ftockings by her filk-woman, and thenceforth fhe never wore cloth ones any more. The fame author adds, that king Henry VIII. ordinarily wore cloth hofe, except there came from Spain, by great chance, a pair of filk ftockings. His fon, king Edward VI. was prefented with a pair of long Spanifh filk ftockings by Sir Thomas Grefham, and the prefent was then much taken notice of. Hence it fhould feem, that the invention of knit filk ftockings originally came from Spain. Others relate, that one William Rider, an apprentice on London-bridge, feeing at the houfe of an Italian merchant a pair of knit worfted ftockings from Mantua, took the hint, and made a pair exactly like them, which he prefented to William earl of Pembroke, and that they were the firft of that kind worn in England, anno 1564.

The modern ftockings, whether woven or knit, are formed of an infinite number of little knots, called *ftitches, loops,* or *mefhes,* intermingled in one another.

Knit ftockings are wrought with needles made of polifhed iron, or brafs wire, which interweave the threads, and form the mefhes the ftocking confifts of. At what time the art of knitting was invented, it is perhaps impoffible to determine, though it has been ufually attributed to the Scots, as it is faid that the firft works of this kind came from Scotland. It is added, that it was on this account that the company of ftocking-knitters, eftablifhed at Paris, 1527, took for their patron St. Fiacre, who is faid to have been the fon of a king of Scotland. But it is moft probable that the method of knitting ftockings by wires or needles was firft brought from Spain.

Woven ftockings are generally very fine; they are manufactured on a frame or machine made of polifhed iron, the ftructure of which it is needlefs to defcribe, as it may be feen in almoft every confiderable town in Great Britain. The invention of this machine is, by Mr. Anderfon, attributed to William Lee, M. A. of St. John's College, Cambridge, at a period fo early as 1589. Others have given the credit of this invention to a ftudent of Oxford at a much later period, who, it is faid by Aaron Hill, was driven to it by dire neceffity. This young man, falling in love with an inn-keeper's daughter, married her though fhe had not a penny, and he by his marriage loft a fellowfhip. They foon fell into extreme poverty; and their marriage producing the confequences naturally to be expected from it, the amorous pair became miferable, not fo much on account of their fufferings, as from the melancholy dread of what would become of their yet unborn infant. Their only means of fupport were the knitting of ftockings, at which the woman was very expert: "But fitting conftantly together from morning to night, and the fcholar often fixing his eyes, with ftedfaft obfervation, on the motion of his wife's fingers in the dexterous management of her needles, he took it into his imagination, that it was not impoffible to contrive a little loom which might do the work with much more expedition. This thought he communicated to his wife, and joining his head to her hands, the endeavour fucceeded to their wifh. Thus the ingenious ftocking-loom, which is fo common now, was firft invented; by which he did not only make himfelf and his family happy, but has left his nation indebted to him for a benefit which enables us to export filk ftockings in great quantities, and to a vaft advantage, to thofe very countries from whence before we ufed to bring them at confiderable lofs in the balance of our traffic."

STOCKS, *or* PUBLIC FUNDS *in England.* By the word *ftock* was originally meant a particular fum of money contributed to the eftablifhing of a fund to enable a company to carry on a certain trade, by means of which the perfon became a partner in that trade, and received a fhare of the profit made thereby, in proportion to the money employed. But this term has been extended farther, though improperly, to fignify any fum of money which has been lent to the government, on condition of receiving a certain intereft till the money is repaid, and which makes a part of the national debt. As the fecurity both of the government and of the public companies is efteemed preferable to that of any private perfon, as the ftocks are negotiable and may be fold at any time, and as the intereft is always punctually paid when due; fo they are thereby enabled to borrow money on a lower intereft than what could be obtained from lending it to private perfons, where there muft be always fome danger of lofing both principal and intereft.

But as every capital ftock or fund of a company is raifed for a particular purpofe, and limited by parliament to a certain fum, it neceffarily follows, that when that fund is completed, no ftock can be bought of the company; though fhares already purchafed may be transferred from one perfon to another. This being the cafe, there is frequently a great difproportion between the original value of the fhares and what is given for them when transferred: for if there are more buyers than fellers, a perfon who is indifferent about felling will not part with his fhare without a confiderable profit to himfelf; and on the contrary, if many are difpofed to fell, and few inclined to buy, the value of fuch fhares will naturally fall in proportion to the impatience of thofe who want to turn their ftock into fpecie.

By what has been faid, the reader will perceive how much the credit and intereft of the nation depends on the fupport of the public funds. While the annuities and intereft for money advanced is there regularly paid, and the principal infured by both prince and people (a fecurity not to be had in other nations), foreigners will lend us their property, and all Europe be interefted in our welfare; the paper of the companies will be converted into money and merchandife, and Great Britain can never want cafh to carry her fchemes into execution. See the article FUND.

STOCKS, a frame erected on the fhore of a river or harbour, whereon to build fhipping. It generally confifts of a number of wooden blocks, ranged parallel to each other, at convenient diftances, and with a gradual declivity towards the water.

STOCKS, a wooden machine to put the legs of offenders in, for fecuring diforderly perfons, and by way of punifhment in divers cafes, ordained by ftatute, &c.

STOCKTON upon Tees, a handfome town in the county of Durham, about fixteen miles fouth of the city of Durham. It is now a port of confiderable trade; though at the Reftoration it was a defpicable village, the beft houfe in which could hardly boaft of any thing better than clay-walls and a thatched roof. About forty years ago it fent out in one year

ſeventy-five veſſels for the port of London; and the trade is much increaſed ſince.

STOEBE, BASTARD ÆTHIOPIAN, in botany: a genus of plants belonging to the claſs of *ſyngeneſia*, and order of *polygamia ſegregata;* and in the natural ſyſtem ranging under the forty-ninth order, *compoſitæ*. The calicle is uniflorous; the corollets are tubular and hermaphrodite; the receptacle is naked, and the pappus is feathery. There are nine ſpecies, the æthiopica, ericoides, proſtrata, gnaphaloides, gomphrenoides, ſcabra, reflexa, rhinocerotis, and diſticha; all plants of foreign growth.

STOICS, the name given to a ſect of Grecian philoſophers from Στοα, "the porch in Athens," which the founder of the ſect choſe for his ſchool. For the peculiar tenets of this ſect, ſee METAPHYSICS, MORAL PHILOSOPHY, and ZENO.

STOLBERG, a ſmall town of Germany, in the circle of Upper Saxony, and territory of Thuringia, of which it is the capital place. It is ſeated between two mountains, fifty-eight miles north-weſt of Leipſic. E. Long. 11. 8. N. Lat. 51. 42.

STOLE, a ſacerdotal ornament worn by the Romiſh pariſh-prieſts above their ſurplice, as a mark of ſuperiority in their reſpective churches; and by other prieſts over the alb, at celebrating of maſs, in which caſe it goes acroſs the ſtomach; and by deacons, over the left ſhoulder, ſcarf-wiſe: when the prieſt reads the goſpel for any one, he lays the bottom of his ſtole on his head. The ſtole is a broad ſwath, or ſlip of ſtuff, hanging from the neck to the feet, with three croſſes thereon.

Groom of the STOLE, the eldeſt gentleman of his Majeſty's bed-chamber, whoſe office it is to preſent and put on his majeſty's firſt garment, or ſhirt, every morning, and to order the things in the chamber.

STOMACH, in anatomy. See ANATOMY.

STOMACHIC, medicines that ſtrengthen the ſtomach and promote digeſtion, &c. Stomachic corroboratives are ſuch as ſtrengthen the tone of the ſtomach and inteſtines; among which are carminatives, as the roots of galangals, red gentian, zedoary, pimpinella, calamus aromaticus, and arum. Of barks and rinds, thoſe of canella alba, ſaſſafras, citrons, Seville and China oranges, &c. Of ſpices, pepper, ginger, cloves, cinnamon, cardamums, and mace.

STONE (Edmund), a diſtinguiſhed ſelf-taught mathematician, was born in Scotland; but neither the place nor time of his birth are well known; nor have we any memoirs of his life, except a letter from the Chevalier de Ramſay, author of the Travels of Cyrus, in a letter to father Caſtel, a Jeſuit at Paris, and publiſhed in the Memoirs de Trevoux, p. 109. Mr. Stone was author and tranſlator of ſeveral uſeful works; viz. 1. A New Mathematical Dictionary, in 1 vol. 8vo. firſt printed in 1726. 2. Fluxions, in 1 vol. 8vo. 1730. The Direct Method is a tranſlation from the French, of Hoſpital's Analyſe des Infiniments Petits: and the Inverſe Method was ſupplied by Stone himſelf. 3. The Elements of Euclid, in 2 vols. 8vo. 1731. A neat and uſeful edition of thoſe Elements, with an account of the life and writings of Euclid, and a defence of his elements againſt modern objectors. Beſide other ſmaller works. Stone was a fellow of the Royal Society, and had inſerted in the Philoſophical Tranſactions (vol. 41, p. 218) an "Account of two ſpecies of lines of the 3d order, not mentioned by ſir Iſaac Newton or Mr. Stirling."

STONEHIVE, or STONEHAVEN, a ſmall town in the county of Kincardine, in Scotland, fifteen miles ſouth from Aberdeen. It was built in the time of Charles II. and ſtands at the foot of ſome high cliffs, in a ſmall bay, with a rocky bottom, opening a little in one part, ſo that ſmall veſſels may find admittance, but only at high water. A pier laps over this harbour from the north ſide to ſecure them after their entrance. The town contains about 800 inhabitants. The manufactures are ſail-cloths and Oſnaburghs, knit worſted and thread ſtockings.

STONES, in natural hiſtory, bodies which are inſipid, no ductile, nor inflammable, nor ſoluble in water. But as this is the definition given of earths by chemiſts and naturaliſts, we muſt refer the reader to the articles EARTH and MINERALOGY for a view of the claſſification of ſtones.

Artificial STONE. See STUCCO.

Elaſtic STONE. See *Elaſtic* MARBLE.

Philoſopher's STONE. See PHILOSOPHER'S STONE.

Precious STONES. See GEM.

Rocking STONE, or *Logan*, a ſtone of a prodigious ſize, ſo exactly poiſed, that it would rock or ſhake with the ſmalleſt force. Of theſe ſtones the ancients give us ſome account. Pliny ſays, that at Harpaſa, a town of Aſia, there was a rock of ſuch a wonderful nature, that if touched with the finger it would ſhake, but could not be moved from its place with the whole force of the body. Ptolemy Hepheſtion mentions a gygonian ſtone near the ocean, which was agitated when ſtruck by the ſtalk of an aſphodel, but could not be removed by a great exertion of force. The word *gygonius* ſeems to be Celtic; for *gwingog* ſignifies *motitans*, the rocking-ſtone.

Many rocking ſtones are to be found in different parts of this iſland; ſome natural, others artificial, or placed in their poſition by human art. In the pariſh of St. Leven, Cornwall, there is a promontory called *Caſtle Treryn*. On the weſtern ſide of the middle group, near the top, lies a very large ſtone, ſo evenly poiſed that any hand may move it from one ſide to another; yet it is ſo fixed on its baſe, that no lever nor any mechanical force can remove it from its preſent ſituation. It is called the *Logan-ſtone*, and is at ſuch a height from the ground that no perſon can believe that it was raiſed to its preſent poſition by art. But there are other rocking ſtones, which are ſo ſhaped and ſo ſituated, that there can be no doubt but they were erected by human ſtrength. Of this kind Borlaſe thinks the great *Quoit* or *Karn-lehau*, in the pariſh of Tywidnek, to be. It is thirty-nine feet in circumference, and four feet thick at a medium, and ſtands on a ſingle pedeſtal. There is alſo a remarkable ſtone of the ſame kind in the iſland of St. Agnes in Scilly. The under rock A, Plate 20, is ten feet ſix inches high, forty-ſeven feet round the middle, and touches the ground with no more than half its baſe. The upper rock C reſts on one point only, and is ſo nicely balanced, that two or three men with a pole can move it. It is eight feet ſix inches high, and forty-ſeven in circumference. On the top there is a baſon D hollowed out, three feet eleven inches in diameter at a medium, but wider at the brim, and three feet deep. From the globular ſhape of this upper ſtone, it is highly probable that it was rounded by human art, and perhaps even placed on its pedeſtal by human ſtrength. In Sithney pariſh, near Helſton, in Cornwall, ſtood the famous logan, or rocking-ſtone, commonly called *Men Amber*, q. d. *Men an Bar*, or the *top-ſtone*. It was eleven feet by ſix and four high, and ſo nicely poiſed on another ſtone that a little child could move it, and all travellers who came this way deſired to ſee it. But Shrubſall, Cromwell's governor of Pendennis, with much ado cauſed it to be undermined, to the great grief of the country. There are ſome marks of the tool on it, and, by its quadrangular ſhape, it was probably dedicated to Mercury.

That the rocking ſtones are monuments erected by the Druids cannot be doubted; but tradition has not informed us for what purpoſe they were intended. Mr. Toland thinks that the Druids made the people believe that they alone could move them, and that by a miracle; and that by this pretended miracle they condemned or acquitted the accuſed, and brought criminals to confeſs what could not otherwiſe be extorted from them. How far this conjecture is right we ſhall leave

to thofe who are deeply verfed in the knowledge of antiquities to determine.

Sonorous STONE, a kind of ftone remarkable for emitting an agreeable found when ftruck, and much ufed in China for making mufical inftruments which they call *king*. The various kinds of fonorous ftones known in China differ confiderably from one another in beauty, and in the ftrength and duration of their tone; and what is very furprifing, is, that this difference cannot be difcovered either by the different degrees of their hardnefs, weight, or finenefs of grain, or by any other qualities which might be fuppofed to determine it. Some ftones are found remarkably hard, which are very fonorous; and others exceedingly foft, which have an excellent tone; fome extremely heavy emit a very fweet found; and there are others as light as pumice ftone which have alfo an agreeable found.

The chemifts and naturalifts of Europe have never yet attempted to difcover, whether fome of our ftones may not have the fame properties as the fonorous ftones of the extremities of Afia. It however appears, that the Romans were formerly acquainted with a fonorous ftone of the clafs of *hiang-che*. Pliny (fays the Abbé du Bos, in his Reflections on Poetry and Painting, when fpeaking of curious ftones) obferves that the ftone called *chalcophonas*, or *brazen found*, is black; and that, according to the etymology of its name, it fends forth a found much refembling that of brafs when it is ftruck. The paffage of Pliny is as follows: *Chalcophonas nigra eft; fed elifa æris tinnitum reddit.*

Some fonorous ftones were at length fent into France, and the late Duke de Chaulnes examined them with particular attention; but his obfervations give us reafon to believe that the black ftones of which the Chinefe king are formed are nothing elfe but a black kind of marble, the conftituent parts of which are the fame as thofe of the marble of Europe, and that fome difference in their organization renders them more or lefs fonorous.

Swine-STONE (*lapis fuillus*), or *fetid ftone*, fo called from its exceffively fetid fmell, calcareous earth impregnated with petroleum. It is found, 1. Solid, with the particles fcarcely vifible, of a black colour, as the marble does in Flanders, and in the province of Jutland in Sweden. 2. With vifible grains of a blackifh brown colour, found likewife in fome places of Sweden. 3. With coarfe fcales, found alfo in Sweden. Great part of the limeftones found in England belong to this clafs, and emit a very fetid fmell when ftruck violently, but it foon goes off in the fire.

STONE *Marrow*. See CLAY, fpecies 4.

STONE-*Ware*, a fpecies of pottery fo called from its hardnefs. See DELFT-*Ware*, PORCELAIN, and POTTERY. Clay is a principal ingredient in pottery of all kinds which has the property of hardening in the fire, and of receiving and preferving any form into which it is moulded. One kind of clay refifts the moft violent action of the fire after being hardened to a certain degree, but is incapable of receiving a fufficient degree of hardnefs and folidity. A fecond kind affumes a hardnefs refembling that of flint, and fuch a compactnefs that veffels made of it have a gloffy appearance in their fracture refembling porcelain. Thefe two fpecies owe their peculiar properties of refifting heat without melting, to fand, chalk, gypfum or ferruginous earth, which they contain. A third fpecies of clay begins to harden with a moderate fire, and melts entirely with a ftrong fire. It is of the fecond fpecies that ftone-ware is made.

The moft famous manufactory of ftone-ware, as well as of other kinds of pottery, is at Burflem in Staffordfhire. This can be traced with certainty at leaft two centuries back; but of its firft introduction no tradition remains. In 1686, as we learn from Dr. Plot's Natural Hiftory of Staffordfhire publifhed in that year, only the coarfe yellow, red, black, and mottled wares, were made in this country; and the only materials employed for them appear to have been the different coloured clays which are found in the neighbourhood, and which form fome of the meafures or ftrata of the coal-mines. Thefe coarfe clays made the body of the ware, and the glaze was produced by powdered lead-ore, fprinkled on the pieces before firing, with the addition of a little manganefe for fome particular colours. The quantity of goods manufactured was at that time fo inconfiderable, that the chief fale of them, the Doctor fays, was "to poor crate men, who carried them on their backs all over the country."

About the year 1690, two ingenious artifans from Germany, of the name of Eller, fettled near Burflem, and carried on a fmall work for a little time. They brought into this country the method of glazing ftone ware, by cafting falt into the kiln while it is hot, and fome other improvements of lefs importance; but finding they could not keep their fecrets to themfelves, they left the place rather in difguft. From this time various kinds of ftone-ware, glazed by the fumes of falt in the manner above mentioned, were added to the wares before made. The white kind, which afterwards became, and for many fucceeding years continued, the ftaple branch of pottery, is faid to have owed its origin to the following accident. A potter, Mr. Aftbury, travelling to London, perceived fomething amifs with one of his horfe's eyes, an hoftler at Dunftable faid he could foon cure him, and for that purpofe put a common black flint ftone into the fire. The potter obferving it, when taken out, to be of a fine white, immediately conceived the idea of improving his ware by the addition of this material to the whiteft clay he could procure: accordingly he fent home a quantity of the flint ftones of that country, where they are plentiful among the chalk, and by mixing them with tobacco-pipe clay, produced a white ftone ware much fuperior to any that had been feen before.

Some of the other potters foon difcovered the fource of this fuperiority, and did not fail to follow his example. For a long time they pounded the flint ftones in private rooms by manual labour in mortars; but many of the poor workmen fuffered feverely from the duft of the flint getting into their lungs, and producing dreadful coughs, confumptions, and other pulmonary diforders. Thefe difafters, and the increafed demand for the flint powder, induced them to try to grind it by mills of various conftructions; and this method being found both effectual and fafe, has continued in practice ever fince. With thefe improvements, in the beginning of the prefent century, various articles were produced for tea and coffee equipages. Soon after attempts were made to furnifh the dinner table alfo; and before the middle of the century, utenfils for the table were manufactured in quantity as well for exportation as home confumption.

But the falt glaze, the only one then in ufe for this purpofe, is in its own nature fo imperfect, and the potters, from an injudicious competition among themfelves for cheapnefs, rather than excellence, had been fo inattentive to elegance of form and neatnefs of workmanfhip, that this ware was rejected from the tables of perfons of rank; and about the year 1760, a white ware, much more beautiful and better glazed than ours, began to be imported in confiderable quantities from France.

This inundation of a foreign manufacture, fo much fuperior to any of our own, muft have had very bad effects upon the potteries of this kingdom, if a new one, ftill more to the public tafte, had not appeared foon after. In the year 1763, Mr. Jofiah Wedgwood, who had already introduced feveral improvements into this art, invented a fpecies of earthen

ware for the table quite new in its appearance, covered with a rich and brilliant glaze, bearing sudden alternations of heat and cold, manufactured with ease and expedition, and consequently cheap, and having every requisite for the purpose intended. To this new manufacture the queen was pleased to give her name and patronage, commanding it to be called *Queen's ware*, and honouring the inventor by appointing him her majesty's potter.

The common clay of the country is used for the ordinary sorts; the finer kinds are made of clay from Devonshire and Dorsetshire, chiefly from Biddeford; but the flints from the Thames are all brought rough by sea, either to Liverpool or Hull, and so by Burton. There is no conjecture formed of the original reason of fixing the manufacture in this spot, except for the convenience of plenty of coals, which abound under all the country.

The flints first are ground in mills, and the clay prepared by breaking, washing, and sifting, and then they are mixed in the requisite proportions. The flints are bought first by the people about the country, and by them burnt and ground, and sold to the manufacturers by the peck.

The mixture is then laid in large quantities on kilns to evaporate the moisture; but this is a nice work, as it must not be too dry; next it is beat with large wooden hammers, and then is in order for throwing, and is moulded into the forms in which it is to remain: this is the most difficult work in the whole manufacture. A boy turns a perpendicular wheel, which by means of thongs turns a small horizontal one, just before the thrower, with such velocity, that it twirls round the lump of clay he lays on it into any form he directs it with his fingers.

There are 300 houses, which are calculated to employ, upon an average, twenty hands each, or 6000 in the whole; but of all the variety of people that work in what may be called the preparation for the employment of the immediate manufactures, the total number cannot be much short of 10,000, and it is increasing every day. Large quantities are exported to Germany, Ireland, Holland, Russia, Spain, the East Indies, and much to America; some of the finest sorts to France.

STONE *in the Bladder*. See MEDICINE, SURGERY, and ALKALI.

STONE, in merchandize, denotes a certain weight for weighing commodities. A stone of beef at London is the quantity of eight pounds: in Herefordshire twelve pounds: in the north sixteen pounds. A stone of glass is five pounds; of wax eight pounds. A stone of wool (according to the statute of 11 Hen. VII.) is to weigh fourteen pounds; yet in some places it is more, in others less; as in Gloucestershire fifteen pounds; in Herefordshire twelve pounds. Among horse-coursers a stone is the weight of fourteen pounds. The reason of the name is evident. Weights at first were generally made of stone. See Deut. xxv. 13. where the word אבן, translated *weight*, properly signifies a *stone*.

STONE-*Chatter*, in ornithology. See MOTACILLA.

STONEHENGE, a celebrated monument of antiquity, stands in the middle of a flat area near the summit of a hill, six miles distant from Salisbury. It is inclosed by a circular double bank and ditch, near thirty feet broad, after crossing which we ascend thirty yards before we reach the work. The whole fabric consisted of two circles and two ovals. The outer circle is about 108 feet diameter, consisting when entire of sixty stones, thirty uprights, and thirty imposts, of which remain only twenty-four uprights, seventeen standing and seven down, $3\frac{1}{2}$ feet asunder, and eight imposts. Eleven uprights have their five imposts on them by the grand entrance. These stones are from thirteen to twenty feet high. The lesser circle is somewhat more than eight feet from the inside of the outer one, and consisted of forty lesser stones (the highest six feet), of which only nineteen remain, and only eleven standing: the walk between these two circles is 300 feet in circumference. The Adytum or Cell is an oval formed of ten stones (from sixteen to twenty-two feet high), in pairs, with imposts, which Dr. Stukeley calls *trilithons*, and above thirty feet high, rising in height as they go round, and each pair separate, and not connected as the outer pair; the highest eight feet. Within these are nineteen more smaller single stones, of which only six are standing. At the upper end of the Adytum is the altar, a large slab of blue coarse marble, twenty inches thick, sixteen feet long, and four broad; pressed down by the weight of the vast stones that have fallen upon it. The whole number of stones, uprights, imposts, and altar, is exactly 140. The stones are far from being artificial, but were most probably brought from those called the *Grey Weathers* on Marlborough Downs, fifteen or sixteen miles off; and if tried with a tool, they appear of the same hardness, grain, and colour, generally reddish. The heads of oxen, deer, and other beasts, have been found on digging in and about Stonehenge; and human bones in the circumjacent barrows. There are three entrances from the plain to this structure, the most considerable of which is from the north-east; and at each of them were raised on the outside of the trench two huge stones, with two smaller within parallel to them.

It has been long a dispute among the learned, by what nation, and for what purpose, these enormous stones were collected and arranged. The first account of this structure we meet with, is in Geoffroy of Monmouth, who, in the reign of king Stephen, wrote the history of the Britons in Latin. He tells us, that it was erected by the counsel of Merlin the British enchanter, at the command of Aurelius Ambrosius, the last British king, in memory of 460 Britons who were murdered by Hengist the Saxon. The next account is that of Polydore Virgil, who says that the Britons erected this as a sepulchral monument of Aurelius Ambrosius. Others suppose it to have been a sepulchral monument of Boadicea, the famous British queen. Inigo Jones is of opinion, that it was a Roman temple; from a stone sixteen feet long, and four broad, placed in an exact position to the eastward, altar-fashion. Mr. Charlton attributed it to the Danes, who were two years masters of Wiltshire; a tin tablet, on which were some unknown characters, supposed to be Punic, was digged up near it in the reign of Henry VIII. but is lost; probably that might have given some information respecting its founders. Its common name, *Stonehenge*, is Saxon, and signifies a "stone gallows," to which those stones, having transverse imposts, bear some resemblance. It is also called in Welch *choir gour*, or "the giants dance."

Mr. Grose thinks that Dr. Stukeley has completely proved this structure to have been a British temple, in which the Druids officiated. He supposes it to have been the metropolitan temple of Great Britain, and translates the words *choir gour*, "the great choir or temple." The learned Mr. Bryant is of opinion, that it was erected by a colony of Cuthites, probably before the time of the Druids; because it was usual with them to place one vast stone upon another for a religious memorial; and these they often placed so equably, that even a breath of wind would sometimes make them vibrate. Of such stones one remains at this day in the pile of Stonehenge. The ancients distinguished stones erected with a religious view, by the name of *amber*; by which was signified any thing solar and divine. The Grecians called them πετραι αμβροσιαι, *petræ ambrosiæ*. Stonehenge, according to Mr. Bryant, is composed of these amber stones: hence the next town is denominated

Ambrefbury; not from a Roman Ambrofius, for no fuch perfon ever exifted, but from the *ambrofiæ petræ*, in whofe vicinity it ftood. Some of thefe were rocking ftones; and there was a wonderful monument of this fort near Penzance in Cornwall, which ftill retains the name of *main-amber*, or the facred ftones. Such a one is mentioned by Apollonius Rhodius, fuppofed to have been raifed in the time of the Argonautæ, in the ifland Tenos, as the monument of the two-winged fons of Boreas, flain by Hercules; and there are others in China and other countries.

STOOK, a term ufed in many parts of the kingdom, for a fhock of corn containing twelve fheaves.

STOOL, in medicine, an evacuation or difcharge of the fæces by the anus.

Stool, in mining, is ufed when the miners leave off digging deeper, and work in the ends forward. The end before them is called the *ftool*.

Stool, in fhip-building, the name of the fupporters of the poop and top lanterns.

STOOPING, in falconry, is when a hawk, being upon her wings at the height of her pitch, bends down violently to take the fowl.

STOPPERS, in a fhip, certain fhort pieces of rope, which are ufually knotted at one or both ends, according to the purpofe for which they are defigned. They are either ufed to fufpend any heavy body, or to retain a cable, fhroud, &c. in a fixed pofition. Thus, the anchors, when firft hoifted up from the ground, are hung to the cat-head by a ftopper attached to the latter, which paffing through the anchor-ring, is afterwards faftened to the timber-head; and the fame rope ferves to faften it on the bow at fea; or to fufpend it by the ring, which is to be funk from the fhip to the bottom. The ftoppers of the cable have a large knot and a laniard at one end, and are faftened to a ring-bolt in the deck by the other. They are attached to the cable by the laniard, which is faftened fecurely round both by feveral turns paffed behind the knot, or about the neck of the ftopper; by which means the cable is reftrained from running out of the fhip when fhe rides at anchor. The ftoppers of the fhroud have a knot and a laniard at each end. They are only ufed when the fhrouds are cut afunder in battle, or difabled by tempeftuous weather; at which time they are lafhed, in the fame manner as thofe of the cables, to the feparated parts of the fhroud, which are thereby reunited, fo as to be fit for immediate fervice. This, however, is only a temporary expedient.

STOPS. See Punctuation.

STORAX. See Styrax.

STORK, in ornithology. See Ardea.

STOVE for heating apartments, greenhoufes, hot-houfes, fruit-walls, &c. When treating of the mechanical properties of air, we explained in fufficient detail the manner in which the expanfion produced in a mafs of air by heat produces that motion up our chimneys which is called the draught of the chimney; and, in the article Smoke, we confidered the circumftances which tend to check, to promote, or to direct this current, fo as to free us from the fmoke and vitiated air which neceffarily accompanies the confumption of the fuel. In Pneumatics, we alfo attended to the manner in which our fires immediately operate in warming our apartments. At prefent, when about to defcribe a method of warming intrinfically different, we muft pay fome more attention to the diftinguifhing circumftance. Without pretending to explain the phyfical connection of heat and light, it may fuffice to obferve, that heat, as well as light, is communicated to diftant bodies in an inftant by radiation. A perfon paffing haftily by the door of a glafs-houfe feels the glow of heat in the very moment he fees the dazzling light of the furnace mouth, and it is interrupted by merely fcreening his face with his hand. In this way is an apartment partly warmed by an open fire; and we avoid the oppreffive heat by fitting where the fire is not feen, or by interpofing a fcreen. We are apt to connect this fo ftrongly in the imagination with the light emitted by the fire, that we attribute the heat to the immediate action of the light. But this opinion is fhown to be gratuitous by a curious experiment made before the Royal Society by Dr. Hooke, and afterwards, with more care and accurate examination, by Mr. Scheele. They found, that by bringing a plate of the moft tranfparent glafs brifkly between the fire and one's face, the heat is immediately intercepted without any fenfible diminution of the light. Scheele, by a very pretty inveftigation, difcovered that the glafs made the feparation, and did it both in refraction and reflection; for he found, that when the light of the fame fire was collected into a focus by means of a polifhed metal concave fpeculum, a thermometer placed there was *inftantly* affected. But if we employ a glafs fpeculum foiled in the ufual manner with quickfilver, of the fame diameter and focal diftance, and of equally brilliant reflection, there is hardly any fenfible heat produced in the focus, and the thermometer muft remain there for a very long while before it is fenfibly affected. When we repeated this curious experiment, we found, that after the glafs has remained a long while in this pofition, whether tranfmitting or reflecting the light, it lofes in a great meafure its power of intercepting the heat. By varying this obfervation in many of its circumftances, we think ourfelves entitled to conclude, that the glafs abforbs the heat which it intercepts, and is very quickly heated by the abforption. While it rifes in its own temperature, it intercepts the heat powerfully; but when it is, as it were, faturated, attracting no more than what it immediately imparts to the air in corporeal contact with it, the heat paffes freely through along with the light. If the glafs be held fo near the fire that the furrounding air is very much heated, no fenfible interruption of heat is perceived after the glafs is thus faturated. We found the check more quickly fenfible than the thermometer of this inftantaneous radiation of the heat which accompanies the light, or is feparated from it in this experiment. It is a very inftructive experiment in the phyfiology of heat.

We cannot fay how far this radiation of heat may extend, nor whether the accompanyment of light is abfolutely neceffary. The mathematician proceeds on the fuppofition that it extends as far as the radiation of light, and that, being alfo rectilineal, the denfity of the heat is proportional to that of the light. But thefe notions are fomewhat gratuitous; and there are appearances which render them doubtful. When with a lens of an inch in diameter we form a focus on a piece of black unpolifhed marble of an inch diameter, the mathematician muft allow that no more rays fall on the marble than if the lens were away: therefore the marble fhould be equally warmed in either cafe. But it is by no means fo, as we have repeatedly found by expofing it during equal times, and then dropping it into water. The water which is heated by the marble on which the focus has been formed will be found to have acquired from it much more heat than from the other. The tops of lofty mountains which are never fhaded by clouds, but enjoy perpetual funfhine and ferenity, inftead of being warmer than the valleys below, are covered with never-melting fnow; and we have fome grounds to fufpect that the genial influence of the fun requires the co-operation of the atmofphere, and to doubt whether there is any warmth at the moon, on which no atmofphere like ours can be obferved. Perhaps the heat which cheers us, and fertilizes our earth, is chemically feparated from our atmofphere by its elective attraction for the light of the fun. Our fucceffors in the ftudy of meteorology need not

fear that the ſubject of their reſearch will be ſoon deprived of ſcientific allurements. We know but little of it after all the progreſs we have made during this laſt century, and it ſtill preſents an ample field of diſcuſſion.

We ſaid that the accompanyment of light is not demonſtrably neceſſary. We are certain that heat may be imparted without any ſenſible light, in a manner which we can hardly ſuppoſe any thing but radiation. If a piece of very hot iron be placed a little without the principal focus of a metallic concave ſpeculum, and a very ſenſible air-thermometer be placed in its conjugate focus, it will inſtantly ſhow an elevation of temperature, although the iron is quite imperceptible to an eye which has even been a long while in the dark. No ſuch riſe of temperature is obſerved if the thermometer be placed a little to one ſide of the focus of the ſpeculum; therefore the phenomenon is preciſely ſimilar to the radiation of light. We are obliged therefore to acknowledge that the heat is radiated in this experiment in the ſame way that light is in the common optical experiments.

Although this is the moſt uſual way that we in this country employ fuel for warming our apartments, it is by no means the only way in which the heat diffuſed from this fuel may be imparted to diſtant bodies. It is not even the moſt effectual method; it is diffuſed alſo by immediate communication to bodies in contact. The air in immediate contact with the burning fuel is heated, and imparts ſome of its heat to the air lying beyond it, and this is partly ſhared with the air which is ſtill farther off; and this diffuſion, by communication *in contactu*, goes on till the remote air contiguous to the walls, the floor, the ceiling, the furniture, the company, all get a ſhare of it in proportion to their attractions and their capacities. And as the air is thus continually ſupplied, and continually gives out heat, the walls, &c. become gradually warmer, and the room becomes comfortable and pleaſant. But we apprehend that no great proportion of the heat actually acquired by the room is communicated in this way. This diffuſion by contact is but ſlow, eſpecially in air which is very dry; ſo ſlow indeed, that the air in the immediate neighbourhood of the fuel is hurried up the chimney before it has time to impart any of the heat received in contact. We know that the time employed in diffuſing itſelf in this way through ſtagnant air to any moderate diſtance is very conſiderable. We imagine, therefore, that the heat communicated to our rooms by an open fire is chiefly by radiation, but in a way ſomething different from what we mentioned before. We imagine, that as the piece of glaſs in Dr. Hooke's experiment abſorbs the heat, ſo the whole maſs of air which fills the room intercepts the radiated heat in every part of the room where the fire is ſeen, and is as it were ſaturated with it throughout, and ready to impart it to every body immerſed in it. We cannot otherwiſe account for the *equability* of the heat in the different parts of the room. Mere radiation on the ſolid bodies would warm them in the inverſe duplicate ratio of their diſtances from the fire; and diffuſion by contact, if compatible with the rapid current up the chimney, would heat the room ſtill more unequably. Recollect how ſlowly, and with what rapid diminution of intenſity, the colour of blue vitriol is communicated to water even to a very ſmall diſtance. But becauſe all parts of the air of the room abſorb radiated heat, what is ſaturated at a higher temperature, being nearer to the fire, riſes to the ceiling, ſpreads outwards along the ceiling, and has its place ſupplied by the air, which is thus puſhed towards the fire from the places which are not directly illuminated.

Far different is the method of warming the room by a ſtove. Here the radiation, if any, is very feeble or ſcanty; and if a paſſage were allowed up the chimney for the warmed air, it would be quickly carried off. This is well known to the Engliſh who reſide in the cold climates of St. Peterſburgh, Archangel, &c. They love the exhilarating flutter of an open fire, and often have one in their parlour; hut this, ſo far from warming the room during the extreme cold weather, obliges them to heat their ſtoves more frequently, and even abſtracts the heat from a whole ſuite of apartments. But all paſſages this way is ſhut up when we warm a room by ſtoves. The air immediately contiguous to the ſtove is heated by contact, and this heat is gradually, though ſlowly, diffuſed through the whole room. The diffuſion would however be very ſlow indeed, were it not for the great expanſibility of air by heat. But the air ſurrounding the ſtove quickly expands and riſes to the ceiling, while the neighbouring air ſlides in to ſupply the place, nay is even puſhed in by the air which goes outwards aloft. Thus the whole air is ſoon mixed, and the room acquires almoſt an equal temperature throughout.

The warming by ſtoves muſt therefore be managed upon very different principles from thoſe adopted in the employment of open fires. The general principle is, 1ſt, To employ the fuel in the moſt effectual manner for heating the external part of the ſtove, which is immediately efficient in warming the contiguous air; and, 2d, To keep in the room the air already warmed, at leaſt as much as is conſiſtent with wholeſomeneſs and cleanlineſs.

The firſt purpoſe is accompliſhed by conducting the flue of the furnace round its external parts, or, in ſhort, by making every part of the flue external. Of all forms, that of a long pipe, returned backwards and forwards, up and down (provided only that the place of its laſt diſcharge be conſiderably higher than its entry from the fire-place), would be the moſt effectual. We have ſeen a very ſmall ſtove conſtructed in this way, the whole being incloſed in a handſome caſe of poliſhed iron plate, pierced and cut into elegant foliage like the cock of a watch, ſo that the odd looking pipes were completely concealed. Though only three feet long, one foot thick, and ſix feet high, it warmed a very lofty room of twenty-four feet by eighteen, and conſumed leſs than half the fuel of a ſtove of the more uſual make, which did not ſo fully warm a ſmaller chamber.

It would occupy a volume to deſcribe the immenſe variety of ſtoves which ingenuity or architectonic taſte has conſtructed. We ſhall content ourſelves with giving a ſpecimen of the two chief claſſes into which they may be diſtinguiſhed.

The air of a room may be equally warmed, either by applying it to the ſurface of a ſmall ſtove made very hot, or to the ſurface of a much larger ſtove more moderately heated. The firſt kind is chiefly uſed in Holland, Flanders, and the milder climates of Germany and Poland. The laſt are univerſally uſed in the frozen climates of Ruſſia and Sweden. The firſt are generally made of caſt-iron, and the laſt of brick-work covered with glazed tiles or ſtucco.

Plate 19. fig. 1. repreſents a ſmall German ſtove fully ſufficient for warming a room of twenty-four feet by eighteen. The baſe is about three feet broad and fourteen inches deep, that is, from back to front, and ſix or ſeven feet high. The decoration is in the faſhion of that country; but the operative ſtructure of it will admit of any ſtyle of ornament. A, is the fire-place, and the wood or charred coal is laid on the bottom, which has no bars. Bars would admit the air too freely among the fuel, and would both conſume it too faſt and raiſe too great a heat. That no heat may be uſeleſsly expended, the ſole of the fire-place and the whole bottom of the ſtove is raiſed an inch or two above the floor of the room, and the air is therefore warmed by it in ſucceſſion, and riſes upwards. For the ſame reaſon the back of the ſtove is not in contact with the wall of the room, or of the niche in which it is placed. The

fire-place is ſhut up by a door which fits cloſely to its caſe, and has a ſmall wicket at the bottom, whoſe aperture is regulated by a ſliding plate, ſo as to admit no more air than what ſuffices for ſlowly conſuming the fuel. The flame and heated air riſe to the top of the fire-place three or four inches above the arch or mantle-piece, and get out laterally by two narrow paſſages B, B, immediately below the top plate of the baſe. The current bends downward on each ſide, paſſes at C, C, under the partition plates which divide the two ſide chambers, and then riſes upwards through the outer diviſion of each, and paſſes through narrow ſlits D, D, in the top plate, and from thence along the two hollow piers E, E. The two lateral currents unite at the top of the arch, and go through the ſingle paſſage F into a larger hollow behind. From this place it either goes ſtraight upwards into the vent in the wall by a pipe on the top of the ſtove, or it goes into the wall behind by a pipe inſerted in the back of the ſtove. The propriety of this conſtruction is very obvious. The current of hot air is applied to exterior parts of the ſtove every-where except in the two ſide-chambers of the baſe, where the partition-plates form one ſide of the canal. Even this might be avoided by making each of theſe ſide-chambers a detached hollow pillar. But this would greatly increaſe the trouble of conſtruction and joining together, and is by no means neceſſary. The arch H has a graceful appearance, and affords a very warm ſituation for any thing that requires it, ſuch as a drink in a ſick perſon's bed-chamber, &c. Perſons of a certain claſs uſe this place for keeping a diſh warm; nay, the lower part of the arch is frequently occupied by an incloſed chamber, where the heat riſes high enough even for dreſſing victuals, as will be eaſily imagined when we reflect that the ſole of it is the roof of the fire-place.

The ſtove now deſcribed is ſupplied with fuel and with air by the front door opening into the room. That there may be room for fuel, this middle part projects a few inches before the two ſide-chambers. Theſe laſt, with the whole upper part of the ſtove, are not more than ten inches deep. The paſſages, therefore, from the fire-place are towards the back of it; ſo that if we have a mind to ſee the fire (which is always cheerful), the door may be thrown open, and there is no danger of the ſmoke coming out after the current has once warmed the upper part of the ſtove. When the ſtove is of ſuch dimenſions that the baſe is about two feet and a half or three feet high, the fire-place may be furniſhed with a ſmall grate in the Britiſh ſtyle. If the door is ſo hung that it can not only be thrown back, but lifted off its hinges, we have a ſtove-grate of the completeſt kind, fully adequate, in our mild climate, to warm a handſome apartment, even with an open fire; and when we hang on the door, and ſhut up the fire-place, a ſtove of the dimenſions already given is almoſt too much for a large drawing-room.

We have frequently remarked, that one ſide of theſe ſtoves grows much warmer than the other, and that it was difficult to prevent or remedy this; and we imagine that this is an unavoidable defect in all ſtoves with a double flue. It is ſcarcely poſſible to make the fire ſo equable in the fire-place, that one ſide ſhall not be a little warmer than the other, and a briſker current will then be produced in it. This muſt increaſe the conſumption of the fuel on this ſide, which will increaſe the current, will heat this ſide ſtill more, and thus go on continually till the fuel on this ſide is expended; after which the other ſide will obtain and increaſe the ſuperiority. The flue is made double, that the fire-place may occupy the middle of the front; and it will be difficult to gain this point of ſymmetry with one fl e. The inconvenience may, however, be corrected by damping valves placed in ſome part of the upright funnels E, E.

In the colder winters on the continent, it is thought neceſſary to increaſe the effect by making the fire-place open to the back of the ſtove. Its mouth or door communicates with or is joined to an opening of the ſame dimenſions formed in the wall, and the door is on the other ſide in an antichamber or lobby. In Weſtphalia, and other places of Germany, the apartments are diſpoſed round a ſpacious lobby, into which all their fire-places open, and are there ſupplied with fuel. By this conſtruction it is plain that the air of the room, already warmed by the ſtove, is not carried off, and the room is more heated. But this method is very unfavourable to cheerfulneſs and health. The ſame air confined, and repeatedly breathed and compounded with all the volatile emanations of the room, quickly loſes that refreſhing quality that is ſo deſirable, and even ſo neceſſary for health. It is never renewed except by very partial admixtures when the room doors are thrown open, and becomes diſagreeable to any perſon coming in from the open air; and in the houſes of the leſs opulent becomes really offenſive and nauſeous.

Something of this is unavoidable in all rooms heated by ſtoves. Even in our apartments in this iſland, perſons of delicate nerves are hurt by what they call the cloſe air of a room; and it is long before the ſmell of dinner is quite removed from a dining-room, notwithſtanding the copious current up the chimney. This muſt be incomparably more ſenſible in a room heated by a ſtove; and this inconvenience is peculiarly ſenſible with reſpect to the ſtove which we are conſidering at preſent, where we employ a ſmall ſurface heated to a great degree.

Such ſtoves are ſeldom made of any thing elſe than caſt-iron. This (in thoſe parts at leaſt which are in immediate contact with the fuel) is in a ſtate of continual calcination, and even throwing off ſcales. This indeed is not ſeen, becauſe it is the bottom or ſole of the fire-place which is ſo heated: but the effect on the air of the room is the ſame. The calcination of the iron is occaſioned by the combination of pure vital air with the iron. This is abſtracted from the general maſs of atmoſpheric air in the room, of which it uſually conſtitutes about two-fifths. By this abſtraction the remainder becomes leſs fit for ſupporting animal life or flame, and may even become highly deleterious. In every degree the remainder becomes leſs refreſhing, and grows dull and oppreſſive. This is always accompanied by a peculiar ſmell, which, though not diſguſting, is unpleaſant. It reſembles the ſmell of burnt feathers, or more exactly the ſmell we feel if we rub violently for ſome time the palms of our hands together when perfectly dry.

For ſimilar reaſons theſe iron ſtoves occaſion a ſickly ſmell, by burning every particle of duſt which falls on the hot parts; and if they be wiped with a woollen cloth, or any cloth not perfectly free from every kind of greaſy or oily matter, a ſmell is produced for a day or days afterwards; ſo that without the moſt ſcrupulous attention we ſuffer by our very cleanlineſs.

For ſuch reaſons we think that the ſtoves of brick-work covered with ſtucco or with glazed tiles are vaſtly preferable. Theſe are much uſed in the genteeler houſes in Flanders and Holland, where they are made in the moſt elegant forms, and decorated with beautiful ſculpture or enamel; but it is plain that they cannot be ſo effectual, nor equally warm a room with the ſame expence of fuel. Earthen ware, eſpecially when covered with porous ſtucco, is far inferior to metal in its power of conducting heat. If built of bricks, they muſt be vaſtly more bulky when the fire-place and flues are of the ſame dimenſions. The moſt perfect way of conſtructing them would certainly be to make them of pottery, in parts exactly fitted to each other, and joined by a proper cement. This mode of conſtructing would admit of every elegance of form

or richneſs of ornament, and would not be ſo bulky as thoſe which are built of bricks. The great difficulty is to prevent their cracking by the heat. Different parts of the ſtove being of very different heats, they expand unequally, and there is no cement which can withſtand this, eſpecially when we recollect that the ſame heat which expands the baked earth cauſes the clay or cement, with which the parts of the ſtove are put together or covered, to contract. Accordingly thoſe earthenware ſtoves ſeldom ſtand a winter or two without cracking in ſome place or other, even when ſtrengthened by iron hoops and cramps judiciouſly diſpoſed within them. Even hooping them externally, which would be very unſightly, will not prevent this; for nothing can reſiſt the expanſion and contraction by heat and cold. When a crack happens in a ſtove, it is not only unſightly, but highly dangerous; becauſe it may be ſo ſituated, that it will diſcharge into the room the air vitiated by the fire.

For theſe and other reaſons, we can ſcarcely hope to make ſtoves of brick-work or pottery which ſhall bear the neceſſary heat without cracking; and their uſe muſt therefore be confined to caſes where very moderate heat is ſufficient. We need not deſcribe their conſtruction. It is evident that it ſhould be more ſimple than that of iron ſtoves; and we imagine that in the very few caſes in which they are likely to be employed in this country, a ſingle fire-place and an arch over it, divided, if we pleaſe, by a partition or two of thin tile to lengthen the flue, will be quite enough. If the ſtove is made in whole or in part of potters'-ware, a baſe for the fire-place, with an urn, column, obeliſk, or pyramid above it, for increaſing the ſurface, will alſo be ſufficient. The failure commonly happens at the joinings, where the different pieces of a different heat, and perhaps of a different baking, are apt to expand unequally, and by working on each other one of them muſt give way. Therefore, inſtead of making the joints cloſe and uſing any cement, the upper piece ſhould ſtand in a groove formed in the undermoſt, having a little powdered chalk or clay ſprinkled over it, which will effectually prevent the paſſage of any air; and room being thus given for the unequal expanſion, the joint remains entire. This may be conſidered as a general direction for all furnace-work, where it is vain to attempt to hinder the mutual working of the parts.

We have ſeen ſtoves in ſmall apartments at St. Peterſburg, which were made internally of potters'-ware, in a great variety of forms, and then covered with a thick coat of ſtucco, finiſhed externally with the utmoſt elegance of ornament, and we were informed that they were very rarely ſubject to crack. They did not give much heat, on account of the very low conducting power of the porous ſtucco; but we imagine that they would be abundantly warm for a moderate room in this country.

When fitted up in theſe ſituations, and with theſe precautions, the brick or pottery ſtoves are incomparably more ſweet and pleaſant than the iron ones.

But in the intenſe colds of Ruſſia and Sweden, or even for very large rooms in this kingdom, ſtoves of theſe ſmall dimenſions are not ſufficiently powerful, and we muſt follow the practice of thoſe countries where they are made of great ſize, and very moderately heated. It is needleſs to deſcribe their external form, which may be varied at pleaſure. Their internal ſtructure is the ſame in all, and is diſtinctly deſcribed in PNEUMATICS. We ſhall only enlarge a little on the peculiarities connected with the general principle of their conſtruction.

The ſtove is intended as a ſort of magazine, in which a great quantity of heat may be quickly accumulated, to be afterwards ſlowly communicated to the air of the room. The ſtove is therefore built extremely maſſive: and it is found that they are more powerful when coated with clay as wet as can be made to hang together. We imagine the reaſon of this to be, that very wet clay, and more particularly ſtucco, muſt be exceedingly porous when dry, and therefore a very ſlow conductor of heat. Inſtead of ſticking on the glazed tiles with no more clay or ſtucco than is ſufficient to attach them, each tile has at its back a ſort of box baked in one piece about two or three inches deep. It is repreſented in fig. 2. This is filled with mortar, and then ſtuck on the brick-work of the ſtove, which has a great number of iron pins or hooks driven into the joints, which may ſink into this clay and keep it firmly attached when dry. This coating, with the maſſive brick-work, forms a great maſs of matter to be heated by the fuel. The loweſt chamber, which is the fire-place, is ſomewhat wider, and conſiderably thicker than the ſtories above, which are merely flues. When the fire-place is finiſhed and about to be arched over, a flat iron bar of ſmall thickneſs is laid along the top of the ſide-wall on both ſides, a ſet of finiſhing bricks being moulded on purpoſe with a notch to receive the iron bar. Croſs bars are laid over theſe, one at each end and one or two between, having a bit turned down at the ends, which takes hold of the longitudinal bars, and keeps them from being thruſt outwards either by the preſſure of the arch or by the ſwelling in conſequence of the heat. In fig. 3. A is the croſs ſection of one of the long bars, and B C is part of one of the croſs bars, and C D is the clench which confines the bar A. This precaution is chiefly neceſſary, becauſe the contraction of the ſtove upwards obliges the walls of the other ſtories to bear a little on the arch of the fire-place. The building above is kept together in like manner by other courſes of iron bars at every ſecond return of the flue. The top of the ſtove is finiſhed by a pretty thick covering of brick-work. The laſt paſſage for the air at H (ſee PNEUMATICS, fig. 62.) has a ring lining its upper extremity, and projecting an inch or two above it. The flat round it is covered with ſand. When we would ſtop this paſſage, a cover ſhaped like a baſon or cover for diſhes at table is whelmed over it. The rim of this, reſting on the ſand, effectually prevents all air from coming through and getting up the vent. Acceſs is had to this damper by a door which can be ſhut tight enough to prevent the heated air of the room from waſting itſelf up the vent. When the room is too warm, it may be very rapidly cooled by opening this door. The warm air ruſhes up with great rapidity, and is replaced by cool air from without.

The management of the ſtove is as follows. About eight o'clock in the morning the *pietchnick*, or ſervant who has the charge of the ſtoves, takes off the cover, ſhuts the damper-door, and opens the fire-place door. He then puts in a handful of wood ſhavings or ſtraw, and kindles it. This warms the ſtove and vent, and begins a current of air through it. He then lays a few chips on the ſole of the fire-place, immediately within the door; and behind this he arranges the billets of birchwood, with their ends inwards. Then he lays on more wood in the front, till he thinks there is enough. He ſets fire to the chips, ſhuts the door, and opens the ſmall wicket at its bottom. The air blows the flame of the chips upon the billets behind them, and thus kindles them. They conſume ſlowly, while the billets in front remain untouched by the fire. The ſervant, having made his firſt round of the rooms, returns to this ſtove, and opens the door above to admit air into the vent. This is to ſupply its draught, and thus to check the draught in the body of the ſtove, which is generally too ſtrong at this time, and would conſume the fuel too faſt. By this time the billets in the front are burning, firſt at the bottom, and the reſt in ſucceſſion as they ſink down on the embers and come oppoſite to the wicket. The room does not yet feel any effect from the fire, the heat of which has not yet reached its

external furface ; but in about half an hour this grows warm. The upper door is fhut again, that no heat may now be wafted. The pietchnik by and by fpreads the embers and afhes over the whole bottom of the fire-place with a rake, by which the bottom is greatly heated, and heats the air contiguous to it externally (for it ftands on little pillars) very powerfully. He takes care to bring up to the top of the afhes every bit of wood or coal that is not yet confumed, that all may be completely expended. He does this as brifkly as poffible, that the room may not lofe much warmed air by keeping open the fire-place door. At his laft vifit, when he obferves no more glowing embers, he fhuts the fire-place door and wicket, and puts the damper on the paffage above, and fhuts its door.—All this is over in about an hour and a half after kindling the fire. All current of air is now at an end within the ftove, and it is now a great mafs of brick-work, heated to a great degree within, but only about blood-warm externally. The heat gradually fpreads outwards, and the external furface of the ftove acquires its greateft heat about three o'clock in the afternoon ; after which it gradually cools till next morning.

This heat feldom is fo great that one cannot bear to touch the ftove with his cheek, and to keep it there. In confequence of this it can burn none of the duft which unavoidably falls on the ftove, and we are never troubled with the fickening fmells that are unavoidable when we employ the fmall caft-iron ftoves much heated. The great expence of heat in a room arifes from the glafs windows. The pane is fo thin that the external air keeps it continually cold, and thus the windows are continually robbing the air of the room of its heat. This expence of heat is reduced to lefs than one third by double cafements. The inner cafement is about as much colder than the room as the outer cafement is warmer than the air of the fields ; and we have the fingular advantage of having no ice formed on the glaffes. But to enfure this laft advantage, the feams of the inner cafement muft be pafted with paper, and thofe of the outer cafement muft be left unpafted. If we do the contrary, we fhall certainly have ice on the outer cafement ; the reafon of which is eafily feen.

We have been thus particular in our defcription of the management, becaufe the reafons of fome particulars are not very obvious, and the practice would not readily occur to us in this country ; fo that a perfon who, on the faith of our recommendation, fhould prefer one of thefe ftoves to the German ftove, whofe management is fimple and obvious, might be greatly difappointed. But by following this method, we are confident that the Ruffian ftove will be found much fuperior both in warmth and agreeable air. The fpreading out of the embers, and waiting till all is reduced to afhes before the doors are fhut, is alfo abfolutely neceffary, and a neglect of it would expofe us to imminent danger of fuffocation by fixed air ; and this is the only inconvenience of the Ruffian ftove, from which the other ftove is free. The fixed air has no fmell ; and the firft indication of its prefence is a flight giddinefs and laffitude, which difpofes us to fit down and to fleep. This would be fatal ; and we muft immediately open the upper paffage and the fire-place door, fo as to produce a ftrong current to carry the vitiated air of the room up the chimney. Throwing up the fafhes, or at leaft opening all the doors, is proper on fuch an occafion.

If we burn pit-coal, either raw or charred, this precaution is ftill more neceffary ; becaufe the cinder is not fo eafily or fo foon completely confumed. This fuel will require a little difference in the management from wood fuel, but which is eafily feen by any perfon of reflection. The fafe way would be to rake out all half-burnt coal before fhutting up the doors.

If we ufe raw pit-coal, great care is neceffary to prevent the accumulation of foot in the upper part of the ftove. It is an inacceffible place for the chimney fweep ; and if we attempt to burn it out, we run a great rifk of fplitting that part of the ftove which is the moft flightly conftructed. It is advifable therefore to burn it away every day, by giving a brifk draught with an open door for five minutes. With wood or coak there is no danger.

It will not be improper in this place to give fome inftructions for the conftruction of ftoves for warming feveral floors in a great manufactory, fuch as a cotton-mill, or a public library or mufeum.

In fuch fituations we think cleanlinefs, wholefomenefs, and fweetnefs of air, no lefs neceffary than in the drawing-room of a man of opulence. We therefore recommend the brick-ftove in preference to the iron one ; and though it would not be the beft or moft economical practice to heat it but once a-day, and we fhould rather prefer the German practice of conftant feeding, we ftill think it highly proper to limit the heat to a very moderate degree, and employ a large furface.

If the difpofition of the rooms allows us the conveniency of a thick party-wall, we would place the ftove in the middle of this wall, in an arch which pierces through the wall. Immediately above this arch we would carry up a very wide chimney through the whole height. This chimney muft have a paffage opening into each floor on both fides, which may be very accurately fhut up by a door. The ftove being fet up under the arch, it muft have a pipe communicating with its flue, and rifing up through this chimney. Could an earthen pipe be properly fupported, and fecured from fplitting by hoops, we fhould prefer it for the reafons already given. But as this is perhaps expecting too much, we muft admit the ufe of a caft-iron pipe. This is the real chimney or flue of the ftove, and muft be of as great diameter as poffible, that it may act, by an extenfive furface, all the way up.

The ftove ftands under the arch in the wall ; but the air that is warmed by its furface would efcape on both fides, and would be expended in that fingle floor. To prevent this, the ftove muft be inclofed in a cafe : this may be of brick-work, at the diftance of two or three inches from the ftove all around. It muft be well fhut in above, and at the foundation muft have a row of fmall holes to admit the air all around it. This air will then be warmed over the whole fpace between the ftove and the cafe, pafs up the chimney, and there receive additional heat from the flue-pipe which is in the middle. Great care muft be taken that the fire-place door have no communication with the fpace between the ftove and its cafe, but be inclofed in a mouth-piece which comes through the cafe, and opens into the feeding-room. Thus all the air which goes up to the rooms will be pure and wholefome, provided we take care that every thing be kept clean and fweet about the air-holes below. Obferve that thofe air-holes which are near the furnace door muft be inclofed in a wooden trunk which takes in its air at fome diftance from this door ; for fince the current between the ftove and cafe may be almoft as great as the current within the ftove (nay, when a puff of wind beats down the chimney, it may even exceed it), there is a rifk of fome vitiated air and fmoke being drawn into the cafe.

If the ftove cannot be placed in the arch of a party-wall, it may be fet adjoining to a fide or outer wall, and furnifhed with a cafe, a large chimney, and a flue-pipe, in the fame manner. But in this cafe a great deal of heat is wafted on this outer wall, and carried off by the external air. In this fituation we would recommend to line that part of the wall which is behind the ftove (at two or three inches diftance), and the whole of the chimney, with plafter on laths. Thefe

ſhould be nailed on battens properly faſtened on the wall, leaving a ſpace of an inch between the laths and the wall. The plaſter ſhould be of the moſt ſpungy kind, having in it a quantity of clay in powder inſtead of the full proportion of ſand. Horſe-dung, waſhed with water and ſtrained through coarſe flannel, leaves a great portion of unaſſimilated vegetable fibre, which will mix very intimately in the plaſter, and make it a ſubſtance very unfit for conducting heat. There is no danger of catching fire by this lining. We have ſeen a moſt tremendous fire rage for three hours, in contact with a partition of lath and plaſter (on the plaſter-ſide however), without diſcolouring the thin laths on the other ſide. We once ſaw a cottage chimney on fire, and burn till the ſoot was conſumed. This chimney was nothing but a pipe of a foot wide, made of laths, and plaſtered on the inſide and outſide; and it paſſed through a thatched roof. We therefore recommend this in place of the brick caſe for incloſing the ſtove. It would ſave heat; and as it might be made in pieces on detached frames, which could be joined by iron ſtraps and hinges, any part of the ſtove could be laid open for repairs at pleaſure.

We have no heſitation in ſaying that a ſtove conſtructed in this manner would be greatly ſuperior in power to any we have ſeen, and would be free from many of their diſguſting defects. We beg leave therefore to conclude this part of the ſubject by deſcribing one which was to have been erected in one of the churches of the city of Edinburgh.

Fig. 4. is a ſketch of the plan of the church contained in the parallelogram A F E D. P marks the place of the pulpit, and L M N O the front of the galleries. Theſe are carried back to the ſide walls A B and D C. But at the end oppoſite to the pulpit they do not reach ſo far, but leave a ſpace B F E C about twelve feet wide. Below the back of the galleries, on each ſide, there is a paſſage A B G H, K I C D, ſeparated from the ſeated part of the church by partitions which reach from the floor to the galleries, ſo that the ſpace H G I K is completely ſhut in. The church is an ancient Gothic building, of a light and airy ſtructure, having two rows of large windows above the arcades, and a ſpacious window in the eaſt end above the pulpit. The congregation complain of a cold air, which they feel pouring down upon their heads. This is more particularly felt by thoſe ſitting in the fronts of the galleries. We imagine that this ariſes chiefly from the extenſive ſurface of the upper row of windows, and of the cold ſtone walls above, which robs the air of its heat as it glides up along the ſides of the church. It becomes heavier by collapſing, and in this ſtate deſcends in the middle of the church.

The ſtove S is placed againſt the middle of the weſt wall at the diſtance of a few inches, and is completely incloſed in a caſe of lath and plaſter. The vent, which is to carry off the ſmoke and burnt air, is conveyed up or along the wall, and through the roof or ſide-wall, but without any communication with the caſe. In like manner the fire-place door is open to the paſſage, without communicating with the caſe; and care is taken that the holes which admit the air into the caſe are ſo diſpoſed that they ſhall run no riſk of drawing in any air from the fire-place door.

From the top of this caſe proceed two trunks Q, R, each of which is two feet broad and ſix inches deep, coated within and without with the moſt ſpungy plaſter that can be compoſed. For this purpoſe we ſhould recommend a compoſition of powdered charcoal and as much clay and quicklime as will give it a very ſlight coheſion. We know that a piece of this may be held in the hand, without inconvenience, within an inch of where it is of a glowing red heat.—Theſe trunks open into another trunk X V T Y Z, which ranges along the partition immediately under the galleries, and may be formed externally into a corniche, a little maſſive indeed, but not unſightly in a building of this ſtyle. This trunk is coated in the ſame manner. It has ſeveral openings *a*, *a*, &c. which have ſliders that can be drawn aſide by means of handles acceſſible from the outer paſſage.—At the extremities X and Z of this trunk are two perpendicular trunks which come up through the galleries, and are continued to a conſiderable height. At their junction with the horizontal trunk are two doors large enough to admit a lamp. Each perpendicular trunk has alſo a valve by which it can be completely ſtopped.

The ſtove is managed as follows: Early in the morning the ſuperintendant ſhuts all the ſliders, and ſets a lamp (burning) in each of the trunks X and Z, and ſhuts the doors. He then puts on and kindles the fire in the ſtove, and manages it either in the Ruſſian or German method. Perhaps the latter is preferable, as being liable to feweſt accidents from miſtake or neglect.

The lamps ſet in the lower ends of the upright trunks preſently warm them, and produce a current of air upwards. This muſt be ſupplied by the horizontal trunk, which muſt take it from the caſe round the ſtove. Thus a current is begun in the direction we wiſh. By and by the air in the caſe acquires heat from the ſtove, and the current becomes extremely briſk. When the manager perceives this, he removes the lamps, ſhuts the valves, and opens the holes *a*, *a*, &c. beginning with the moſt remote, and proceeding ſlowly towards the ſtove from each extremity of the horizontal branches. The heated air now iſſues by theſe holes, glides along the ceiling below the galleries, and eſcapes, by riſing up along the fronts of the galleries, and will be ſenſibly felt by thoſe ſitting there, coming on their faces with a gentle warmth. It will then riſe (in great part) ſtraight up, while ſome of it will glide backwards, to the comfort of thoſe who ſit behind.

The propriety of ſhutting the valves of the upright trunks is evident. If they were left open, no air would come out by the holes *a*, *a*, &c.; but, on the contrary, the air would go in at theſe holes to ſupply the current, and the ſtove be rendered uſeleſs. The air delivered by theſe holes will keep cloſe to the ceiling, and will not, as we imagine, incommode thoſe who ſit below the galleries. But if it ſhould be found to render theſe parts too warm, holes may be pierced through the ceiling, by which it will riſe among the people above, and muſt be very comfortable. It will require the careful attention of ſome intelligent perſon to bring all this into a proper train at firſt, by finding the proper apertures of the different holes, ſo as to render the heat equable through the whole ſpace. But this being once aſcertained the difficulty is over.

The air trunks muſt be very capacious, but may be contracted towards the extremities as their lateral diſcharges diminiſh; and the row of holes which admit the air to the caſe round the ſtove muſt be fully able to ſupply them.

It muſt be obſerved, that in this conſtruction the aſcenſional force is but ſmall. It is only the height of a ſhort column of warm air from the ground to the galleries. At firſt indeed it is great, having the unlimited height of the perpendicular trunks at X and Z; but during the uſe of the ſtove it is reduced to nine or ten feet. It is neceſſary, therefore, that the ſtove be highly heated, perhaps conſiderably beyond the Ruſſian practice, but yet inferior to the heat of the German iron ſtoves. But ſtill we ſtrongly recommend the brick or pottery ſtoves, on account of the wholeſome ſweetneſs of the air which they furniſh; and we are certain that a ſtove of moderate dimenſions, eight feet long, for inſtance, by eight feet high, will be ſufficient for warming a church holding 1200 or 1500 people. If the ſtove could be placed lower, which in many ſituations is very practicable, its effect would be proportionally greater, becauſe all depends on the rapidity

of the current. When we are limited in height, we muſt extend the ſtove ſo much the more in length, and make the air trunks more capacious. Theſe and many other circumſtances of local modification, muſt be attended to by the erector of the ſtove; and without the judicious attention of an intelligent artiſt, we may expect nothing but diſappointment. It is hardly poſſible to give inſtructions ſuited to every ſituation; but a careful attention to the general principle which determines the aſcenſional force, will free the artiſt from any great riſk of failure.

We may ſay the ſame thing of ſtoves for conſervatories, hot-houſes, hot walls, &c. and can hardly add any thing of conſequence to what we have already ſaid on theſe heads in the article PNEUMATICS.

We muſt not, however, diſmiſs the ſubject without taking notice of the very ſpecious projects which have been frequently offered for drying malt by ſtoves. Many of theſe are to be ſeen in the publications of the academies of Stockholm, Upſal, Copenhagen, and ſome have been erected in this kingdom; but they have not been found to anſwer.

We apprehend that they cannot anſwer. To dry malt, and make it fit for the ales and beers for which this iſland is ſo famous, it is by no means enough that we give it a proper and an equable ſupply of heat.—This alone would bake it and make it flinty, cauſing the moiſture to penetrate the mealy particles of the grain; and, by completely diſſolving the ſoluble parts, would render each kernel an uniform maſs, which would dry into a flinty grain, breaking like a piece of glaſs.—A grain of malt is not an inert pulp. It is a SEED, in an active ſtate, growing, and of an organiſed ſtructure. We wiſh to ſtop it in this ſtate, and kill it, not by heating it, but by abſtracting its moiſture We thus leave it in its granulated or organiſed form, ſpungy, and fit for imbibing water in the maſh-tub, without running into a paſte.

To accompliſh theſe purpoſes, the conſtruction of our malt kilns ſeems very well adapted. The kiln is the only flue of the furnace, and a copious *current* of air is formed through among the grains, carrying off with it the water which is evaporating by the heat. But this evaporation, being chiefly in conſequence of the vapour being immediately diſſolved by the paſſing air, will ſtop as ſoon as the current of air ſtops. This current has to make its way through moiſt grain, laid in a pretty thick bed, and matted together. Some force, therefore, is neceſſary to drive it through. This is furniſhed by the draught of the kiln. Subſtituting a ſtove, immediately applied to the malt, will not have this effect. The only way in which we think this can be done different from the preſent, is to have a horizontal flue, as has been propoſed in theſe projects, ſpread out at a ſmall diſtance below the grate on which the malt is laid, and to cover the whole with a high dome, like a glaſs-houſe dome. This being filled with a tall column of hot air, and having no paſſage into it but through the malt, would produce the current which we want. We are convinced that this will make much leſs fuel ſerve; but we are by no means certain that the ſulphureous and carbonic acid which accompanies the air in our common kiln, is not a neceſſary or a uſeful ingredient in the proceſs. It is well known that different coaks, cinders, or charcoals, impart different qualities to the malts, and are preferred *each for its own purpoſe*. Were this a matter of indifference, we know a method of rapidly drying malt much more economical and expeditious than by either kiln or ſtove. But this has nothing to do with our preſent ſubject, of which we now take leave.

STOURBRIDGE, or STURBICH, the name of a field near Cambridge, noted for its famous fair kept annually on the 7th of September, and which continues for a fortnight. The commodities are, horſes, hops, iron, wool, leather, cheeſe, &c. This place is alſo noted for an excellent ſpecies of clay, capable of reſiſting an intenſe heat. It is uſed in making pots for glaſs-houſes, fire-bricks, &c. and is ſold at an high price.

STOW, the name of a market-town in Glouceſterſhire in England, ſituated in W. long. 1. 50. N. lat. 51. 54. It is alſo the name of a fine ſeat of the marquis of Buckingham in Buckinghamſhire. Here are the beſt gardens in England, adorned with buſts, ſtatues, obeliſks, pavilions, and temples. It is two miles from the town of Buckingham.

STOW (John), the induſtrious hiſtorian, ſon of Thomas Stow, merchant-taylor of St. Michael's, Cornhill, in London, was born about the year 1525. Of the early part of his life we know very little, except that he was bred to his father's buſineſs, which in the year 1560 he relinquiſhed, devoting himſelf entirely to the ſtudy of our ancient hiſtorians, chronicles, annals, charters, regiſters, and records. Of theſe he made a conſiderable collection, travelling for that purpoſe to different parts of the kingdom, and tranſcribing ſuch manuſcripts as he could not purchaſe. But this profeſſion of an antiquary being attended with no preſent emolument, he was obliged for ſubſiſtence to return to his trade.—It happened, however, that his talents and neceſſities were made known to Dr. Parker, archbiſhop of Canterbury; who being himſelf an antiquary, encouraged and enabled Mr. Stow to proſecute his darling ſtudy. In thoſe times of perſecution, though Elizabeth was then upon the throne, honeſt John Stow did not eſcape danger. His collection of Popiſh records was deemed cauſe of ſuſpicion. His younger brother Thomas preferred no leſs than 140 articles againſt him before the eccleſiaſtical commiſſion; but the proof being inſufficient, he was acquitted. In 1565 he firſt publiſhed his Summary of the Chronicles of England. About the year 1584 he began his Survey of London. In 1585 he was one of the two collectors for a great muſter of Lime-ſtreet ward: in the ſame year he petitioned the corporation of London to beſtow on him the benefit of two freemen, to enable him to publiſh his Survey; and in 1589 he petitioned again for a penſion. Whether he ſucceeded, is not known. He was principally concerned in the ſecond edition of Holinſhed's chronicle, publiſhed in 1587. He alſo corrected, and twice augmented, Chaucer's works, publiſhed in 1561 and in 1597. His Survey of London was firſt publiſhed in 1598. To theſe laborious works he would have added his large Chronicle, or Hiſtory of England; but he lived only to publiſh an abſtract of it, under the title of *Flores Hiſtoriarum*. The folio volume, which was printed after his death, with the title of *Stow's Chronicle*, was taken from his papers by Edmund Howes. Having thus ſpent his life and fortune in theſe laborious purſuits, he was at laſt obliged to ſolicit the charitable and well diſpoſed for relief. For this purpoſe, king James I. granted him, in 1603, a brief, which was renewed in 1604, authoriſing him to collect in churches the benefactions of his fellow-citizens. He died in April, 1605, aged eighty; and was buried in his pariſh-church of St. Andrew's, Underſhaft, where his widow erected a decent monument to his memory. John Stow was a moſt indefatigable antiquarian, a faithful hiſtorian, and an honeſt man.

STOWMARKET, a town of Suffolk, in England, ſituated in E. long. 1. 6. N. lat. 52. 16. It is a large handſome place, ſituated between the branches of the rivers Gypping and Orwell, and is remarkable for having the beſt cherries in England.

STOWAGE, the general diſpoſition of the ſeveral materials contained in a ſhip's hold, with regard to their figure, magnitude, or ſolidity. In the ſtowage of different articles, as ballaſt, caſks, caſes, bales, and boxes, there are ſeveral

general rules to be obferved, according to the circumftances or qualities of thofe materials. The cafks which contain any liquid are. according to the fea-phrafe, to be *bung-up* and *bilge-free*, i. e. clofely wedged up in an horizontal pofition, and refting on their quarters: fo that the bilges where they are thickeft being entirely free all round, cannot rub againft each other by the motion of the veffel. Dry goods, or fuch as may be damaged by the water, are to be carefully inclofed in cafks, bales, cafes, or wrappers; and wedged off from the bottom and fides of the fhip, as well as from the bow, mafts, and pump-well. Due attention muft likewife be had to their dif-pofition with regard to each other, and to the trim and centre of gravity of the fhip; fo that the heavieft may always be neareft the keel, and the lighteft gradually above them.

STRABISMUS, fquinting. See Squinting.

STRABO, a celebrated Greek geographer, philofopher, and hiftorian, was born at Amafia, and was defcended from a family fettled at Gnoffus in Crete. He was the difciple of Xenarchus, a Peripatetic philofopher, and at length attached himfelf to the Stoics. He contracted a ftrict friendfhip with Cornelius Gallus, governor of Egypt, and travelled into feveral countries to obferve the fituation of places, and the cuftoms of nations. He flourifhed under Auguftus, and died under Tiberius, about the year 25, in a very advanced age.—He compofed feveral works, all of which are loft, except his Geography in feventeen books; which are juftly efteemed very precious remains of antiquity. The two firft books are employed in fhowing, that the ftudy of geography is not only worthy of, but even neceffary to, a philofopher; the third defcribes Spain; the fourth, Gaul and the Britannic ifles; the fifth and fixth, Italy and the adjacent ifles; the feventh, which is imperfect at the end, Germany, the countries of the Getæ and Illyrii, Taurica Cherfonefus, and Epirus; the eighth, ninth, and tenth, Greece with the neighbouring ifles; the four following, Afia within Mount Taurus; the fifteenth and fixteenth, Afia without Taurus, India, Perfia, Syria, Arabia; and the feventeenth, Egypt, Æthiopia, Carthage, and other places of Africa. Strabo's work was publifhed with a Latin verfion by Xylander, and notes by Ifaac Cafaubon (or rather by Henry Scrimzeer, from whom Cafaubon chiefly ftole them), at Paris, 1620, in folio. But the beft edition is that of Amfterdam, in 1707, in two volumes folio, by the learned Theodore Janfonius ab Almelooveen, with the entire notes of Xylander, Cafaubon, Meurfius, Cluver, Holftenius, Salmafius, Bochart, Ez. Spanheim, Cellarius, and others. To this edition is fubjoined the *Chreftomathiæ*, or epitome of Strabo; which, according to Mr. Dodwell, who has written a very elaborate and learned differtation about it, was made by fome unknown perfon between the years of Chrift 676 and 996. It has been found of fome ufe, not only in helping to correct the original, but in fupplying in fome meafure the defect in the feventh book. Mr. Dodwell's differtation is prefixed to this edition.

STRADA (Famianus), a very ingenious and learned Jefuit, was born at Rome the latter end of the 16th century, and taught rhetoric there, in a public manner, for fifteen years. He wrote feveral pieces upon the art of oratory, and publifhed fome orations with a view of illuftrating by example what he had inculcated by precept. But his *Prolufiones Academicæ*, and his *Hiftoria de Bello Belgico*, are the works which raifed his reputation, and have preferved his memory. His hiftory of the war of Flanders was publifhed at Rome; the firft decade in 1640, the fecond in 1647: the whole extending from the death of Charles V. which happened in 1558; to the year 1590. It is written in good Latin, as all allow; but its merit in other refpects has been varioufly determined. His *Prolufiones Academicæ* fhow great ingenuity, and a mafterly fkill in claffical literature; that prolufion efpecially in which he introduces Lucan, Lucretius, Claudian, Ovid, Statius, and Virgil, each of them verfifying according to his own ftrain. They have been often printed. We know not the year of Strada's birth or of his death.

STRAHAN (William), an eminent printer, was born at Edinburgh in the year 1715. His father, who had a fmall appointment in the cuftoms, gave his fon the education which every one of decent rank then received in a country, where the avenues to learning were eafy, and open to men of the moft moderate circumftances. After having paffed through the tuition of a grammar fchool, he was put apprentice to a printer; and when a very young man, removed to a wider fphere in that line of bufinefs, and went to follow his trade in London. Sober, diligent, and attentive, while his emoluments were for fome time very fcanty, he contrived to live rather within than beyond his income; and though he married early, and without fuch a provifion as prudence might have looked for in the eftablifhment of a family, he continued to thrive, and to better his circumftances. This he would often mention as an encouragement to early matrimony; and ufed to fay, that he never had a child born that Providence did not fend fome increafe of income to provide for the increafe of his houfehold. With fufficient vigour of mind, he had that happy flow of animal fpirits, that is not eafily difcouraged by unpromifing appearances.

His abilities in his profeffion, accompanied with perfect integrity and unabating diligence, enabled him, after the firft difficulties were overcome, to advance with rapid fuccefs. And he was one of the moft flourifhing men of the trade, when, in the year 1770, he purchafed a fhare of the patent for king's printer of Mr. Eyre, with whom he maintained the moft cordial intimacy during the reft of his life. Befide the emoluments arifing from this appointment, as well as from a very extenfive private bufinefs, he now drew largely from a field which required fome degree of fpeculative fagacity to cultivate, on account of the great literary property which he acquired by purchafing the copy-rights of the moft celebrated authors of the time. In this his liberality kept equal pace with his prudence, and in fome cafes went perhaps rather beyond it. Never had fuch rewards been given to the labours of literary men, as now were received from him and his affociates in thofe purchafes of copy-rights from authors.

Having now attained the firft great object of bufinefs, wealth, Mr. Strahan looked with a very allowable ambition on the ftations of political rank and eminence. Politics had long occupied his active mind, which he had for many years purfued as his favourite amufement, by correfponding on that fubject with fome of the firft characters of the age. Mr. Strahan's queries to Dr. Franklin in the year 1769, refpecting the difcontents of the Americans, publifhed in the London Chronicle of 28th July, 1778, fhow the juft conception he entertained of the important confequences of that difpute, and his anxiety as a good fubject to inveftigate, at that early period, the proper means by which their grievances might be removed, and a permanent harmony reftored between the two countries. In the year 1775 he was elected a member of parliament for the borough of Malmfbury in Wiltfhire, with a very illuftrious colleague, the hon. C. J. Fox; and in the fucceeding parliament, for Wootton Baffet, in the fame county. In this ftation, applying himfelf with that induftry which was natural to him, he was a ufeful member, and attended the houfe with a fcrupulous punctuality. His talents for bufinefs acquired the confideration to which they were intitled, and were not unnoticed by the minifter.

In his political connections he was conftant to the friends to whom he had firft been attached. He was a fteady fupporter

of that party who were turned out of adminiſtration in ſpring, 1784, and loſt his ſeat in the houſe of commons by the diſſolution of parliament with which that change was followed: a ſituation which he did not ſhow any deſire to reſume on the return of the new parliament; ariſing from a feeling of ſome decline in his health, which had rather ſuffered from the long ſittings and late hours with which the political warfare in the preceding had been attended. Without any fixed diſeaſe, his ſtrength viſibly declined; and though his ſpirits ſurvived his ſtrength, yet the vigour and activity of his mind were alſo conſiderably impaired. Both continued gradually to decline till his death, which happened on the 9th of July, 1785, in the ſeventy-firſt year of his age.

Endued with much natural ſagacity, and an attentive obſervation of life, he owed his riſe to that ſtation of opulence and reſpect which he attained, rather to his own talents and exertion, than to any accidental occurrence of favourable or fortunate circumſtances. His mind was not uninformed by letters; and from a habit of attention to ſtyle, he acquired a conſiderable portion of critical acuteneſs in the diſcernment of its beauties and defects. In one branch of writing he particularly excelled—the epiſtolary; in which he not only ſhowed the preciſion and clearneſs of buſineſs, but poſſeſſed a neatneſs as well as a fluency of expreſſion, which few letter-writers have been known to ſurpaſs. Letter-writing was one of his favourite amuſements; and among his correſpondents were men of ſuch eminence and talents, as well repaid his endeavours to entertain them. Among theſe, as before mentioned, was the juſtly celebrated Dr. Franklin, originally a printer like Mr. Strahan, whoſe friendſhip and correſpondence, notwithſtanding the difference of their ſentiments in political matters, he continued to enjoy till his death. One of the lateſt letters which he received from his illuſtrious and venerable friend, contained a humorous allegory of the ſtate of politics in Britain, drawn from the profeſſion of printing; of which, though the doctor had quitted the exerciſe, he had not forgotten the terms.

The judicious diſpoſition which Mr. Strahan made of his property, affords an evident proof of his good ſenſe and propriety. After providing munificently for his widow and children, his principal ſtudy ſeems to have been to mitigate the affliction of thoſe (and many there were) who would more immediately have felt his loſs, by bequeathing them liberal annuities for their lives; and (recollecting that all of a profeſſion are not equally provident) he left 1000l. to the Company of Stationers, the intereſt to be divided among infirm old printers.

As the virtuous connections of the life and the heart are always pleaſing to trace—of Mr. Strahan it may briefly be ſaid, that his capacity, diligence, and probity, raiſed him to the head of his profeſſion. The good humour and obliging diſpoſition which he owed to nature, he cultivated with care, and confirmed by habit. His ſympathetic heart beat time to the joy and ſorrow of his friends. His advice was always ready to direct youth, and his purſe open to relieve indigence. Living in times not the pureſt in the Engliſh annals, he eſcaped unſullied through the artifices of trade and the corruption of politics. In him a ſtrong natural ſagacity, improved by an extenſive knowledge of the world, ſerved only to render reſpectable his unaffected ſimplicity of manners, and to make his Chriſtian philanthropy more diſcerning and uſeful. The uninterrupted health and happineſs which accompanied him for half a century in the capital, proves honeſty to be the beſt policy, temperance the greateſt luxury, and the eſſential duties of life its moſt agreeable amuſement. In his elevated fortune, none of his former acquaintance ever accuſed him of neglect. He attained proſperity without envy, enjoyed wealth without pride, and diſpenſed bounty without oſtentation.

STRAIKS, in the military art, are ſtrong plates of iron, ſix in number, fixed with large nails called *ſtraik-nails*, on the circumference of a cannon-wheel, over the joints of the felloes; both to ſtrengthen the wheel, and to ſave the felloes from wearing on hard ways or ſtreets.

STRAIN, a lameneſs occaſioned by the violent extenſion of ſome membranous or tendinous part, as the ancle or ſhoulder.

STRAIN, *Streſs*, in mechanics, are terms indiſcriminately uſed to expreſs the force which is *excited* in any part of a machine or ſtructure of any kind, tending to break it in that part. Thus every part of a rope is *equally* ſtrained by the weight which it ſuſpends. Every part of a pillar is *equally* ſtrained by the load which it ſupports. A mill axle is *equally* twiſted and ſtrained in every part which lies between the part of the wheel actuated by the moving power, and the part which is reſiſted by the work to be performed. Every part of a lever or joiſt is *differently* ſtrained by a force acting on a diſtant part.

It is evident that we cannot make the ſtructure fit for its purpoſe, unleſs the ſtrength in every part be at leaſt equal to the ſtreſs laid on, or the ſtrain excited in that part. It is no leſs plain, that if we are ignorant of the principles which determine this ſtrain, both in intenſity and direction, in relation to the magnitude and the ſituation of its remote cauſe, the only ſecurity we have for ſucceſs is to give to every part of the aſſemblage ſuch ſolidity, that we can leave no doubt of its ſufficiency. But daily experience ſhows us that this vague ſecurity is in many caſes uncertain, if we are thus ignorant. In all caſes it is ſlovenly, unlike an artiſt, attended with uſeleſs expence, and in machines is attended with a loſs of power, which is waſted in changing the motions of a needleſs load of matter.

It muſt therefore greatly tend to the improvement of all profeſſions occupied in the erection or employment of ſuch ſtructures, to have a diſtinct notion of the ſtrains to which their parts are expoſed. Frequently, nay generally, theſe ſtrains are not immediate, but ariſe from the action of forces on diſtant parts, by which the aſſemblage is ſtrained, and there is a tendency to rupture in every part. This ſtrain is *induced* on every part, and is there modified by fixed mechanical laws. Theſe it is our buſineſs to learn; but our chief object in this inveſtigation, is to determine the ſtrength of materials which it is neceſſary to oppoſe in every part to this ſtrain; and how to oppoſe this ſtrength in ſuch a manner that it ſhall be exerted to the beſt advantage. The notions of ſtrain and ſtrength therefore hardly admit of ſeparation; for it is even by means of the ſtrength of the intermediate parts, that the ſtrain is propagated to, or excited in, the part under conſideration.

STRAINING, is the clarification of a liquor, by paſſing it through a ſieve or filter. The word is derived from the French *eſtreindre*; which is formed from *ex*, "out of," and *ſtringere*, "to preſs."

STRAIT, a narrow channel or arm of the ſea, ſhut up between lands on either ſide, and affording a paſſage out of one great ſea into another. There are three kinds of ſtraits. 1. Such as join one ocean to another. Of this kind are the ſtraits of Magellan and Le Maire. 2. Thoſe which join the ocean to a gulf: the ſtraits of Gibraltar and Babelmandel are of this kind, the Mediterranean and Red Sea being only large gulfs. 3. Thoſe which join one gulf to another; as the ſtraits of Caffa, which join the Palus Mæotis to the Euxine or Black Sea. The paſſage of ſtraits is commonly dangerous, on account of the rapidity and oppoſite motion of currents. The

moſt celebrated ſtrait in the world is that of Gibraltar, which is about from twenty-four to thirty-ſix miles long, and from fifteen to twenty-four broad, joining the Mediterranean Sea with the Atlantic Ocean. The ſtraits of Magellan, diſcovered in 1520 by F. Magellan, were uſed ſome time as a paſſage out of the North into the South Sea; but ſince the year 1616, that the ſtrait of Le Maire has been diſcovered, the former has been diſuſed; both becauſe of its length, which is full three hundred miles, and becauſe the navigation thereof is very dangerous, from the waves of the North and South Seas meeting in it and claſhing. The ſtrait at the entrance of the Baltic is called the *Sound*. That between England and France, *Le pas de Calais*, or the *Channel*. There are alſo the ſtraits of Weigats, of Jeſſo, of Anian, of Davis, and Hudſon, &c.

STRAKES, or STREAKS, in a ſhip, the uniform ranges of planks on the bottom and ſides of a ſhip, or the continuation of planks joined to the ends of each other, and reaching from the ſtem to the ſtern-poſt and faſhion-pieces; the loweſt of theſe, which is called the *garboard-ſtreak*, is let into the keel below, and into the ſtem and ſtern-poſt. They ſay alſo a ſhip *heels a ſtrake*, that is, hangs or inclines to one ſide the quantity of a whole plank's breadth.

STRAKES, or *ſtreks*, in mining, are frames of boards fixed on or in the ground, where they waſh and dreſs the ſmall ore in a little ſtream of water, hence called *ſtraked ore*.

STRALSUND, a ſtrong and rich ſea-port town of Germany, in Hither Pomerania, and was formerly an important trading-place. In 1678 it was forced to ſurrender to the elector of Brandenburg, after 1800 houſes had been burnt to aſhes in one night's time. After this the Swedes defended it to the laſt extremity; and Charles XII in 1714, came hither after his return out of Turkey. But the crown of Sweden not being able to hold out againſt five great powers, it was forced to ſubmit in 1715. In 1720 it was rendered back to Sweden, but in a very poor condition. It is almoſt ſurrounded by the ſea and the lake Franeen, and has a harbour ſeparated from the iſle of Rugen by a narrow ſtrait. It is fifteen miles north-weſt of Grippiwald, and forty north-eaſt of Guſtrow. E. long. 13. 28. N. lat. 54. 17.

STRAMONIUM, in botany: a ſpecies of DATURA.

STRAND *(Saxon)*, any ſhore or bank of a ſea or great river. Hence the ſtreet in the weſt ſuburbs of London, which lay next the ſhore or bank of the Thames, was called the *Strand*. An immunity from cuſtom, and all impoſitions upon goods or veſſels by land or water, was uſually expreſſed by *ſtrand* or *ſtream*.

STRANDED (from the Saxon *ſtrand*), is when a ſhip is by tempeſt, or by ill ſteerage, run on ground, and ſo periſhes. Where a veſſel is ſtranded, juſtices of the peace, &c. ſhall command conſtables near the ſea-coaſts to call aſſiſtance for the preſervation of the ſhip; and officers of men-of-war are to be aiding and aſſiſting thereto.

STRANGE (Sir Robert), who carried the art of engraving to ſo great perfection in this country, was a man of ſuch general merit, that a life of him, not merely eſtimating his character as an artiſt, but alſo pourtraying his private virtues and domeſtic habits, would be both uſeful and entertaining. Such a life, we have reaſon to believe, will be preſented to the public. Modeſt as he was ingenious, he uſed indeed to ſay that the works of an artiſt ſhould ſerve for a life and monument to him. His works no doubt will perpetuate his name, whilſt any taſte for the fine arts remains. In the mean time, we cannot but here give a ſhort ſketch of his hiſtory, the accuracy of which may be depended on.

Sir Robert Strange was born in the iſland of Pomona in Orkney, July the 14th, 1721, and died at London July the 5th, 1792. He was lineally deſcended from David Strange, or Strang, a younger ſon of the family of the Stranges or Strangs of Balcaſky, in the county of Fife, who ſettled in Orkney at the time of the Reformation. But as there were no males remaining of the elder branch of the Stranges of Balcaſky, Sir Robert became the male repreſentative of it, and was found by a legal inveſtigation to have a right to the armorial bearings, and every other mark of honour belonging to that ancient family.

He received his claſſical education at Kirkwall, in Orkney, under the care of a learned, worthy, and much reſpected gentleman, Mr. Murdoch Mackenzie, ſtill alive (1795), who has rendered infinite ſervice to his country, by the accurate ſurveys and charts he has given of the iſlands of Orkney and of the Britiſh and Iriſh coaſts.

Originally intended for the law, Mr. Strange ſoon became tired of that profeſſion, and perceived that his genius deciſively led him to the arts of drawing and engraving. For this purpoſe he was introduced to the late Mr. Richard Cooper at Edinburgh, the only perſon there who had then any taſte in that line of the fine arts. He was bound with him as an apprentice for ſix years; during which time he made ſuch progreſs in his new profeſſion, that his friends entertained the higheſt expectation of his ſucceſs; nor were they diſappointed.

In the year 1747 he married Iſabella, only daughter of William Lumſden, ſon of biſhop Lumſden; and ſoon after his marriage he went to France, where, with the moſt ardent application he proſecuted his ſtudies, chiefly at Paris, under the direction of the celebrated Le Bas, who engraved many excellent prints from the Dutch painters. It was from Le Bas he had the firſt hint of the uſe of the inſtrument commonly called *the dry needle*; but which he afterwards greatly improved by his own genius, and which has added ſuch ſuperior beauties to his engravings.

In the year 1751 Mr. Strange removed with his family from Edinburgh and ſettled at London, where he engraved ſeveral fine hiſtorical prints, which juſtly acquired to him great reputation. At this period hiſtorical engraving had made little progreſs in Britain, and he may be properly conſidered as its father.

The admiration he always had for the works of the great Italian painters made him long deſire to viſit Italy, the ſeat of the fine arts; and the farther he advanced in life, he became the more perſuaded that a journey to that country was eſſential to an artiſt who had the laudable ambition to excel in his profeſſion. He therefore undertook this journey in the year 1760. In Italy he made many admirable drawings, ſeveral of which he afterwards engraved. Theſe drawings are now in the poſſeſſion of Lord Dundas.

Every-where in Italy ſingular marks of attention were beſtowed on Mr. Strange; not only by great perſonages, but by the principal academies of the fine arts in that country. He was made a member of the academies of Rome, Florence, and Bologna, and profeſſor in the royal academy at Parma.

To ſhow the eſtimation in which his talents were held at Rome, we cannot but record the following anecdote. The ceiling of the room of the Vatican library, in which the collection of engravings are kept, is elegantly painted by Signor Rotſanelli. It repreſents the progreſs of engraving; and the portraits of the moſt eminent artiſts in that line are there introduced, among which is that of our artiſt. Under his arm he holds a portfolio, on which his name is inſcribed. He is the only Britiſh artiſt on whom this honour has been conferred.

In France, where he reſided many years at different periods,

his talents likewiſe received every mark of attention that could be beſtowed on a foreigner. He was made a member of the royal academy of painting at Paris.

His majeſty King George III. ever attentive to the progreſs of the fine arts in Britain, and ſenſible of the advantages of which engraving particularly has been to this country, even in a commercial light; and deſirous to give a mark of his royal approbation of the merit of Mr. Strange, whom he conſidered as at the head of his profeſſion and the great improver of it, was graciouſly pleaſed to confer the honour of knighthood on him the 5th of January, 1787.

Such was Sir Robert Strange as an artiſt; nor was he leſs diſtinguiſhed by his truly amiable moral qualities, which endeared him to all who had the happineſs to know him.

With regard to his works, he left fifty capital plates, ſtill in good condition, which are carefully preſerved in his family. They are engraved from pictures by the moſt celebrated painters of the Roman, Florentine, Lombard, Venetian, and other ſchools. They are hiſtorical, both ſacred and profane, poetical, allegorical.

From his earlieſt eſtabliſhment in life, Sir Robert carefully preſerved about eighty copies of the fineſt and moſt choice impreſſions of each plate he engraved; which, from length of time, have acquired a beauty, mellowneſs, and brilliancy, eaſier ſeen than deſcribed. He did this with a view of preſenting them to the public at a period when age ſhould diſable him from adding to their number. Theſe he collected into as many volumes, and arranged them in the order in which they were engraved. To each volume he prefixed two portraits of himſelf, on the ſame plate, the one an etching, the other a finiſhed proof, from a drawing by John Baptiſte Greuſe. This is the laſt plate he engraved; and which is a proof that neither his eyes nor hand were impaired by age. It likewiſe ſhows the uſe he made both of aquafortis and the graver. Each volume, beſides a dedication to the king, contains an introduction on the progreſs of engraving, and critical remarks on the pictures from which his engravings are taken. Theſe volumes were ready to be given to the public, when Sir Robert's death and conſequent circumſtances delayed this magnificent publication; a publication which does ſo much honour to the artiſt, and to the country which gave him birth.

STRANGER, in law, denotes a perſon who is not privy or party to an act. Thus a ſtranger to a judgment is he to whom a judgment does not belong; in which ſenſe the word ſtands directly oppoſed to party or privy.

STRANGLES, in farriery. See Farriery.

STRANGURY, a ſuppreſſion of urine. See Medicine.

STRAP, among ſurgeons, a ſort of band uſed to ſtretch out limbs in the ſetting of broken or disjointed bones.

Strap, in a ſhip, the rope which is ſpliced about any block, and made with an eye to faſten it any-where on occaſion.

Straps, in the manege. The ſtraps of a ſaddle are ſmall leather ſtraps, nailed to the bows of the ſaddle, with which we make the girths faſt to the ſaddle.

STRAPADO, or Strappado, a kind of military puniſhment, wherein the criminal's hands being tied behind him, he is hoiſted up with a rope to the top of a long piece of wood, and let fall again almoſt to the ground; ſo that, by the weight of his body in the ſhock, his arms are diſlocated. Sometimes he is to undergo three ſtrapadoes or more.

STRASBURG, an ancient, large, handſome, populous and ſtrong city of France in Alſace. It contains about 200 ſtreets, part of which are very narrow, and moſt of the houſes are built after the ancient taſte. However, there are a great number of handſome buildings, ſuch as the hotel of the marſhal of France, who is commander of the city; the hotel of the cardinal of Rouen, the biſhop's palace, the Jeſuit's college, the royal hoſpital, the hotel of Heſſe-Darmſtadt, the arſenal, the town-houſe, and the cathedral. It has a wooden bridge over the Rhine, which is thought to be one of the fineſt in Europe; as is likewiſe the cathedral church, whoſe tower is the handſomeſt in Germany, and the clock is greatly admired by all travellers. Some look upon it as one of the wonders of the world, and the ſteeple is allowed to be the higheſt in Europe. The clock not only ſhows the hours of the day, but the motion of the ſun, moon, and ſtars. Among other things there is an angel which turns an hour-glaſs every hour; and the twelve apoſtles proclaim noon, by each of them ſtriking a blow with a hammer on a bell. There is likewiſe a cock, which is a piece of clock-work, that crows every hour. There are 700 ſteps up to the tower or ſteeple, it being 500 feet high. It was a free and imperial city: but the king of France became maſter of it in 1681, and greatly augmented the fortifications, though before it had as many cannon as there are days in the year. The inhabitants were formerly Proteſtants, and carried on a great trade; but moſt of them have been obliged to embrace the Romiſh ſuperſtition, though there is ſtill a ſort of toleration. Such was Straſburg before the French revolution; what it is now we have not leiſure to enquire. It is ſeated on the river Ill, fifty-five miles north of Baſil, 112 ſouth-weſt of Mentz, and 255 eaſt of Paris. E. Long. 7. 51. N. Lat. 48. 35.

STRATA, in natural hiſtory, the ſeveral beds or layers of different matters whereof the earth is compoſed. See Quarry. The ſtrata whereof the earth is compoſed are ſo very different in different countries, that it is impoſſible to ſay any thing concerning them that may be generally applicable: and indeed the depths to which we can penetrate are ſo ſmall, that only a very few can be known to us at any rate; thoſe that lie near the centre, or even a great way from it, being for ever hid. One reaſon why we cannot penetrate to any great depth is, that as we go down the air becomes foul, loaded with pernicious vapours, inflammable air, fixed air, &c. which deſtroy the miners, and there is no poſſibility of going on. In many places, however, theſe vapours become pernicious much ſooner than in others, particularly where ſulphureous minerals abound, as in mines of metal, coal, &c.

But however great differences there may be among the under ſtrata, the upper one is in ſome reſpects the ſame all over the globe, at leaſt in this reſpect, that it is fit for the ſupport of vegetables, which the others are not, without long expoſure to the air. Properly ſpeaking, indeed, the upper ſtratum of the earth all round, is compoſed of the pure vegetable mold, though in many places it is mixed with large quantities of other ſtrata, as clay, ſand, gravel, &c.; and hence proceed the differences of ſoils ſo well known to thoſe who practiſe agriculture.

It has been ſuppoſed by ſome naturaliſts, that the different ſtrata of which the earth is compoſed were originally formed at the creation, and have continued in a manner immutable ever ſince: but this cannot poſſibly have been the caſe, ſince we find that many of the ſtrata are ſtrangely intermixed with each other; the bones of animals both marine and terreſtrial are frequently found at great depths in the earth; beds of oyſter-ſhells are found of immenſe extent in ſeveral countries; and concerning theſe and other ſhell-fiſh, it is remarkable, that they are generally found much farther from the ſurface than the bones or teeth either of marine or terreſtrial animals. Neither are the ſhells or other remains of fiſh found in thoſe countries adjoining to the ſeas where they grow naturally, but in the moſt diſtant regions. Mr. Whitehurſt, in his Inquiry into the original State and Formation of the Earth, has given the following account of many different kinds of ani-

mals, whofe fhells and other remains or *exuviæ* are found in England; though at prefent the living animals are not to be found except in the Eaft and Weft Indies.

A Catalogue of Extraneous Foffils, fhowing where they were dug up; alfo their native Climates. Moftly felected from the curious Cabinet of Mr. Neilfon, in King-ftreet, Red-Lion-fquare.

Their names, and places where found.	Native climates.
Chambered Nautilus. Sheppy Iflands; Richmond in Surrey; Sherbone in Dorfetfhire, - -	Chinefe Ocean, and other parts of that great fea.
Teeth of Sharks. Sheppy Ifland, Oxfordfhire, Middlefex, Surrey, Northamptonfhire, - -	Eaft and Weft Indies.
Sea-tortoife, feveral kinds; the Hawkf-bill, Loggerhead, and Green fpecies. Sheppy Ifland, - -	Weft Indies.
Mangrove-tree Oyfters. Sheppy Ifland,	Weft Indies.
Coxcomb-tree Oyfters. Oxfordfhire, Gloucefterfhire, Dorfetfhire, and Hanover, - -	Coaft of Guinea.
Vertebræ and Palates of the Orbes Sheppy Iflands, and many other parts of England, - -	Eaft and Weft Indies.
Crocodile. Germany, Derbyfhire, Nottinghamfhire, Oxfordfhire, and Yorkfhire, - - -	
Alligator's Teeth. Oxfordfhire, Sheppy Ifland, - - -	Eaft and Weft Indies.
The Banded Buccinum. Oxfordfhire, and the Alps, - -	Weft Indies.
The Dipping-fnail, and Star-fifh. Sheppy Ifland, - - -	Weft Indies.
Tail Buccinum. Sheppy Ifland, Hordel Cliff, Hampfhire, - -	Eaft Indies.

Nothing has more perplexed thofe who undertake to form theories of the earth than thefe appearances. Some have at once boldly afferted, from thefe and other phenomena, that the world is eternal. Others have had recourfe to the univerfal deluge. Some, among whom is the count de Buffon, endeavour to prove that the ocean and dry land are perpetually changing places; that for many ages the higheft mountains have been covered with water, in confequence of which the marine animals juft mentioned were generated in fuch vaft quantities, that the waters will again cover thefe mountains, the habitable part of the earth become fea, and the fea become dry land as before, &c. Others have imagined that they might be occafioned by volcanoes, earthquakes, &c. which confound the different ftrata, and often intermix the productions of the fea with thofe of the dry land.

Thefe fubjects have been difcuffed under the article EARTH, to which therefore we refer the reader; and fhall conclude with fome account of the ftrata in thofe places where they have been moft particularly obferved.

Under the article NATURAL HISTORY, Sect. I. it is obferved, that the upper ftrata of the earth and mountains generally confift of rag-ftone, the next of flate, the third of marble filled with petrefactions, the fourth again of flate, and the next of free-ftone. But we are far from confidering this as a rule which holds univerfally. The ftrata differ exceedingly in a great number of places; fome inftances of which we fhall give from Mr. Whitehurft.—At Alfreton Common in Derbyfhire, the ftrata are,

A Table of the Strata at Alfreton Common.

Numb.		Feet.	Inch.
1	Clay - - - -	7	0
2	Rachell, fragments of ftone - -	9	0
3	Bind, indurated clay - -	13	4
4	Stone, argillaceous concreted clay -	6	0
5	Bind - - - -	8	8
6	Bind - - - -	25	0
7	Stone, a black colour - -	5	0
8	Bind - - - -	2	0
9	Stone - - - -	2	0
10	Bind - - -	5	0
11	Bind - - - -	5	0
12	Coal - - - -	1	6
13	Bind - - - -	1	6
14	Stone - - - -	23	0
15	Stone - - - -	14	0
16	Bind - - - -	7	0
17	Smutt, a black fubftance, refembling a ftratum of coal-duft -	3	0
18	Bind - - - -	3	0
19	Stone - - - -	20	0
20	Bind - - - -	16	0
21	Coal - - - -	7	4
		184	4

A Table of the Strata at Weft Hallam.

Numb.		Feet.	Inch.
1	Clay - - - -	7	6
2	Bind - - - -	48	0
3	Smutt - - -	1	6
4	Clunch, or indurated clay - -	4	0
5	Bind - - - -	3	0
6	Stone - - - -	2	3
7	Bind - - - -	1	0
8	Stone - - -	1	0
9	Bind - - - -	3	0
10	Stone - - - -	1	0
11	Bind - - - -	16	0
12	Shale - - - -	2	0
13	Bind - - - -	12	0
14	Shale - - -	3	0
15	Clunch, ftone, and fometimes cank -	54	0
16	Soft coal - - - -	4	0
17	Clay - - - -	0	6
18	Soft coal - - - -	4	6
19	Clunch and bind - - -	21	0
20	Coal - - - -	1	0
21	Bind - - -	1	0
22	Strong, broad bind - - -	25	0
23	Coal - - - -	6	0
		222	3

Mr. Fofter has given an account of fome of the ftrata of the South-fea iflands. It appears, he thinks, evidently, that all the high tropical ifles of the South fea have been fubject to the action of volcanoes. Pyritical and fulphureous fubftances, together with a few iron-ftones, and fome veftiges of copper, are no doubt found in feveral of them: but the mountains of New Caledonia are the moft likely to contain the richeft metallic veins; and the fame opinion, he fufpects, may be formed of the mountains in New Zealand.

In the city of Modena in Italy, and for fome miles round that place, there is the moft fingular arrangement of ftrata perhaps in the whole world. From the furface of the ground to

the depth of fourteen feet, they meet with nothing but the ruins of an ancient city. Being come to that depth, they find paved ſtreets, artificers' ſhops, floors of houſes, and ſeveral pieces of inlaid work. After theſe ruins they find a very ſolid earth, which one would think had never been removed; but a little lower they find it black and marſhy, and full of briars. Signior Ramazzini in one place found a heap of wheat entire at the depth of twenty-four feet; in another, he found filbert-trees with their nuts. At the depth of about twenty-eight feet, they find a bed of chalk, about eleven feet deep, which cuts very eaſily; after this a bed of marſhy earth of about two feet, mixed with ruſhes, leaves, and branches. After this bed comes another of chalk, nearly of the ſame thickneſs; and which ends at the depth of forty-two feet. This is followed by another bed of marſhy earth like the former; after which comes a new chalk-bed, but thinner, which alſo has a marſhy bed underneath it. This ends at the depth of ſixty-three feet; after which they find ſand mingled with ſmall gravel, and ſeveral marine ſhells. This ſtratum is uſually about five feet deep, and underneath it is a vaſt reſervoir of water. It is on account of this water that the ſoil is ſo frequently dug, and the ſtrata ſo well known in this part of the world. After coming to the ſandy bottom above mentioned, the workmen pierce the ground with a terebra or auger, when the water immediately ſprings up with great force, and fills the well to the brim. The flow is perpetual, and neither increaſes by rain, nor decreaſes by drought. Sometimes the auger meets with great trees, which give the workmen much trouble; they alſo ſometimes ſee at the bottom of theſe wells great bones, coals, flints, and pieces of iron.

It has been aſſerted by ſome, that the ſpecific gravity of the ſtrata conſtantly increaſed with the depth from the ſurface. But Dr. Leigh, in his Natural Hiſtory of Lancaſhire, ſpeaking of the coal-pits, denies the ſtrata to lie according to the laws of gravitation; obſerving, that the ſtrata there are firſt a bed of marle, then free-ſtone, next iron-ſtone, then coal or channel mire, then ſome other ſtrata, then coal again, &c. This determined Mr. Derham to make a nicer enquiry into the matter: accordingly, in 1712, he cauſed divers places to be bored, laying the ſeveral ſtrata by themſelves; and afterwards determined very carefully their ſpecific gravity. The reſult was, that in his yard the ſtrata were gradually ſpecifically heavier and heavier the lower and lower they went; but in another place in his fields, he could not perceive any difference in the ſpecific gravities.

Acquainting the Royal Society therewith, their operator Mr. Haukſbee was ordered to try the ſtrata of a coal pit, which he did to the depth of thirty ſtrata: the thickneſs and ſpecific gravity of each whereof he gives us in a table in the Philoſophical Tranſactions, Vol. XXVII. p. 541.; and from the whole makes this inference, that it evidently appears the gravities of the ſeveral ſtrata are in no manner of order, but purely caſual, as if mixed by chance.

STRATAGEM, in the art of war, any device for deceiving and ſurpriſing an enemy. The ancients dealt very much in ſtratagems; the moderns wage war more openly, and on the ſquare. Frontinus has made a collection of the ancient ſtratagems of war.

STRATEGUS, ϛρατηγος, in antiquity, an officer among the Athenians, whereof there were two choſen yearly, to command the troops of the ſtate. Plutarch ſays, there was one choſen from out of each tribe; but Pollux ſeems to ſay they were choſen indifferently out of the people. The people themſelves made the choice; and that on the laſt day of the year in a place called *Pnyx*. The two *ſtrategi* did not command together, but took their turns day by day; as we find from Herodotus and Cornelius Nepos. Sometimes indeed, as when a perſon was found of merit vaſtly ſuperior, and exceedingly famed in war, the command was given to him alone: but it was ever a rule, not to put any perſon in the office but whoſe eſtate was in Attica, and who had children, that there might be ſome hoſtages and ſecurities for his conduct and fidelity. Conſtantine the Great, beſides many other privileges granted to the city of Athens, honoured its chief magiſtrate with the title of Μεγας Στρατηγος, *Magnus Dux*.

STRATH, in the Scottiſh language, ſignifies a long narrow valley, with a river running along the bottom.

STRATHEARN, a beautiful and extenſive valley in Perthſhire, bounded on the north by the lofty ridge of mountains called the *Grampians*, and on the ſouth by the Ochils, which are rounded on the tops and covered with verdure. It is called *Strathearn* from the river Earn, which runs through the middle of it from weſt to eaſt for about thirty miles. On each ſide of the banks of this beautiful ſtream are many villages and country ſeats, diſtinguiſhed for romantic ſituations. Were we to ſingle out any of the villages, we would mention Crieff, which ſtands on a fine ſloping ground on the north ſide of the Earn, and has been much admired by travellers for its ſituation, and the variety, contraſt, ſingularity, and beauty of the proſpect which it affords.

STRATHNAVER, a ſubdiviſion or diſtrict of the county of Sutherland in Scotland; bounded on the north by the ocean, on the eaſt by Caithneſs, on the ſouth by Sutherland properly ſo called, and on the weſt partly by Roſs and partly by the ocean.

STRATIOTES, Water-soldier, in botany: a genus of plants belonging to the claſs of *polyandria*, and to the order of *hexagynia*; and in the natural ſyſtem ranging under the firſt order, *palmæ*. The ſpatha is diphyllous: the perianthium is trifid. There are three petals, and the berry is ſix-celled and inferior. There are three ſpecies, the aloides, the acoroidès, and aliſmoides. The *aloides* alone is of Britiſh extraction, which is alſo called the *water aloe*, or *freſh-water ſoldier*. The root conſiſts of long fibres tufted at the ends. The leaves are thick, triangular, pointed, and prickly at the edges. The flowers are white and floating on the water, and bloſſom in June. This plant may be ſeen in ſlow rivers and fens.

STRATO, a philoſopher of Lampſacus, diſciple and ſucceſſor in the ſchool of Theophraſtus, about 248 years before the Chriſtian era. He applied himſelf with uncommon induſtry to the ſtudy of nature: and after the moſt mature inveſtigations, he ſupported that nature was inanimate, and that there was no god but nature. (See Plastic *Nature*.) He was appointed preceptor to Ptolemy Philadelphus, who not only revered his abilities and learning, but alſo rewarded his labours with unbounded liberality. He wrote different treatiſes, all now loſt.

STRAWBERRY, in botany. See Fragaria.

Strawberry-*Tree*. See Arbutus.

STRENGTHENERS, or Corroborants, ſuch medicines as add to the bulk and firmneſs of the ſolids; and ſuch are all agglutinant and aſtringent medicines. See Materia Medica.

STRETCHING, in navigation, is generally underſtood to imply the progreſſion of a ſhip under a great ſurface of ſail, when cloſe-hauled. The difference between this term and *ſtanding*, conſiſts apparently in the quantity of ſail; which in the latter may be very moderate; but ſtretching generally ſignifies exceſs: as, we ſaw the enemy at day-break ſtretching to the ſouthward under a croud of ſail, &c. *Falconer*.

STRETTO, in Italian muſic, is ſometimes uſed to ſignify

that the meaſure is to be ſhort and conciſe, and conſequently quick. In this ſenſe it ſtands oppoſed to LARGO.

STRIATED LEAF, among botaniſts, one that has a number of longitudinal furrows on its ſurface.

STRIKE, a meaſure of capacity, containing four buſhels. Alſo an inſtrument uſed in meaſuring corn.

STRIX, the OWL, in ornithology, a genus belonging to the order of *accipitres*. The bill is hooked, but has no cere or wax; the noſtrils are covered with ſetaceous feathers; the head is very large, as are alſo the ears and eyes; and the tongue is bifid. There are forty-ſix ſpecies; the moſt remarkable are,

1. The *bubo*, or great-eared owl, in ſize is almoſt equal to an eagle. Irides bright yellow; head and whole body finely varied with lines, ſpots, and ſpecks of black, brown, cinereous, and ferruginous. Wings long; tail ſhort, marked with duſky bars. Legs thick, covered to the very end of the toes with a cloſe and full down of a teſtaceous colour. Claws great, much hooked, and duſky.—It has been ſhot in Scotland and in Yorkſhire. It inhabits inacceſſible rocks and deſert places; and preys on hares and feathered game. Its appearance in cities was deemed an unlucky omen; Rome itſelf once underwent a luſtration becauſe one of them ſtrayed into the capitol. The ancients had them in the utmoſt abhorrence; and thought them, like the ſcreech-owls, the meſſengers of death. Pliny ſtyles it *bubo funebris*, and *noctis monſtrum*.

2. The *otus*, or long-eared owl, is found, though not frequently, in the north of England, in Cheſhire, and in Wales. Mr. Haſſelquiſt ſaw it alive in Cairo, and it is not unfrequent all over Egypt. Its weight, according to Dr. Latham, is nine ounces; the length fourteen inches and a half; the breadth thirty-four; the irides are of a bright yellow; the bill black; the breaſt and belly are of a dull yellow, marked with ſlender brown ſtrokes pointing downwards; the thighs and vent feathers of the ſame colour, but unſpotted. The back and coverts of the wings are varied with deep brown and yellow; the quill-feathers of the ſame colour, but near the ends of the outmoſt is a broad bar of red; the tail is marked with duſky and reddiſh bars, but beneath appears aſh-coloured; the horns or ears are about an inch long, and conſiſt of ſix feathers variegated with yellow and black; the feet are feathered down to the claws.

3. The *brachyotos*, or ſhort-eared owl, is fourteen inches long; three feet broad; the head is ſmall and hawk like; the bill is duſky; weight fourteen ounces; the circle of feathers that immediately ſurrounds the eyes is black; the larger circle white, terminated with tawny and black; the feathers on the head, back, and coverts of the wings, are brown, edged with pale dull yellow; the breaſt and belly are of the ſame colour, marked with a few long narrow ſtreaks of brown pointing downwards; the quill feathers are duſky, barred with red; the tail is of a very deep brown, adorned on each ſide of the ſhaft of the four middle feathers with a yellow circle which contains a brown ſpot; the tip of the tail is white. The horns of this ſpecies are very ſmall, and each conſiſts of only a ſingle feather; theſe it can raiſe or depreſs at pleaſure; and in a dead bird are with difficulty diſcovered. This kind is ſcarcer than the former; both are ſolitary birds, avoiding inhabited places. Theſe ſpecies may be called *long-winged owls*; the wings when cloſed reaching beyond the end of the tail; whereas in the common kinds they fall ſhort of it.—This is a bird of paſſage, and has been obſerved to viſit Lincolnſhire in the beginning of October, and to retire early in the ſpring; ſo probably, as it performs its migrations with the woodcock, its ſummer retreat is Norway. During day it lies hid in long old graſs; when diſturbed, it ſeldom flies far, but will light, and ſit looking at one, at which time the horns may be ſeen very diſtinctly. It has not been obſerved to perch on trees like other owls; it uſually flies in ſearch of prey in cloudy hazy weather. Farmers are fond of ſeeing theſe birds in the fields, as they clear them from mice. It is found frequently on the hill of Hoy in the Orkneys, where it flies about and preys by day like a hawk. It is found alſo, as we mentioned before, in Lancaſhire, which is a hilly and woody country; and in New England and Newfoundland.

4. The *flammea*, or common white owl. The elegant plumage of this bird makes amends for the uncouthneſs of its form: a circle of ſoft white feathers ſurround the eyes. The upper part of the body, the coverts, and ſecondary feathers of the wings, are of a fine pale yellow: on each ſide of the ſhafts are two grey and two white ſpots placed alternate: the exterior ſides of the quill feathers are yellow; the interior white, marked on each ſide with four black ſpots: the lower ſide of the body is wholly white; the interior ſides of the feathers of the tail are white; the exterior marked with ſome obſcure duſky bars; the legs are feathered to the feet: the feet are covered with ſhort hairs: the edge of the middle claw is ſerrated. The uſual weight is eleven ounces; its length fourteen inches; its breadth three feet.—This ſpecies is almoſt domeſtic; inhabiting, for the greateſt part of the year, barns, hay-lofts, and other out-houſes; and is as uſeful in clearing thoſe places from mice as the congenial cat: towards twilight it quits its perch, and takes a regular circuit round the fields, ſkimming along the ground in queſt of field-mice, and then returns to its uſual reſidence: in the breeding ſeaſon it takes to the eaves of churches, holes in lofty buildings, or hollows of trees. During the time the young are in the neſt, the male and female alternately ſally out in queſt of food, make their circuit, beat the fields with the regularity of a ſpaniel, and drop inſtantly on their prey in the graſs. They very ſeldom ſtay out above five minutes; return with their prey in their claws; but as it is neceſſary to ſhift it into their bill, they always alight for that purpoſe on the roof, before they attempt to enter their neſt. This ſpecies does not hoot; but ſnores and hiſſes in a violent manner; and while it flies along will often ſcream moſt tremendouſly. Its only food is mice. As the young of theſe birds keep their neſt for a great length of time, and are fed even long after they can fly, many hundreds of mice will ſcarcely ſuffice to ſupply them with food. Owls caſt up the bones, fur, or feathers, of their prey, in form of ſmall pellets, after they have devoured it, in the ſame manner as hawks do. A gentleman, on grubbing up an old pollard aſh that had been the habitation of owls for many generations, found at the bottom many buſhels of this rejected ſtuff. Some owls, when they are ſatisfied, hide the remainder of their meat like dogs.

5. The *ſtridula*, or tawny owl. The female of this ſpecies weighs nineteen ounces; the length is fifteen inches; the breadth two feet eight inches; the irides are duſky; the ears in this, as in all owls, very large; and their ſenſe of hearing very exquiſite. The colour of this kind is ſufficient to diſtinguiſh it from every other: that of the back, head coverts of the wings, and on the ſcapular feathers, being a fine tawny red, elegantly ſpotted and powdered with the black or duſky ſpots of various ſizes: on the coverts of the wings and on the ſcapulars are ſeveral large white ſpots: the coverts of the tail are tawny, and quite free from any marks: the tail is variouſly blotched, barred, and ſpotted with pale red and black; in the two middle feathers the red predominates: the breaſt and belly are yellowiſh, mixed with white, and marked with narrow black ſtrokes pointing downwards: the legs are covered with feathers down to the toes.—This is a hardier ſpecies than the former; and the young will feed on any dead thing, whereas thoſe of the white owl muſt have a conſtant ſupply of freſh

meat. It is the ſtrix of Aldrovandus, and what we call the *ſcreech-owl*; to which the folly of ſuperſtition had given the power of preſaging death by its cries. The ancients believed that it ſucked the blood of young children: a fact ſome think not incredible; for Haſſelquiſt deſcribes a ſpecies found in Syria, which frequently in the evening flies in at the windows, and deſtroys the helpleſs infant.

6. The *ulula*, or brown owl, agrees with the former in its marks; differing only in the colours: in this, the head, wings, and back, are of a deep brown, ſpotted with black in the ſame manner as the former: the coverts of the wings and the ſcapulars are adorned with ſimilar white ſpots: the exterior edges of the four firſt quill feathers in both are ſerrated: the breaſt in this is of a very pale aſh-colour mixed with tawny, and marked with oblong jagged ſpots: the feet too are feathered down to the very claws: the circle round the face is aſh-coloured, ſpotted with brown.—Both theſe ſpecies inhabit woods, where they reſide the whole day: in the night they are very clamorous; and when they hoot, their throats are inflated to the ſize of an hen's egg. In the duſk they approach our dwellings; and will frequently enter pigeon-houſes, and make great havoc in them. They deſtroy numbers of little leverets, as appears by the legs frequently found in their neſts. They alſo kill abundance of moles, and ſkin them with as much dexterity as a cook does a rabbit. They build in hollow trees or ruined edifices; lay four eggs, of an elliptic form, and of a whitiſh colour.

7. The *paſſerina*, or little owl, is very rare in England; it is ſometimes found in Yorkſhire, Flintſhire, and alſo near London: in ſize it ſcarcely exceeds a thruſh, though the fulneſs of its plumage makes it appear larger: the irides are of a light yellow; the bill of a paper-colour; the feathers that encircle the face are white tipt with black; the head brown, ſpotted with white; on the breaſt is a mixture of white and brown; the belly is white, marked with a few brown ſpots; the tail of the ſame colour with the back; in each feather barred with white; in each adorned with circular white ſpots, placed oppoſite to one another on both ſides of the ſhaft; the legs and feet are covered with feathers down to the claws.—The Italians make uſe of this owl to decoy ſmall birds to the limed twig; the method of which is exhibited in Olina's *Uccelliera*, p. 65. Mr. Steuart, author of the Antiquities of Athens, informed Mr. Pennant, that this ſpecies of owl was very common in Attica; that they were birds of paſſage, and appeared there in the beginning of April in great numbers; that they bred there; and that they retired at the ſame time as the ſtorks, whoſe arrival they a little preceded.

8. The ſpectacle owl of Cayenne, which is accurately deſcribed by Dr. Latham, is twenty-one inches in length: the upper parts of the body are of a reddiſh colour; the lower parts of a rufous white: the head and neck are white, and not ſo full of feathers as thoſe of owls generally are, and from this circumſtance it appears not unlike a hawk: a large patch of dark brown ſurrounds each eye, giving the bird much the appearance of wearing ſpectacles; the legs are covered with feathers quite to the toes, and are of a yellowiſh colour. A ſpecimen of this curious bird may be ſeen in the Leverian muſeum.

STROBILUS, in botany, a pericarp formed from an amentum by the hardening of the ſcales.

STROKING, or rubbing gently with the hand, a method which has been employed by ſome impoſtors for curing diſeaſes. One of theſe was Mr. Greatrakes or Greatrix, the famous Iriſh ſtroker who was ſaid to have performed many wonderful cures. He gives the following account of his diſcovery of this art, and of the ſucceſs with which he practiſed it. About the year 1662 he pretended to have received the gift of healing from divine inſpiration; and under this pretence exerciſed his art on multitudes of weak minded perſons who flocked to him with ſcrofulous and other diſeaſes. Vulgar prejudices, however, are not always confined to the claſs of the vulgar; witneſs the *high patronage* ſhewn, in our days, to the *Whitworth doctors!!* He cured Colonel Phaire, of Cahirmony in the county of Corke, of an ague, and afterwards many other perſons of different diſtempers, by ſtroking; ſo that his name was wonderfully cried up, as if ſome divine perſon had been ſent from above. January 1665-6, he came over to England, at the requeſt of the Earl of Orrery; in order to cure the lady of the Lord-viſcount Conway of Ragley in Warwickſhire, who had for many years laboured under a moſt violent headache. He ſtaid at Ragley three weeks or a month; but he failed in his endeavours to relieve that lady.

STROMATEUS, in ichthyology, a genus of fiſhes belonging to the order of *apodes*. The head is compreſſed; the teeth are placed in the jaws and palate; the body is oval and ſlippery; and the tail is forked. There are three ſpecies according to Gmelin, the fiatola, paru, and cumarca.

STROMBOLI, the moſt northern of the Lipari iſlands. It is a volcano, which conſtantly diſcharges much fire and ſmoke. It riſes in a conical form above the ſurface of the ſea. On the eaſt ſide it has three or four little craters ranged near each other, not at the ſummit, but on the declivity, nearly at two thirds of its height. But as the ſurface of the volcano is very rugged, and interſected with hollow ways, it may be naturally concluded, that at the time of ſome great eruption, the ſummit and a part of this ſide fell in, as muſt have happened alſo to Veſuvius; conſequently, the common chimney is at this day on the declivity, although always in the centre of the whole baſe. It is inhabited notwithſtanding its fires; but care is taken to avoid the proximity of the crater, which is yet much to be feared. "I was aſſured," ſays M. de Luc, "by an Engliſhman, who, like me, had the curioſity to viſit theſe iſles, that the fine weather having invited him and his company to land at Stromboli, they aſcended a volcano, whoſe craters at that time threw out nothing; but that while they were attentively viewing them, unapprehenſive of any danger, they were ſuddenly ſaluted by ſuch a furious diſcharge, as to be obliged to retreat with precipitation, and not without one of the company being wounded by a piece of ſcoria." Of all the volcanoes recorded in hiſtory, Stromboli ſeems to be the only one that burns without ceaſing. Etna and Veſuvius often lie quiet for many months, and even years, without the leaſt appearance of fire; but Stromboli is ever at work, and for ages paſt has been looked upon as the great lighthouſe of theſe ſeas. E. Long. 15. 45. N. Lat. 30. 0.

STROMBUS, in natural hiſtory, a genus of *vermes*, belonging to the order of *teſtacea*. The animal is a limax; the ſhell is univalve and ſpiral; the opening is much dilated, and ends in a canal which turns to the left. Gmelin enumerates fifty-three ſpecies; of which only one is peculiar to Britain, the pes pelecani. The ſpires are ten; the lip is fingered; the point very ſharp; the length two inches.

STRONGOLI, a town of the kingdom of Naples, with a biſhop's ſee. It is ſituated on a rugged mountain, is about three miles from the ſea, and ſeven north from St. Severino. It is ſuppoſed to be the ancient *Petelia*, which made a conſpicuous figure in the ſecond Punic war by its obſtinate reſiſtance againſt Hannibal. Near its walls Marcellus the rival of Hannibal was ſlain in a ſkirmiſh. E. Long. 17. 26. N. Lat. 39. 20.

STRONTITES, or STRONTIAN EARTH, a new ſpecies of earth lately diſcovered at Strontian in Scotland. Who the diſcoverer of this earth was we have not learned; but Dr.

Kirvan ſays, the firſt information he received of it was from Dr. Crawford in the year 1790. Its external characters are theſe: Its colour is whitiſh or light green; its luſtre common; its tranſparency intermediate between the ſemitranſparent and opaque; its fracture ſtriated, preſenting oblong diſtinct concretions, ſomewhat uneven and bent; its hardneſs moderate, being eaſily ſcratched, but not ſcraped. It is very brittle; and its ſpecific gravity from 3,4 to 3,644. It requires 180 times its weight of water at a low temperature to diſſolve it. When diſſolved in boiling water, and allowed to cool, it depoſits tranſparent cryſtals, which when expoſed to the air become white and powdery. It is not affected by the ſulphuric acid; but when diluted, 10,000 parts of it will diſſolve one of ſtrontites. Diluted nitric acid diſſolves it rapidly. The muriatic acid, whether diluted or oxygenated, diſſolves it in a ſimilar manner.

Strontites has a ſtrong reſemblance to barytes, but eſſentially differs from it. Its ſpecific gravity is leſs; it parts with its carbonic acid when urged by heat ſomewhat more readily, and without ſuffering fuſion; when calcined, it imbibes moiſture with vaſtly greater avidity, ſwelling and cracking with more heat and noiſe. Strontites diſſolves much more abundantly in hot water than barytes; and the form of the cryſtals of theſe pure earths is very diſſimilar. The compounds generated by ſtrontites differ from thoſe of barytes. It will ſuffice to mention the nitrate and muriate. This earth, united to nitric and muriatic acid, forms ſalts that ſuffer changes from expoſure to air, which do not happen to the nitrate and muriate of barytes. They are likewiſe much more ſoluble in water, and have cryſtals of a peculiar figure. The combinations of ſtrontites with acids are not, like thoſe of barytes, decompoſed by pruſſiate of lime or of potaſh. Strontites and its compounds tinge flame, which barytes does not. Laſtly, theſe earths diſagree in the order of their attractions. From theſe conſiderations it is concluded, that the mineral is not aerated barytes.

It alſo is diſtinguiſhed from calcareous ſpar or limeſtone: for it is much heavier, and retains its fixed air with more obſtinacy in the fire. The incomparably greater ſolubility of the pure earth in hot than in cold water, and the cryſtalline form it aſſumes, ſufficiently diſtinguiſh it from lime, which the diſpoſition of the nitrate and muriate to cryſtallize no leſs tends to do.

The moſt remarkable quality of ſtrontites is that of tinging flame of a red colour. The muriate has it in the moſt eminent degree, and its effects are well exhibited by putting a portion of the ſalt on the wick of a candle, which is thereby made to burn with a very beautiful blood-red flame. The nitrate ſtands next, then cryſtallized ſtrontites, and after it the acetite. A hundred parts of ſtrontites are compoſed of 61.21 of earth, 30.20 of carbonic acid, and 8.59 of water.

STROPHE, in ancient poetry, a certain number of verſes, including a perfect ſenſe, and making the firſt part of an ode. See Poetry.

STRUMÆ, ſcrophulous tumors ariſing on the neck and throat, conſtituting what is commonly called the *king's evil.* See Medicine.

STRUMPFIA, in botany: a genus of plants belonging to the claſs of *ſyngeneſia*, and to the order of *monogamia*. The calyx is quinquedentate and ſuperior; the corolla is pentapetalous; and the berry monoſpermous. There is only one ſpecies, the maritima.

STRUTHIO, in natural hiſtory; a genus of birds belonging to the order of *grallæ* of Linnæus; but, according to the new claſſification of Dr. Latham, it forms, along with the dodo, caſſuarius, and rhea, a ſeparate order under the name of *ſtruthious*. As the dodo or didus, and rhea, have been already deſcribed in their proper place, we will now give ſome account of the oſtrich and caſſowary. See 2d Pl. 23.

I. The Ostrich (the *Camelus* of Linnæus) has a bill ſomewhat conical; the wings are ſo ſhort as to be unfit for flying; the thighs and ſides of the body are naked; the feet are formed for running, having two toes, one only of which is furniſhed with a nail. In this reſpect it differs entirely from the caſſowary, which has three toes complete. The oſtrich is without doubt the largeſt of all birds: it is nearly eight feet in length, and when ſtanding upright from ſix to eight feet in height. We are told in the Gentleman's Magazine, that two oſtriches were ſhown in London in the year 1750, and that the male was ten feet in height, and weighed three hundred weight and a quarter. The head and bill ſomewhat reſemble thoſe of a duck; and the neck may be likened to that of a ſwan, but that it is much longer; the legs and thighs reſemble thoſe of an hen; though the whole appearance bears a ſtrong reſemblance to that of a camel. But though uſually ſeven feet high from the top of the head to the ground, from the back it is only four; ſo that the head and neck are above three feet long. From the top of the head to the rump, when the neck is ſtretched out in a right line, it is ſix feet long, and the tail is about a foot more. One of the wings, without the feathers, is a foot and an half; and being ſtretched out, with the feathers, is three feet.

The plumage is much alike in all; that is, generally black and white; though ſome of them are ſaid to be grey. There are no feathers on the ſides, nor yet on the thighs, nor under the wings. The lower part of the neck, about half way, is covered with ſtill ſmaller feathers than thoſe on the belly and back; and thoſe alſo are of different colours.

All theſe feathers are of the ſame kind, and peculiar to the oſtrich; for other birds have ſeveral ſorts, ſome of which are ſoft and downy, and others hard and ſtrong. Oſtrich feathers are almoſt all as ſoft as down, being utterly unfit to ſerve the animal for flying, and ſtill leſs adapted to be a proper defence againſt external injury. The feathers of other birds have the webs broader on one ſide than the other, but thoſe of the oſtrich have their ſhaft exactly in the middle. The upper part of the head and neck are covered with a very fine clear white hair, that ſhines like the briſtles of a hog; and in ſome places there are ſmall tufts of it, conſiſting of about twelve hairs, which grow from a ſingle ſhaft about the thickneſs of a pin.

At the end of each wing there is a kind of ſpur almoſt like the quill of a porcupine. It is an inch long, being hollow and of an horny ſubſtance. There are two of theſe on each wing; the largeſt of which is at the extremity of the bone of the wing, and the other a foot lower. The neck ſeems to be more ſlender in proportion to that of other birds, from its not being furniſhed with feathers. The ſkin in this part is of a livid fleſh colour, which ſome, improperly, would have to be blue. The bill is ſhort and pointed, and two inches and an half at the beginning. The external form of the eye is like that of a man, the upper eye-lid being adorned with eye-laſhes which are longer than thoſe on the lid below. The tongue is ſmall, very ſhort, and compoſed of cartilages, ligaments, and membranes, intermixed with fleſhy fibres. In ſome it is about an inch long, and very thick at the bottom; in others it is but half an inch, being a little forked at the end.

The thighs are very fleſhy and large, being covered with a white ſkin inclining to redneſs, and wrinkled in the manner of a net, whoſe meſhes will admit the end of the finger. Some have very ſmall feathers here and there on the thighs; and others again have neither feathers nor wrinkles. What are called the legs of birds, in this are covered before with

large ſcales. The end of the foot is cloven, and has two very large toes, which, like the leg, are covered with ſcales. Theſe toes are of unequal ſizes. The largeſt, which is on the inſide, is ſeven inches long, including the claw, which is near three-fourths of an inch in length, and almoſt as broad. The other toe is but four inches long, and is without a claw.

The internal parts of this animal are formed with no leſs ſurpriſing peculiarity. At the top of the breaſt, under the ſkin, the fat is two inches thick; and on the fore-part of the belly it is as hard as ſuet, and about two inches and an half thick in ſome places. It has two diſtinct ſtomachs. The firſt, which is lowermoſt, in its natural ſituation ſomewhat reſembles the crop in other birds; but it is conſiderably larger than the other ſtomach, and is furniſhed with ſtrong muſcular fibres, as well circular as longitudinal. The ſecond ſtomach or gizzard has outwardly the ſhape of the ſtomach of a man; and upon opening is always found filled with a variety of diſcordant ſubſtances; hay, graſs, barley, beans, bones, and ſtones, ſome of which exceed in ſize a pullet's egg. The kidneys are eight inches long, and two broad, and differ from thoſe of other birds in not being divided into lobes. The heart and lungs are ſeparated by a midriff as in quadrupeds; and the parts of generation alſo bear a very ſtrong reſemblance and analogy.

The oſtrich is a native only of the torrid regions of Africa, and has long been celebrated by thoſe who have had occaſion to mention the animals of that region. Its fleſh is proſcribed in Scripture as unfit to be eaten; and moſt of the ancient writers deſcribe it as well known in their times. Like the race of the elephant, it is tranſmitted down without mixture; and has never been known to breed out of that country which firſt produced it. It ſeems formed to live among the ſandy and burning deſerts of the torrid zone; and, as in ſome meaſure it owes its birth to their genial influence, ſo it ſeldom migrates into tracts more mild or more fertile. The Arabians aſſert that the oſtrich never drinks; and the place of its habitation ſeems to confirm the aſſertion. In theſe formidable regions oſtriches are ſeen in large flocks, which to the diſtant ſpectator appear like a regiment of cavalry, and have often alarmed a whole caravan. There is no deſert, how barren ſoever, but what is capable of ſupplying theſe animals with proviſion; they eat almoſt every thing; and theſe barren tracts are thus doubly grateful, as they afford both food and ſecurity. The oſtrich is of all other animals the moſt voracious. It will devour leather, graſs, hair, iron, ſtones, or any thing that is given. Thoſe ſubſtances which the coats of the ſtomach cannot ſoften, paſs whole; ſo that glaſs, ſtones, or iron, are excluded in the form in which they were devoured. In an oſtrich diſſected by Ranby, there appeared ſuch a quantity of heterogeneous ſubſtances, that it was wonderful how any animal could digeſt ſuch an overcharge of nouriſhment. Valiſnieri alſo found the firſt ſtomach filled with a quantity of incongruous ſubſtances; graſs, nuts, cords, ſtones, glaſs, braſs, copper, iron, tin, lead, and wood; a piece of ſtone was found among the reſt that weighed more than a pound. He ſaw one of theſe animals that was killed by devouring a quantity of quicklime. It would ſeem that the oſtrich is obliged to fill up the great capacity of its ſtomach in order to be at eaſe; but that nutritious ſubſtances not occurring, it pours in whatever offers to ſupply the void.

In their native deſerts, however, it is probable they live chiefly upon vegetables, where they lead an inoffenſive and ſocial life; the male, as Thevenot aſſures us, aſſorting with the female with connubial fidelity. They are ſaid to be very much inclined to venery; and the make of the parts in both ſexes ſeems to confirm the report. It is probable alſo they copulate like other birds, by compreſſion. They lay very large eggs, ſome of them being above five inches in diameter, and weighing above fifteen pounds. Theſe eggs have a very hard ſhell, ſomewhat reſembling thoſe of the crocodile, except that thoſe of the latter are leſs and rounder.

The ſeaſon for laying depends on the climate where the animal is bred. In the northern parts of Africa, this ſeaſon is about the beginning of July; in the ſouth it is about the latter end of December. Theſe birds are very prolific, and lay generally from forty to fifty eggs at one clutch, which are as big as a child's head. It has been commonly reported, that the female depoſits them in the ſand, and covering them up, leaves them to be hatched by the heat of the climate, and then permits the young to ſhift for themſelves. Very little of this, however, is true: no bird has a ſtronger affection for her young than the oſtrich, nor none watches her eggs with greater aſſiduity. It happens, indeed, in thoſe hot climates, that there is leſs neceſſity for the continual incubation of the female; and ſhe more frequently leaves her eggs, which are in no danger of being chilled by the weather: but though ſhe ſometimes forſakes them by day, ſhe always carefully broods over them by night; and Kolben, who has ſeen great numbers of them at the Cape of Good Hope, affirms, that they ſit on their eggs like other birds, and that the male and the female take this office by turns, as he had frequent opportunities of obſerving. Nor is it more true what is ſaid of their forſaking their young after they are excluded the ſhell. On the contrary, the young ones are not even able to walk for ſeveral days after they are hatched. During this time the old ones are very aſſiduous in ſupplying them with graſs, and very careful to defend them from danger; nay, they encounter every danger in their defence. The young, when brought forth, are of an aſh-colour the firſt year, and are covered with feathers all over. But in time theſe feathers drop; and thoſe parts which are covered aſſume a different and more becoming plumage.

The beauty of a part of this plumage, particularly the long feathers that compoſe the wings and tail, is the chief reaſon that man has been ſo active in purſuing this harmleſs bird to its deſerts, and hunting it with no ſmall degree of expence and labour. The ancients uſed thoſe plumes in their helmets; our military wear them in their hats; and the ladies make them an ornament in their dreſs. Thoſe feathers which are plucked from the animal while alive are much more valued than thoſe taken when dead, the latter being dry, light, and ſubject to be worm-eaten.

Beſide the value of their plumage, ſome of the ſavage nations of Africa hunt them alſo for their fleſh; which they conſider as a dainty. They ſometimes alſo breed theſe birds tame, to eat the young ones, of which the females are ſaid to be the greateſt delicacy. Some nations have obtained the name of *Struthophagi*, or *oſtrich eaters*, from their peculiar fondneſs for this food; and even the Romans themſelves were not averſe to it. Even among the Europeans now, the eggs of the oſtrich are ſaid to be well taſted, and extremely nouriſhing; but they are too ſcarce to be fed upon, although a ſingle egg be a ſufficient entertainment for eight men.

As the ſpoils of the oſtrich are thus valuable, it is not to be wondered at that man has become the moſt aſſiduous purſuer. For this purpoſe, the Arabians train up their beſt and fleeteſt horſes, and hunt the oſtrich ſtill in view. Perhaps, of all other varieties of the chaſe, this, though the moſt laborious, is yet the moſt entertaining. As ſoon as the hunter comes within ſight of his prey, he puts on his horſe with a gentle gallop, ſo as to keep the oſtrich ſtill in ſight; yet not ſo as to terrify him from the plain into the mountains. Of all known animals, the oſtrich is by far the ſwifteſt in running; upon obſerving himſelf, therefore, purſued at a diſtance, he

begins to run at first but gently; either insensible of his danger, or sure of escaping. In this situation, he somewhat resembles a man at full speed; his wings, like two arms, keep working with a motion correspondent to that of his legs; and his speed would very soon snatch him from the view of his pursuers; but, unfortunately for the silly creature, instead of going off in a direct line, he takes his course in circles; while the hunters still make a small course within, relieve each other, meet him at unexpected turns, and keep him thus still employed, still followed, for two or three days together. At last, spent with fatigue and famine, and finding all power of escape impossible, he endeavours to hide himself from those enemies he cannot avoid, and covers his head in the sand or the first thicket he meets. Sometimes, however, he attempts to face his pursuers; and though in general the most gentle animal in nature, when driven to desperation he defends himself with his beak, his wings, and his feet. Such is the force of his motion, that a man would be utterly unable to withstand him in the shock.

The Struthophagi have another method of taking this bird: they cover themselves with an ostrich's skin, and passing up an arm through the neck, thus counterfeit all the motions of this animal. By this artifice they approach the ostrich, which becomes an easy prey. He is sometimes also taken by dogs and nets; but the most usual way is that mentioned above.

When the Arabians have thus taken an ostrich, they cut its throat; and making a ligament below the opening, they shake the bird as one would rinse a barrel; then taking off the ligature, there runs out from the wound in the throat a considerable quantity of blood mixed with the fat of the animal; and this is considered as one of their greatest dainties. They next flea the bird; and of the skin, which is strong and thick, sometimes make a kind of vest, which answers the purposes of a cuirass and a buckler.

There are others who, more compassionate or more provident, do not kill their captive, but endeavour to tame it, for the purposes of supplying those feathers which are in so great request. The inhabitants of Dara and Lybia breed up whole flocks of them, and they are tamed with very little trouble. But it is not for their feathers alone that they are prized in this domestic state; they are often ridden upon and used as horses. Moore assures us, that at Joar he saw a man travelling upon an ostrich; and Adanson asserts, that at the factory of Podore he had two ostriches, which were then young, the strongest of which ran swifter than the best English racer, although he carried two negroes on his back. As soon as the animal perceived that it was thus loaded, it set off running with all its force, and made several circuits round the village; till at length people were obliged to stop it by barring up the way. How far this strength and swiftness may be useful to mankind, even in a polished state, is a matter that perhaps deserves inquiry.

II. The Cassowary (the *Casuarius* of Linnæus, and *Galeated Cassowary* of Dr. Latham) was first brought into Europe from Java by the Dutch about the year 1597. It is nearly equal in size to the ostrich, but its legs are much thicker and stronger in proportion. This conformation gives it an air of strength and force, which the fierceness and singularity of its countenance conspire to render formidable. It is five feet and an half long from the point of the bill to the extremity of the claws. The legs are two feet and an half high from the belly to the end of the claws. The head and neck together are a foot and an half; and the largest toe, including the claw, is five inches long. The claw alone of the least toe is three inches and a half in length. The wing is so small that it does not appear, it being hid under the feathers of the back. In other birds, a part of the feathers serve for flight, and are different from those that serve merely for covering; but in the cassowary all the feathers are of the same kind, and outwardly of the same colour. They are generally double, having two long shafts, which grow out of a short one, which is fixed in the skin. Those that are double are always of an unequal length; for some are fourteen inches long, particularly on the rump, while others are not above three The beards that adorn the stem or shaft are about half way to the end, very long, and as thick as an horse-hair, without being subdivided into fibres. The stem or shaft is flat, shining, black, and knotted below; and from each knot there proceeds a beard; likewise the beards at the end of the large feathers are perfectly black, and towards the root of a grey tawny colour; shorter, more soft, and throwing out fine fibres like down; so that nothing appears except the ends, which are hard and black; because the other part, composed of down, is quite covered. There are feathers on the head and neck; but they are so short and thinly sown, that the bird's skin appears naked, except towards the hinder part of the head, where they are a little longer. The feathers which adorn the rump are extremely thick; but do not differ in other respects from the rest, excepting their being longer. The wings, when they are deprived of their feathers, are but three inches long; and the feathers are like those on other parts of the body. The ends of the wings are adorned with five prickles, of different lengths and thickness, which bend like a bow: these are hollow from the roots to the very points, having only that slight substance within which all quills are known to have. The longest of these prickles is eleven inches; and it is a quarter of an inch in diameter at the root, being thicker there than towards the extremity; the point seems broken off.

The part, however, which most distinguishes this animal is the head; which, though small, like that of an ostrich, does not fail to inspire some degree of terror. It is bare of feathers, and is in a manner armed with an helmet of horny substance, that covers it from the root of the bill to near half the head backwards. This helmet is black before and yellow behind. Its substance is very hard, being formed by the elevation of the bone of the skull; and it consists of several plates, one over another, like the horn of an ox. Some have supposed that this was shed every year with the feathers; but the most probable opinion is, that it only exfoliates slowly like the beak. To the peculiar oddity of this natural armour may be added the colour of the eye in this animal, which is a bright yellow; and the globe being above an inch and a half in diameter, give it an air equally fierce and extraordinary. The hole of the ear is very large and open, being only covered with small black feathers. The sides of the head, about the eye and ear, being destitute of any covering, are blue, except the middle of the lower eye-lid, which is white. The part of the bill which answers to the upper jaw in other animals is very hard at the edges above, and the extremity of it is like that of a turkey-cock. The end of the lower mandible is slightly notched, and the whole is of a greyish brown, except a green spot on each side. As the beak admits a very wide opening, this contributes not a little to the bird's menacing appearance. The neck is of a violet colour, inclining to that of slate; and it is red behind in several places, but chiefly in the middle. About the middle of the neck before, at the rise of the large feathers, there are two processes formed by the skin, which resemble somewhat the gills of a cock, but that they are blue as well as red. The skin which covers the forepart of the breast, on which this bird leans and rests, is hard, callous, and without feathers. The thighs and legs are covered with feathers, and are extremely thick, strong, straight, and covered with scales of several shapes; but the legs are thicker a

little above the foot than in any other place. The toes are likewife covered with fcales, and are but three in number; for that which fhould be behind is wanting. The claws are of a hard folid fubftance, black without and white within.

The internal parts are equally remarkable. The caffowary unites with the double ftomach of animals that live upon vegetables the fhort inteftines of thofe that live upon flefh. The inteftines of the caffowary are thirteen times fhorter than thofe of the oftrich. The heart is very fmall, being but an inch and an half long, and an inch broad at the bafe. Upon the whole, it has the head of a warrior, the eye of a lion, the defence of a porcupine, and the fwiftnefs of a courfer.

Thus formed for a life of hoftility, for terrifying others, and for its own defence. it might be expected that the caffowary was one of the moft fierce and terrible animals of the creation. But nothing is fo oppofite to its natural character: it never attacks others; and inftead of the bill, when attacked, it rather makes ufe of its legs, and kicks like a horfe, or runs againft its purfuer, beats him down, and treads him to the ground.

The manner in which this animal moves is not lefs extraordinary than its appearance. Inftead of going directly forward, it feems to kick up behind with one leg; and then making a bound onward with the other, it goes with fuch prodigious velocity, that the fwifteft racer would be left far behind

The fame degree of voracioufnefs which we perceived in the obftrich obtains as ftrongly here. The caffowary fwallows every thing that comes within the capacity of its gullet. The Dutch affert, that it can devour not only glafs, iron, and ftones, but even live and burning coals, without teftifying the fmalleft fear or feeling the leaft injury. It is faid. that the paffage of the food through its gullet is performed fo fpeedily, that even the very eggs which it has fwallowed whole pafs through it unbroken in the fame form they went down. In fact, the alimentary canal of this animal, as was obferved above, is extremely fhort; and it may happen, that many kinds of food are indigeftible in its ftomach, as wheat or currants are to man, when fwallowed whole.

The caffowary's eggs are of a grey-afh colour, inclining to green. They are not fo large nor fo round as thofe of the oftrich. They are marked with a number of little tubercles of a deep green, and the fhell is not very thick. The largeft of thefe is found to be fifteen inches round one way, and about twelve the other.

The fouthern parts of the moft eaftern Indies feem to be the natural climate of the caffowary. His domain, if we may fo call it, begins where that of the oftrich terminates. The latter has never been found beyond the Ganges; while the caffowary is never feen nearer than the iflands of Banda, Sumatra, Java, the Molucca iflands, and the correfponding parts of the continent. Yet even here this animal feems not to have multiplied in any confiderable degree, as we find one of the kings of Java making a prefent of one of thefe birds to the captain of a Dutch fhip, confidering it as a very great rarity.

2. The *Cafuarius Novæ Hollandiæ*, or New Holland caffowary, differs confiderably from the common caffowary. It is a much larger bird, ftanding higher on its legs, and having the neck longer than in the common one. Total length feven feet two inches. The bill is not greatly different from that of the common caffowary; but the horny appendage or helmet on the top of the head in this fpecies is totally wanting: the whole of the head and neck is alfo covered with feathers, except the throat and fore-part of the neck about half way, which are not fo well feathered as the reft; whereas in the common caffowary the head and neck are bare and carunculated as in the turkey.

The plumage in general confifts of a mixture of brown and grey, and the feathers are fomewhat curled or bent at the ends in the natural ftate: the wings are fo very fhort as to be totally ufelefs for flight, and indeed are fcarcely to be diftinguifhed from the reft of the plumage, were it not for their ftanding out a little. The long fpines which are feen in the wings of the common fort are in this not obfervable, nor is there any appearance of a tail. The legs are ftout, formed much as in the galeated caffowary, with the addition of their being jagged or fawed the whole of their length at the back part.

This bird is not uncommon in New Holland, as feveral of them have been feen about Botany Bay and other parts. Although it cannot fly, it runs fo fwiftly, that a greyhound can fcarcely overtake it. The flefh is faid to be in tafte not unlike beef.

STRUTHIOLA, in botany: a genus of plants belonging to the clafs of *tetrandria*, and order of *monogynia*. The corolla is wanting; the calyx is tubulous, with eight glandules at its mouth; the berry is without juice, and monofpermous. The fpecies are three, the virgata, erecta, and nana, all of foreign extraction.

STRYCHNOS, in botany: a genus of plants belonging to the clafs of *pentandria*, and order of *monogynia*; and in the natural fyftem ranging under the twenty-eighth order, *Luridæ*. The corolla is quinquefid; the berry is unilocular, with a woody bark. The fpecies are three, the nux vomica, colubrina, and potatorum, natives of foreign countries.

STRYMON (anc. geog.), formerly *Conozus*; a river conftituting the ancient limits of Macedonia and Thrace; rifing in mount Scombrus (Ariftotle). Authors differ as to the modern name of this river.

STRYPE (John), was defcended from a German family, born at London, and educated at Cambridge. He was vicar of Low Layton in Effex, and diftinguifhed himfelf by his compilations of Lives and Memoirs; in which, as Dr. Birch remarks, his fidelity and indutiry will always give a value to his writings, however deftitute they may be of the graces of ftyle. He died in 1737, after having enjoyed his vicarage near fixty-eight years.

STUART (Dr. Gilbert), was born at Edinburgh in the year 1742. His father Mr. George Stuart was profeffor of humanity in the univerfity, and a man of confiderable eminence for his claffical tafte and literature. For thefe accomplifhments he was probably indebted in no fmall degree to his relation the celebrated Ruddiman, with whom both he and his fon converfed familiarly, though they afterwards united to injure his fame.

Gilbert having finifhed his claffical and philofophical ftudies in the grammar-fchool and univerfity, applied himfelf to jurifprudence, without following or probably intending to follow the profeffion of the law. For that profeffion he has been reprefented as unqualified by indolence; by a paffion which at a very early period of life he difplayed for general literature; or by boundlefs diffipation:—and all thefe circumftances may have contributed to make him relinquifh purfuits in which he could hope to fucceed only by patient perfeverance and ftrict decorum of manners. That he did not wafte his youth in idlenefs, is, however, evident from An Hiftorical Differtation concerning the Antiquity of the Britifh Conftitution, which he publifhed before he had completed his twenty-fecond year, and which had fo much merit as to induce the univerfity of Edinburgh to confer upon the author, though fo young a man, the degree of LL.D.

After a ftudious interval of fome years, he produced a valuable work, under the title of A View of Society in Europe, in its Progrefs from Rudenefs to Refinement; or, Inquiries concerning the Hiftory of Laws, Government, and Manners.

He had read and meditated with patience on the moſt important monuments of the middle ages; and in this volume (which ſpeedily reached a ſecond edition) he aimed chiefly at the praiſe of originality and invention, and diſcovered an induſtry that is ſeldom connected with ability and diſcernment. About the time of the publication of the firſt edition of this performance, having turned his thoughts to an academical life, he aſked for the profeſſorſhip of public law in the univerſity of Edinburgh. According to his own account he had been promiſed that place by the miniſter, but had the mortification to ſee the profeſſorſhip beſtowed on another, and all his hopes blaſted by the influence of Dr. Robertſon, whom he repreſented as under obligations to him.

To the writer of this article, who was a ſtranger to theſe rival candidates for hiſtorical fame, this part of the ſtory ſeems very incredible; as it is not eaſy to conceive how it ever could be in the power of Dr. Stuart to render to the learned Principal any eſſential ſervice. It was believed indeed by the earl of Buchan, and by others, who obſerved that the illiberal jealouſy not unfrequent in the world of letters was probably the ſource of this oppoſition; which entirely broke the intimacy of two perſons who, before that time, were underſtood to be on the moſt friendly footing with each other. Ingratitude, however, is as likely to have been the vice of Dr. Stuart as of Dr. Robertſon; for we have been told by a writer (Chalmer's in his Life of Ruddiman), who, at leaſt in one inſtance, has completely proved what he affirms, that "ſuch was Gilbert Stuart's laxity of principle as a man, that he conſidered ingratitude as one of the moſt venial ſins; ſuch was his conceit as a writer, that he regarded no one's merits but his own; ſuch were his diſappointments, both as a writer and a man, that he allowed his peeviſhneſs to ſour into malice, and indulged his malevolence till it ſettled in corruption."

Soon after this diſappointment Dr. Stuart went to London, where he became from 1768 to 1774 one of the writers of the Monthly Review. In 1772 Dr. Adam, rector of the high-ſchool at Edinburgh, publiſhed a Latin Grammar, which he intended as an improvement of the famous Ruddiman's. Stuart attacked him in a pamphlet under the name of *Buſhby*, and treated him with much ſeverity. In doing this, he was probably actuated more by ſome perſonal diſlike of Dr. Adam than by regard for the memory of his learned relation; for on other occaſions he ſhowed ſufficiently that he had no regard to Ruddiman's honour as a grammarian, editor, or critic.

In 1774 he returned to his native city, and began the Edinburgh Magazine and Review, in which he diſcuſſed the liberty and conſtitution of England, and diſtinguiſhed himſelf by an inquiry into the character of John Knox the reformer, whoſe principles he reprobated in the ſevereſt terms. About this time he reviſed and publiſhed Sullivan's Lectures on the Conſtitution of England. Soon after he turned his thoughts to the hiſtory of Scotland, and publiſhed Obſervations concerning its Public Law and Conſtitutional Hiſtory; in which he examined with a critical care the preliminary book to Dr. Robertſon's Hiſtory. His next work was The Hiſtory of the Reformation; a book which deſerves praiſe for the eaſy dignity of the narrative, and for ſtrict impartiality. His laſt great work, The Hiſtory of Scotland from the Eſtabliſhment of the Reformation to the Death of Queen Mary, which appeared in 1782, has been very generally read and admired. His purpoſe was to vindicate the character of the injured queen, and expoſe the weakneſs of the arguments by which Dr. Robertſon had endeavoured to prove her guilty: but though the ſtyle of this work is his own, it contains very little matter which was not furniſhed by Goodall and Tytler; and it is with the arms which theſe two writers put into his hands, that Dr. Stuart vanquiſhed his great antagoniſt.

In 1782 he once more viſited London, and engaged in the Political Herald and Engliſh Review; but the jaundice and dropſy increaſing on him, he returned by ſea to his native country, where he died in the houſe of his father on the 13th of Auguſt, 1786.

In his perſon Dr. Stuart was about the middle ſize and juſtly proportioned. His countenance was modeſt and expreſſive, ſometimes glowing with ſentiments of friendſhip, of which he was truly ſuſceptible, and at others darting that ſatire and indignation at folly and vice, which appear in ſome of his writings. He was a lively companion; and, with a conſtitution that might have ſtood the ſhock of ages, he fell a premature martyr to intemperance. His talents were certainly great, and his writings are uſeful; but he ſeems to have been influenced more by paſſion than prejudice, and in his character there was not much to be imitated.

STUCCO, in building, a compoſition of white marble pulveriſed, and mixed with plaſter of lime; and the whole being ſifted and wrought up with water, is to be uſed like common plaſter: this is called by Pliny *marmoratum opus*, and *albarium opus*.

A patent has been granted to Mr. B. Higgins for inventing a new kind of ſtucco, or water-cement, more firm and durable than any heretofore. Its compoſition, as extracted from the ſpecification ſigned by himſelf, is as follows: "Drift-ſand, or quarry (A) ſand, which conſiſts chiefly of hard quartoſe flat-faced grains, with ſharp angles; which is the freeſt, or may be moſt eaſily freed by waſhing, from clay, ſalts, and calcareous, gypſeous, or other grains leſs hard and durable than quartz; which contains the ſmalleſt quantity of pyrites or heavy metallic matter, inſeparable by waſhing; and which ſuffers the ſmalleſt diminution of its bulk in waſhing in the following manner—is to be preferred before any other. And where a coarſe and a fine ſand of this kind, and correſponding in the ſize of their grains with the coarſe and fine ſands hereafter deſcribed, cannot be eaſily procured, let ſuch ſand of the foregoing quality be choſen, as may be ſorted and cleanſed in the following manner:

"Let the ſand be ſifted in ſtreaming clear water, through a ſieve which ſhall give paſſage to all ſuch grains as do not exceed one-ſixteenth of an inch in diameter; and let the ſtream of water and the ſifting be regulated ſo, that all the ſand, which is much finer than the Lynn-ſand commonly uſed in the London glaſs-houſes, together with clay and every other matter ſpecifically lighter than ſand, may be waſhed away with the ſtream, whilſt the purer and coarſer ſand, which paſſes through the ſieve, ſubſides in a convenient receptacle, and whilſt the coarſe rubbiſh and rubble remain on the ſieve to be rejected.

"Let the ſand which thus ſubſides in the receptacle, be waſhed in clean ſtreaming water through a finer ſieve, ſo as to be further cleanſed, and ſorted into two parcels; a coarſer, which will remain in the ſieve, which is to give paſſage to ſuch grains of ſand only as are leſs than one-thirtieth of an inch in diameter, and which is to be ſaved apart under the name of *coarſe ſand*; and a finer, which will paſs through the ſieve and ſubſide in the water, and which is to be ſaved apart under the name of *fine ſand*.—Let the coarſe and the fine ſand be dried

(A) "This is commonly called *pit-ſand*.

ſeparately, either in the ſun or on a clean iron-plate, ſet on a convenient ſurface, in the manner of a ſand-heat (B).

" Let lime be choſen (C), which is ſtone-lime, which heats the moſt in ſlaking, and ſlakes the quickeſt when duly watered; which is the freſheſt made and cloſeſt kept; which diſſolves in diſtilled vinegar with the leaſt effervèſcence, and leaves the ſmalleſt reſidue inſoluble, and in this reſidue the ſmalleſt quantity of clay, gypſum, or martial matter.

" Let the lime choſen according to theſe important rules, be put in a braſs-wired ſieve, to the quantity of fourteen pounds. Let the ſieve be finer than either of the foregoing; the finer the better it will be: let the lime be ſlaked (D) by plunging it in a butt filled with ſoft water, and raiſing it out quickly and ſuffering it to heat and fume, and by repeating this plunging and raiſing alternately, and agitating the lime, until it be made to paſs through the ſieve into the water; and let the part of the lime which does not eaſily paſs through the ſieve be rejected: and let freſh portions of the lime be thus uſed, until as many (E) ounces of lime have paſſed through the ſieve, as there are quarts of water in the butt. Let the water thus impregnated ſtand in the butt cloſely covered (F), until it becomes clear; and through wooden (G) cocks placed at different heights in the butt, let the clear liquor be drawn off as faſt (H) and as low as the lime ſubſides, for uſe. This clear liquor I call the *cementing liquor* (I). The freer the water is from ſaline matter, the better will be the cementing liquor made with it.

" Let fifty-ſix pounds of the aforeſaid choſen lime be ſlaked, by gradually ſprinkling on it, and eſpecially on the unſlaked pieces, the cementing liquor, in a cloſe (K) clean place. Let the ſlaked part be immediately (L) ſifted through the laſt-mentioned fine braſs-wired ſieve: let the lime which paſſes be uſed inſtantly, or kept in air-tight veſſels, and let the part of the lime which does not paſs through the ſieve be rejected (M).—This finer richer part of the lime which paſſes through the ſieve, I call *purified lime*.

" Let bone-aſh be prepared in the uſual manner, by grinding the whiteſt burnt bones; but let it be ſifted, to be much finer than the bone-aſh commonly ſold for making cupels.

" The moſt eligible materials for making my cement being thus prepared, take fifty-ſix pounds of the coarſe ſand, and forty-two pounds of the fine ſand; mix them on a large plank of hard wood placed horizontally; then ſpread the ſand ſo that it may ſtand to the height of ſix inches, with a flat ſurface on the plank; wet it with the cementing liquor; and let any ſuperfluous quantity of the liquor, which the ſand in the condition deſcribed cannot retain, flow away off the plank. To the wetteſt ſand add fourteen pounds of the purified lime in ſeveral ſucceſſive portions, mixing and beating them up together in the mean time, with the inſtruments generally uſed in

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(B) " The ſand ought to be ſtirred up continually until it is dried, and is then to be taken off; for otherwiſe the evaporation will be very ſlow, and the ſand which lies next the iron plate, by being overheated, will be diſcoloured.

(C) " The preference given to ſtone-lime is founded on the preſent practice in the burning of lime, and on the cloſer texture of it, which prevents it from being ſo ſoon injured by expoſure to the air as the more ſpongy chalk-lime is; not on the popular notion that ſtone-lime has ſomething in it, whereby it excels the beſt chalk in the cementing properties. The gypſum contained in lime-ſtone remains unaltered, or very little altered, in the lime, after the burning; but it is not to be expected that clay or martial matter ſhould be found in their native ſtate in well-burned lime; for they concrete or vitrify with a part of the calcareous earth, and conſtitute the hard grains or lumps which remain undiſſolved in weak acids, or are ſeparable from the ſlaked lime by ſifting it immediately through a ſieve.

(D) " This method of impregnating the water with lime, is not the only one which may be adopted. It is, however, preferred before others, becauſe the water clears the ſooner, in conſequence of its being warmed by the ſlaking lime; and the gypſeous part of the lime does not diffuſe itſelf in the water ſo freely in this way, as it does when the lime is ſlaked to fine powder in the common method, and is then blended with the water; for the gypſeous part of the lime ſlakes at firſt into grains rather than into fine powder, and will remain on the ſieve after the pure lime has paſſed through, long enough to admit of the intended ſeparation; but when the lime is otherwiſe ſlaked, the gypſeous grains have time to ſlake to a finer powder, and paſſing through the ſieve, diſſolve in the water along with the lime. I have imagined that other advantages attended this method of preparing the lime-water, but I cannot yet ſpeak of them with preciſion.

(E) " If the water contains no more acidulous gas than is uſually found in river or rain water, a fourth part of this quantity of lime, or leſs, will be ſufficient.

(F) " The calcareous cruſt which forms on the ſurface of the water, ought not to be broke, for it aſſiſts in excluding the air, and preventing the abſorption of acidulous gas whereby the lime-water is ſpoiled.

(G) " Braſs-cocks are apt to colour a part of the liquor.

(H) " Lime-water cannot be kept many days unimpaired, in any veſſels that are not perfectly air-tight. If the liquor be drawn off before it clears, it will contain whiting, which is injurious; and if it be not inſtantly uſed after it is drawn limpid from the butt into open veſſels, it will grow turbid again, and depoſit the lime changed to whiting by the gas abſorbed from the air. The calcareous matter which ſubſides in the butt, reſembles whiting the more nearly, as the lime has been more ſparingly employed; in the contrary circumſtances, it approaches to the nature of lime; and in the intermediate ſtate, it is fit for the common compoſition of the plaſterers for inſide ſtucco.

(I) " At the time of writing this ſpecification, I preferred this term before that of lime-water, on grounds which I had not ſufficiently examined.

(K) " The vapour which ariſes in the ſlaking of lime, contributes greatly to the ſlaking of theſe pieces which lie in its way; and an unneceſſary waſte of the liquor is prevented, by applying it to the lime heaped in a pit or in a veſſel, which may reſtrain the iſſue of the vapour, and direct it through the maſs. If more of the liquor be uſed than is neceſſary to ſlake the lime, it will create error in weighing the ſlaked powder, and will prevent a part of it from paſſing freely through the ſieve. The liquid is therefore to be uſed ſparingly, and the lime which has eſcaped its action is to be ſprinkled apart with freſh liquor.

(L) " When the aggregation of the lumps of lime is thus broken, it is impaired much ſooner than it is in the former ſtate, becauſe the air more freely pervades it.

(M) " Becauſe it conſiſts of heterogeneous matter, or of ill-burnt lime; which laſt will ſlake and paſs through the ſieve, if the lime be not immediately ſifted after the ſlaking, agreeable to the text.

making fine mortar: then add fourteen pounds of the bone-aſh in ſucceſſive portions, mixing and beating all together. The quicker and the more perfectly theſe materials are mixed and beaten together, and the ſooner the cement thus formed is uſed, the better (N) it will be. This I call the *water-cement coarſe-grained*, which is to be applied in building, pointing, plaſtering, ſtuccoing, or other work, as mortar and ſtucco now are; with this difference chiefly, that as this cement is ſhorter than mortar or common ſtucco, and dries ſooner, it ought to be worked expeditiouſly in all caſes; and in ſtuccoing, it ought to be laid on by ſliding the trowel upwards on it; that the materials uſed along with this cement in building, or the ground on which it is to be laid in ſtuccoing, ought to be well wetted with the cementing liquor in the inſtant of laying on the cement; and that the cementing liquor is to be uſed when it is neceſſary to moiſten the cement, or when a liquid is required to facilitate the floating of the cement.

" When ſuch cement is required to be of a finer texture, take ninety-eight pounds of the fine ſand, wet it with the cementing liquor, and mix it with the purified lime and the bone-aſh, in the quantities and in the manner above deſcribed; with this difference only, that fifteen pounds of lime, or (O) thereabouts, are to be uſed inſtead of fourteen pounds, if the greater part of the ſand be as fine as Lynn ſand. This I call *water-cement fine-grained.* It is to be uſed in giving the laſt coating, or the finiſh to any work intended to imitate the finer-grained ſtones or ſtucco. But it may be applied to all the uſes of the water-cement coarſe-grained, and in the ſame manner.

" When for any of the foregoing purpoſes of pointing, building, &c. ſuch a cement is required much cheaper and coarſer-grained, then much coarſer clean ſand than the foregoing coarſe ſand, or well-waſhed fine rubble, is to be provided. Of this coarſe ſand or rubble take fifty-ſix pounds, of the foregoing coarſe ſand twenty-eight pounds, and of the fine ſand fourteen pounds; and after mixing theſe, and wetting them with the cementing liquor in the foregoing manner, add fourteen pounds, or ſomewhat leſs, of the (P) purified lime, and then fourteen pounds, or ſomewhat leſs, of the bone-aſh, mixing them together in the manner already deſcribed. When my cement is required to be white, white ſand, white lime, and the whitiſh bone-aſh, are to be choſen. Grey ſand, and grey bone-aſh formed of half-burnt bones, are to be choſen to make the cement grey; and any other colour of the cement is obtained, either by chooſing coloured ſand, or by the admixture of the neceſſary quantity of coloured talc in powder, or of coloured, vitreous, or metallic powders, or other durable colouring ingredients commonly uſed in paint.

" To the end that ſuch a water-cement, as I have deſcribed, may be made as uſeful as it is poſſible in all circumſtances; and that no perſon may imagine that my claim and right under theſe letters-patent may be eluded by divers variations, which may be made in the foregoing proceſs, without producing any notable defect in the cement; and to the end that the principles of this art, as well as the art itſelf, of making my cement, may be gathered from this ſpecification, and perpetuated to the public; I ſhall add the following obſervations:

" This my water-cement, whether the coarſe or fine grained, is applicable in forming artificial ſtone, by making alternate layers of the cement and of flint, hard ſtone, or brick, in moulds of the figure of the intended ſtone, and by expoſing the maſſes ſo formed to the open (Q) air to harden.

" When ſuch cement is required for water (R) fences, two-thirds of the preſcribed quantity of bone-aſhes are to be omitted; and in the place thereof an equal meaſure of powdered terras is to be uſed; and if the ſand employed be not of the coarſeſt ſort, more terras muſt be added, ſo that the terras ſhall be by weight one-ſixth part of the weight of the ſand.

" When ſuch a cement is required of the fineſt grain (S), or in a fluid form, ſo that it may be applied with a bruſh, flint powder, or the powder of any quartoſe or hard earthy ſubſtance, may be uſed in the place of ſand: but in a quantity ſmaller, as the flint or other powder is finer; ſo that the flint-powder, or other ſuch powder, ſhall not be more than ſix times

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(N) " Theſe proportions are intended for a cement made with ſharp ſand, for incruſtation in expoſed ſituations, where it is neceſſary to guard againſt the effects of hot-weather and rain. In general, half this quantity of bone-aſhes will be found ſufficient; and although the incruſtation in this latter caſe will not harden deeply ſo ſoon, it will be ultimately ſtronger, provided the weather be favourable.

" The injuries which lime and mortar ſuſtain by expoſure to the air, before the cement is finally placed in a quieſcent ſtate, are great; and therefore our cement is the worſe for being long beaten, but the better as it is quickly beaten until the mixture is effected, and no longer.

(O) " The quantity of bone-aſhes is not to be increaſed with that of the lime; but it is to be leſſened as the expoſure and purpoſes of the work will admit.

(P) " Becauſe leſs lime is neceſſary, as the ſand is coarſer.

(Q) " But they muſt not be expoſed to the rain until they are almoſt as ſtrong as freſh Portland ſtone; and even then they ought to be ſheltered from it as much as the circumſtances will admit. Theſe ſtones may be made very hard and beautiful, with a ſmall expence of bone-aſh, by ſoaking them, after they have dried thoroughly and hardened, in the lime liquor, and repeating this proceſs twice or thrice, at diſtant intervals of time. The like effect was experienced in incruſtations.

(R) " In my experiments, mortar made with terras-powder, in the uſual method, does not appear to form ſo ſtrong a cement for water-fences as that made, according to the ſpecification, with coarſe ſand; and I ſee no more reaſon for avoiding the uſe of ſand in terras-mortar, than there would be for rejecting ſtone from the embankment. The bone-aſhes meant in this place, are the dark grey or black ſort. I am not yet fully ſatisfied about the operation of them in this inſtance.

(S) " The qualities and uſes of ſuch fine calcareous cement, are recommended chiefly for the purpoſe of ſmoothing and finiſhing the ſtronger cruſtaceous works, or for waſhing walls to a lively and uniform colour. For this laſt intention, the mixture muſt be as thin as new cream, and laid on briſkly with a bruſh, in dry weather; and a thick and durable coat is to be made by repeated waſhing; but is not to be attempted by uſing a thicker liquor; for the coat made with this laſt is apt to ſcale, whilſt the former endures the weather much longer than any other thin calcareous covering, that has been applied in this way. Fine yellow-ochre is the cheapeſt colouring ingredient for ſuch waſh, when it is required to imitate Bath-ſtone, or the warm-white ſtones.

the weight of the lime, nor lefs than four times its weight. The greater the quantity of lime within thefe limits, the more will the cement be liable to crack by quick drying, and *vice verfa.*

" Where fuch fand as I prefer cannot be conveniently procured, or where the fand cannot be conveniently wafhed and forted, that fand which moft refembles the mixture of coarfe and fine fand above prefcribed, may be ufed as I have directed, provided due attention is paid to the quantity of the lime, which is to be greater (T) as the quantity is finer, and *vice verfa.*

" Where fand cannot be eafily procured, any durable ftony body, or baked earth grofsly powdered (U), and forted nearly to the fizes above prefcribed for fand, may be ufed in the place of fand, meafure for meafure, but not weight for weight, unlefs fuch grofs powder be as heavy fpecifically as fand.

" Sand may be cleanfed from every fofter, lighter, and lefs durable matter, and from that part of the fand which is too fine, by various methods preferable (X), in certain circumftances, to that which I have defcribed.

" Water may be found naturally free from fixable gas, felenite, or clay; fuch water may, without any notable inconvenience, be ufed in the place of the cementing liquor; and water approaching this ftate will not require fo much lime as I have ordered to make the cementing liquor; and a cementing liquor fufficiently ufeful, may be made by various methods of mixing lime and water in the defcribed proportions, or nearly fo.

" When ftone-lime cannot be procured, chalk-lime, or fhell-lime, which beft refembles ftone-lime, in the characters above written of lime, may be ufed in the manner defcribed, except that fourteen pounds and a half of chalk-lime will be required, in the place of fourteen pounds of ftone-lime. The proportion of lime which I have prefcribed above, may be increafed without inconvenience, when the cement or ftucco is to be applied where it is not liable to dry quickly; and in the contrary circumftance, this proportion may be diminifhed; and the defect of lime in quantity or quality, may be very advantageoufly fupplied (Y), by caufing a confiderable quantity of the cementing liquor to foak into the work, in fucceffive portions, and at diftant intervals of time, fo that the calcareous matter of the cementing liquor, and the matter attracted from the open air, may fill and ftrengthen the work.

" The powder of almoft every well-dried or burnt animal fubftance, may be ufed inftead of bone-afh; and feveral earthy powders, efpecially the micaceous and the metallic; and the elixated afhes of divers vegetables, whofe earth will not burn to lime; and the afhes of mineral fuel, which are of the calcareous kind, but will not burn to lime, will anfwer the ends of bone-afh in fome degree.

" The quantity of bone-afh defcribed, may be leffened without injuring the cement, in thofe circumftances efpecially which admit the quantity of lime to be leffened, and in thofe wherein the cement is not liable to dry quickly. And the art of remedying the defects of lime, may be advantageoufly practifed to fupply the deficiency of bone-afh, efpecially in building, and in making artificial ftone with this cement."

STUD, in the manege, a collection of breeding-horfes and mares.

STUDDING-SAILS, certain light fails extended, in moderate and fteady breezes, beyond the fkirts of the principal fails, where they appear as wings upon the yard-arms.

STUFF, in commerce, a general name for all kinds of fabrics of gold, filver, filk, wool, hair, cotton, or thread, manufactured on the loom; of which number are velvets, brocades, mohairs, fatins, taffetas, cloths, ferges, &c.

STUKELEY (Dr. William), a celebrated antiquarian, defcended from an ancient family in Lincolnfhire, was born at Holbech in 1687, and educated in Bene't College, Cambridge. While an under-graduate, he often indulged a ftrong propenfity to drawing and defigning; but made phyfic his principal ftudy, and firft began to practife at Bofton in his native country. In 1717 he removed to London, where, on the recommendation of Dr. Mead, he was foon after elected a fellow of the Royal Society; he was one of the firft who revived that of the Antiquarians in 1718, and was their fecretary for many years during his refidence in town. In 1729 he took holy orders by the encouragement of Archbifhop Wake; and was foon after prefented by Lord-chancellor King with the living of All-Saints in Stamford. In 1741 he became one of the founders of the Egyptian Society, which brought him acquainted with the benevolent Duke of Montague, one of the members; who prevailed on him to leave Stamford, and prefented him to the living of St. George the Martyr, Queen-fquare. He died of a ftroke of the palfy in 1765. In his phyfical capacity, his Differtation on the Spleen was well received; and his *Itinerarium Curiofum*, the firft fruit of his juvenile excurfions, was a good fpecimen of what was to be expected from his riper age. His great learning, and profound refearches into the dark remains of antiquity, enabled him to publifh many elaborate and curious works: his friends ufed to call him the *arch-druid* of his age. His difcourfes, intitled *Palæographia Sacra*, on the vegetable creation, befpeak him a botanift, philofopher, and divine.

STUM, in the wine-trade, denotes the unfermented juice of the grape, after it has been feveral times racked off and feparated from its fediment. The cafks are for this purpofe well matched or fumigated with brimftone every time, to prevent the liquor from fermenting, as it would otherwife readily do, and become wine. See MUST.

STUPIDITY. The Greek word μωροτης correfponds moft with our Englifh word *ftupidity* or *foolifhnefs*, when ufed to exprefs that ftate of mind in which the intellects are defective. The immediate caufes are faid to be, a deficiency of vital heat, or a defect in the brain. Stupid children fometimes become fprightly youths; but if ftupidity continues to the age of puberty, it is hardly ever removed. If ftupidity follows upon a violent paffion, an injury done to the head, or other evident caufe, and if it continues long, it becomes incurable. But the ftupidity which confifts in a lofs of memory, and fucceeds a lethargy, fpontaneoufly ceafes when the lethargy is cured.

(T) " If fea-fand be well wafhed in frefh water, it is as good as any other round fand.

(U) " The cement made with thefe and the proper quantities of purified lime and lime-water, are inferior to the beft, as the grains of thefe powders are more perifhable and brittle than thofe of fand. They will not therefore be employed, unlefs for the fake of evafion, or for want of fand: in this latter cafe, the finer powder ought to be wafhed away.

(X) " This and the next paragraph is inferted with a view to evafions, as well as to fuggeft the eafier and cheaper methods which may be adopted in certain circumftances, by artifts who underftand the principles which I endeavoured to teach.

(Y) " This practice is noticed, as the remedy which may be ufed for the defects arifing from evafive meafures, and as the method of giving fpongy incruftations containing bone-afhes, the greateft degree of hardnefs."

STUPOR, a numbneſs in any part of the body, whether occaſioned by ligatures obſtructing the blood's motion, by the palſy, or the like.

STUPPA, or Stupe, in medicine, is a piece of cloth dipped in ſome proper liquor, and applied to an affected part.

STURDY, a diſtemper to which cattle are ſubject, called alſo the *turning evil.* See Farriery.

STURGEON. See Accipenser.

STURMIUS (John), a learned philologer and rhetorician, was born at Sleida in Eifel, near Cologne, in 1507. He ſtudied at firſt in his native country with the ſons of Count de Manderſcheid, whoſe receiver his father was. He afterwards purſued his ſtudy at Liege, in the college of St. Jerom, and then went to Louvain in 1524. Five years he ſpent there, three in learning and two in teaching. He ſet up a printing-preſs with Rudger Reſcius, profeſſor of the Greek tongue, and printed ſeveral Greek authors. He went to Paris in 1529, where he was highly eſteemed, and read public lectures on the Greek and Latin writers, and on logic. He married there, and kept a great number of boarders: but as he liked what were called the *new opinions,* he was more than once in danger; and this undoubtedly was the reaſon why he removed to Straſburg in 1537, in order to take poſſeſſion of the place offered him by the magiſtrates. The year following he opened a ſchool, which became famous, and by his means obtained of Maximilian II. the title of an univerſity in 1566. He was very well ſkilled in polite literature, wrote Latin with great purity, and was a good teacher. His talents were not confined to the ſchool; for he was frequently intruſted with deputations in Germany and foreign countries, and diſcharged theſe employments with great honour and diligence. He ſhowed extreme charity to the refugees on account of religion: he not only laboured to aſſiſt them by his advice and recommendations, but he even impoveriſhed himſelf for them. He died in his eighty-ſecond year, after he had been for ſome time blind. He publiſhed many books; the principal of which are, 1. *Partitiones Dialecticæ.* 2. *De Educatione Principum.* 3. *De Nobilitate Anglicana.* 4. *Linguæ Latinæ reſolvendæ Ratio.* 5. Excellent Notes on Ariſtotle's and Hermogenes's Rhetoric, &c. He ought not to be confounded with *John Sturmius,* a native of Mechlin, and phyſician and profeſſor of mathematics at Louvain, who alſo wrote ſeveral works.

STURNUS, the Starling; a genus of birds belonging to the order of *paſſeres.* The beak is ſubulated, depreſſed, and ſomewhat blunt; the ſuperior mandible is entire, and ſomewhat open at the edges; the noſtrils are marginated above; and the tongue is ſharp and emarginated. There are fifteen ſpecies according to Dr. Latham; the vulgaris, capenſis, ludovicianus, militaris, cellaris, carunculatus, gallinaceus, ſericeus, viridis, olivaceus, moritanicus, loyca, dauuricus, junceti, and mexicanus.

The *vulgaris,* or common ſtarling, is the only ſpecies of the ſturnus that is indigenous. The weight of the male of this ſpecies is about three ounces; that of the female rather leſs. The length is eight inches three quarters: the bill is brown or yellow, but in old birds generally yellow. The whole plumage is black, very reſplendent, with changeable blue, purple, and copper: each feather marked with a pale yellow ſpot. The leſſer coverts are edged with yellow, and ſlightly gloſſed with green. The quill-feathers and tail duſky: the former edged with yellow on the exterior ſide; the laſt with dirty white. The legs of a reddiſh brown.

The ſtare breeds in hollow trees, eaves of houſes, towers, ruins, cliffs, and often in high rocks over the ſea, ſuch as that of the iſle of Wight. It lays four or five eggs, of a pale-greeniſh aſh-colour; and makes its neſt of ſtraw, ſmall fibres of roots, and the like. In winter, ſtares aſſemble in vaſt flocks: they collect in myriads in the fens of Lincolnſhire, and do great damage to the fen-men, by rooſting on the reeds, and breaking them down by their weight; for reeds are the thatch of the country, and are laid up in harveſt with great care. Theſe birds feed on worms and inſects; and it is ſaid that they will get into pigeon-houſes, for the ſake of ſucking the eggs. Their fleſh is ſo bitter as to be ſcarce eatable. They are fond of following oxen and other large cattle as they feed in the meadows, attracted, it is ſaid, by the inſects which flutter round them, or by thoſe, perhaps, which ſwarm in their dung, or in meadows in general. From this habit is derived the German name *Rinder Staren.* They are alſo accuſed of feeding on the carcaſes that are expoſed on gibbets; but it is probably in ſearch only of inſects. They live ſeven or eight years, or even longer, in the domeſtic ſtate. The wild ones cannot be decoyed by the call, becauſe they regard not the ſcream of the owl. A method has been diſcovered of taking entire families, by fixing to the walls and the trees where they lodge, pots of earthen ware of a convenient form, which the birds often prefer to place their neſts in. Many are alſo caught by the gin and draw-net. In ſome parts of Italy it is common to employ tame weaſels to drag them out of their neſts, or rather their holes; for the artifice of man conſiſts in employing one enſlaved race to extend his dominion over the reſt.

The ſtare, it is ſaid, can be taught to ſpeak either French, German, Latin, Greek, &c. and to pronounce phraſes of ſome length. Its pliant throat accommodates itſelf to every inflection and every accent. It can readily articulate the letter R, and acquires a ſort of warbling which is much ſuperior to its native ſong. This bird is ſpread through an extenſive range in the ancient continent. It is found in Sweden, Germany, France, Italy, the Iſle of Malta, the Cape of Good Hope, and is every-where nearly the ſame; whereas thoſe American birds which have been called ſtares, preſent a great diverſity of appearance.

STYE, or Stythe, in the eye. See Crithe.

STYLE, a word of various ſignifications, originally deduced from *ſtylos,* a kind of bodkin wherewith the ancients wrote on plates of lead, or on wax, &c. and which is ſtill uſed to write on ivory-leaves and paper prepared for that purpoſe, &c.

Style, in dialling, denotes the gnomon or cock of a dial, raiſed on the plane thereof to project a ſhadow.

Style, in botany. See Botany, Sect. iv.

Style, in language, is the peculiar manner in which a man expreſſes his conceptions. It is a picture of the ideas which riſe in his mind, and of the order in which they are there produced.

The qualities of a good ſtyle may be ranked under two heads; perſpicuity and ornament. It will readily be admitted, that perſpicuity ought to be eſſentially connected with every kind of writing; and to attain it, attention muſt be paid, firſt to ſingle words and phraſes, and then to the conſtruction of ſentences. When conſidered with reſpect to words and phraſes, it requires theſe three qualities; purity, propriety, and preciſion. When conſidered with regard to ſentences, it requires a clear arrangement of the words and unity in the ſenſe; to which, if ſtrength and harmony be added, the ſtyle will become ornamented.

One of the moſt important directions to be obſerved by him who wiſhes to form a good ſtyle, is to acquire clear and preciſe ideas on the ſubject, concerning which he is to write or ſpeak. To this muſt be added frequency of compoſition, and an acquaintance with the ſtyle of the beſt authors. A ſervile imitation, however, of any author, is carefully to be avoided; for he who copies, can hardly avoid copying faults

as well as beauties. A ſtyle cannot be proper, unleſs it be adapted to the ſubject, and likewiſe to the capacity of our hearers, if we are to ſpeak in public. A ſimple, clear, and unadorned ſtyle, ſuch as that of Swift, is fitteſt for intricate diſquiſition; a ſtyle elegant as Addiſon's, or impetuous like Johnſon's, is moſt proper for fixing the attention on truths, which, though known, are too much neglected. We muſt not be inattentive to the ornaments of ſtyle, if we wiſh that our labours ſhould be read and admired: but he is a contemptible writer, who looks not beyond the dreſs of language, who lays not the chief ſtreſs upon his matter, and who does not regard ornament as a ſecondary and inferior recommendation. For further obſervations on the different kinds of ſtyle, ſee ORATORY.

STYLE, in juriſprudence, the particular form or manner of proceeding in each court of juriſdiction, agreeable to the rules and orders eſtabliſhed therein: thus we ſay, the ſtyle of the court of Rome, of chancery, of parliament, of the privy-council, &c.

STYLE, in muſic, denotes a peculiar manner of ſinging, playing, or compoſing; being properly the manner that each perſon has of playing, ſinging, or teaching; which is very different both in reſpect of different geniuſes, of countries, nations, and of the different matters, places, times, ſubjects, paſſions, expreſſions, &c. Thus we ſay, the ſtyle of Paleſtrina, of Lully, of Corelli, of Handel, &c.; the ſtyle of the Italians, French, Spaniards, &c.

Old STYLE, the Julian method of computing time, as the *New* STYLE is the Gregorian method of computation. See KALENDAR.

STYLEPHORUS CHORDATUS, a genus of fiſhes belonging to the order of *apodes*. See 2d Pl. 23. This very curious genus was diſcovered by Dr. Shaw, who read a deſcription of it before the Linnæan Society in the year 1788. The eyes are fixed on cylindrical pillars which lie cloſe together. The roſtrum, or narrow part which is terminated by the mouth, is connected to the back part of the head by a flexible leathery duplicature, which permits it either to be extended in ſuch a manner that the mouth points directly upwards, or to fall back ſo as to be received into a ſort of caſe, formed by the upper part of the head. There are three pairs of branchiæ ſituate under the throat. The pectoral fins are ſmall; the dorſal fin runs from the head to within about an inch and a half of the tail; the caudal fin is ſhort, and is furniſhed with five remarkable ſpines. The body is extremely long, and compreſſed very much, and gradually diminiſhes as it approaches the tail, which terminates in a proceſs or ſtring of an enormous length, and finiſhes in a very fine point. This ſtring, or caudal proceſs, ſeems to be ſtrengthened throughout its whole length, or at leaſt as far as the eye can trace it, by a ſort of double fibre or internal part. The ſtylephorus chordatus is a native of the Weſt-Indian Sea. It was taken between the iſlands of Cuba and Martinico, near a ſmall cluſter of little iſlands about nine leagues from ſhore, and was ſeen ſwimming near the ſurface. The whole length of this uncommon animal from the head to the extremity of the caudal proceſs is about thirty-two inches, of which the proceſs itſelf meaſures twenty-two.

STYLET, a ſmall dangerous kind of poniard which may be concealed in the hand, chiefly uſed in treacherous aſſaſſinations. The blade is uſually triangular, and ſo ſmall that the wound it makes is almoſt imperceptible.

STYLITES, PILLAR SAINTS, in eccleſiaſtical hiſtory, an appellation given to a kind of ſolitaries, who ſtood motionleſs upon the tops of pillars, raiſed for this exerciſe of their patience, and remained there for ſeveral years, amidſt the admiration and applauſe of the ſtupid populace. Of theſe we find ſeveral mentioned in ancient writers, and even as low as the twelfth century, when they were totally ſuppreſſed.

The founder of the order was St. Simeon Stylites, a famous anchoret in the fifth century, who firſt took up his abode on a column ſix cubits high; then on a ſecond of twelve cubits, a third of twenty-two, a fourth of thirty-ſix, and on another of forty cubits, where he thus paſſed thirty-ſeven years of his life. The tops of theſe columns were only three feet in diameter, and were defended by a rail that reached almoſt to the girdle, ſomewhat reſembling a pulpit. There was no lying down in it. The faquirs, or devout people of the Eaſt, imitate this extraordinary kind of life to this day.

STYLOCERALOIDES,
STYLO-GLOSSUS,
STYLO-*Hyoidæus*,
STYLO-*Pharyngæus*,
STYLOIDES,
} The names of different muſcles in the human body. See *Table of the Muſcles under* ANATOMY.

STYLOSANTHES, in botany: a genus of the *decandria* order, belonging to the *diadelphia* claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The calyx is tubulated, very long, having the corolla attached to it. The legumen or pod biarticulated and hooked. Of this there are two ſpecies, both natives of Jamaica, viz. 1. *Procumbens*, the *hedyſarum procumbens* of Linnæus; a figure of which may be ſeen in Sloane's Natural Hiſtory of Jamaica. 2. *Viſcoſa*, the *trifolium* 2. of Browne; a figure of which is alſo given by Sloane.

STYPTIC, in pharmacy, a medicine which by its aſtringency ſtops hæmorrhages, &c. See PHARMACY.

STYRAX, the STORAX-TREE, in botany: a genus of plants belonging to the claſs of *decandria*, and to the order of *monogynia;* and in the natural ſyſtem ranging under the 18th order, *bicornes*. Linnæus only mentions one ſpecies of this genus, the *ſtyrax-officinale;* but Aiton, in his *Hortus Kewenſis*, has added two more; namely, the *grandefolium* and *lævigatum;* and we believe a fourth may now be added, the *ſtyrax benzoin*.

The *officinale* uſually riſes about twenty feet in height; it ſends off many ſtrong branches, which are covered with a roughiſh bark of a grey colour: the leaves are broad, elliptical, entire, ſomewhat pointed, on the upper ſurface ſmooth, and of a light green colour, on the under ſurface covered with a whitiſh down; they are placed alternately, and ſtand upon ſhort footſtalks: the flowers are large, white, and diſpoſed in cluſters upon ſhort peduncles, which terminate the branches: the corolla is monopetalous, funnel-ſhaped, and divided at the limb into five lance-ſhaped ſegments: the filaments are ten, placed in a regular circle, and ſeem to adhere towards the baſe: the antheræ are erect and oblong; the germen is oval, and ſupports a ſlender ſtyle, with a ſimple ſtigma: the fruit is a pulpy pericarpium, which contains one or two nuts of an oval compreſſed figure.

The reſinous drug called *ſtorax* iſſues in a fluid ſtate from inciſions made in the trunk or branches of the tree. Two ſorts of this reſin have been commonly diſtinguiſhed in the ſhops. 1. *Storax in the tear:* is ſcarcely, if ever, found in ſeparate tears, but in maſſes, ſometimes compoſed of whitiſh and pale reddiſh brown tears, and ſometimes of an uniform reddiſh yellow or browniſh appearance; unctuous and ſoft like wax, and free from viſible impurities. This is ſuppoſed to be the ſort which the ancients received from Pamphylia in reeds or canes, and which was thence named *calamita*.

2. *Common ſtorax:* in large maſſes, conſiderably lighter and leſs compact than the former, and having a large admixture of woody matter like ſaw-duſt. This appears to be the kind intended by the London college, as they direct their ſtyrax ca-

lamita to be purified, for medicinal uſe, by ſoftening it with boiling water, and preſſing it out from the feces betwixt warm iron plates: a proceſs which the firſt ſort does not ſtand in need of. And indeed there is rarely any other than this impure ſtorax to be met with in the ſhops.

Storax, with ſome of the ancients, was a familiar remedy as a reſolvent, and particularly uſed in catarrhal complaints, coughs, aſthmas, menſtrual obſtructions, &c. and from its affinity to the balſams it was alſo preſcribed in ulcerations of the lungs, and other ſtates of pulmonary conſumption. And our pharmacopœias formerly directed the *pilulæ e ſtyrace;* but this odoriferous drug has now no place in any of the officinal compounds; and though a medicine which might ſeem to promiſe ſome efficacy in nervous debilities, yet by modern practitioners it is almoſt totally diſregarded.

The *ſtyrax benzoin* (ſee 2d Pl. 23.) is deſcribed by Dr. Dryander in the Philoſophical Tranſactions for 1787, p. 308, &c. It has been characteriſed by oblong acuminated leaves, which are downy underneath, and nearly of the length of the racemi. The botanical character of this tree was miſtaken by modern botaniſts till Dr. Dryander aſcertained it to be a ſtyrax. Benzoin was long ſuppoſed to be the produce of a ſpecies of *laurus.* Linnæus detected this error: but he committed another; for he tells us, that it is furniſhed by a ſhrub which, in the country where it grows, is called *croton bezoe;* and afterwards, in his *Supplementum Plantarum,* deſcribes the ſame plant a ſecond time, under the name of *terminalia benzoin.*

This tree, which is a native of Sumatra, is deemed in ſix years of ſufficient age for affording the benzoin, or when its trunk acquires about ſeven or eight inches in diameter; the bark is then cut through longitudinally, or ſomewhat obliquely, at the origin of the principal lower branches, from which the drug exudes in a liquid ſtate, and by expoſure to the ſun and air ſoon concretes, when it is ſcraped off from the bark with a knife or chiſel. The quantity of benzoin which one tree affords never exceeds three pounds, nor are the trees found to ſuſtain the effects of theſe annual inciſions longer than ten or twelve years. The benzoin which iſſues firſt from the wounded bark is the pureſt, being ſoft, extremely fragrant, and very white; that which is leſs eſteemed is of a browniſh colour, very hard, and mixed with various impurities, which it acquires during its long continuance upon the trees. Eſchelſkron diſtinguiſhes benzoin into three kinds, viz. *camayan poeti,* or white benjamin, which, upon being melted in a bladder by the heat of the ſun, appears marked with red ſtreaks or veins. *Camayan bamatta* is leſs white than the former, and often ſpotted with white circles, called eyes, from the number of which its goodneſs is eſtimated: it likewiſe melts by the heat of the ſun. *Camayan itam,* or black benjamin, which requires to be melted in hot water for its preſervation in bladders. In Arabia, Perſia, and other parts of the Eaſt, the coarſer kinds of benjamin are conſumed for fumigating and perfuming the temples, and for deſtroying inſects.

The benzoin which we find here in the ſhops is in large brittle maſſes, compoſed partly of white, partly of yellowiſh or light brown, and often alſo of darker coloured pieces; that which is cleareſt, and contains the moſt white matter, called by authors *benzoe amygdaloides,* is accounted the beſt. This reſin has very little taſte, impreſſing on the palate only a ſlight ſweetneſs: its ſmell, eſpecially when rubbed or heated, is extremely fragrant and agreeable. It totally diſſolves in rectified ſpirit (the impurities excepted, which are generally in a very ſmall quantity) into a deep yellowiſh red liquor, and in this ſtate diſcovers a degree of warmth and pungency, as well as ſweetneſs. It imparts, by digeſtion, to water alſo a conſiderable ſhare of its fragrance, and a ſlight pungency: the filtered liquor, gently exhaled, leaves not a reſinous or mucilaginous extract, but a cryſtalline matter, ſeemingly of a ſaline nature, amounting to one-tenth or one-eighth of the weight of the benzoin. Expoſed to the fire in proper veſſels, it yields a quantity of a white ſaline concrete, called *flores benzoes,* of an acidulous taſte and grateful odour, ſoluble in rectified ſpirit, and in water by the aſſiſtance of heat.

The principal uſe of this fragrant reſin is in perfumes, and as a coſmetic; for which laſt purpoſe, a ſolution of it in ſpirit of wine is mixed with ſo much water as is ſufficient to render it milky, as twenty times its quantity or more. It promiſes, however, to be applicable to other uſes, and to approach in virtue, as in fragrance, to ſtorax and balſam of Tolu. It is ſaid to be of great ſervice in diſorders of the breaſt, for reſolving obſtructions of the pulmonary veſſels, and promoting expectoration: in which intentions the flowers are ſometimes given, from three or four grains to fifteen. The white powder, precipitated by water from ſolutions of the benzoin in ſpirit, has been employed by ſome as ſimilar and ſuperior to the flowers, but appears to be little other than the pure benzoin in ſubſtance: it is not the ſaline, but the reſinous matter of the benzoin, that is moſt diſpoſed to be precipitated from ſpirit by water. The flowers, ſnuffed up the noſe, are ſaid to be a powerful errhine.

Liquid ſtorax is a reſinous juice obtained from a tree called by Linnæus *liquidambar ſtyraciflua,* a native of Virginia and Mexico, and lately naturalized in this country. The juice called liquidambar is ſaid to exude from inciſions made in the trunk of this tree, and the liquid ſtorax to be obtained by boiling the bark or branches in water. Two ſorts of liquid ſtorax are diſtinguiſhed by authors: one, the purer part of the reſinous matter that riſes to the ſurface in boiling, ſeparated by a ſtrainer, of the conſiſtence of honey, tenacious like turpentine, of a reddiſh or aſh brown colour, moderately tranſparent, of an acrid unctuous taſte, and a fragrant ſmell, faintly reſembling that of the ſolid ſtorax, but ſomewhat diſagreeable: the other, the more impure part, which remains on the ſtrainer, is not tranſparent, in ſmell and taſte is much weaker, and contains a conſiderable proportion of the ſubſtance of the bark. What is moſt commonly met with under this name in the ſhops is of a weak ſmell and a grey colour, and is ſuppoſed to be an artificial compoſition. Liquid ſtorax has been employed chiefly in external applications, but it is at preſent almoſt wholly in diſuſe.

STYX (fab. hiſt.), a celebrated river of hell, round which it flows nine times. The gods held the waters of the Styx in ſuch veneration, that to ſwear by them was reckoned an oath altogether inviolable. If any of the gods had perjured themſelves, Jupiter obliged them to drink the waters of the Styx, which lulled them for one whole year into a ſenſeleſs ſtupidity, for the nine following years they were deprived of the ambroſia and the nectar of the gods, and after the expiration of the years of their puniſhment, they were reſtored to the aſſembly of the deities, and to all their original privileges. It is ſaid that this veneration was ſhown to the Styx, becauſe it received its name from the nymph Styx, who with her three daughters aſſiſted Jupiter in his war againſt the Titans.

Styx was a river which it was neceſſary for departed ſhades to paſs before they could enter the infernal regions; and it was the office of Charon to ferry them over in a boat which was kept for that purpoſe. The ghoſts of thoſe who had not been honoured with the rites of ſepulture were obliged to wander an hundred years before Charon could admit them into his boat to convey them before the judges of Hades. What could have given riſe to this fable of Charon and his boat, it is not very material to inquire. Mythological writers have ſaid, that the Greeks learned it from the Egyptians, which is indeed probable enough; that the Egyptians framed both this,

and ſome other fables relating to the dead, from certain cuſtoms peculiar to their country; that in particular there was, not far from Memphis, a famous burying-place, to which the dead bodies were conveyed in a boat acroſs the lake Acheruſia; and that Charon was a boatman who had long officiated in that ſervice. The learned Dr. Blackwell ſays, in his life of Homer, that, in the old Egyptian language, *Charoni* ſignified "ferryman."

SUABIA, a circle of Germany, bounded on the north by the circle of Franconia and that of the Lower Rhine; on the weſt by the circle of the Lower Rhine and Alſace; on the ſouth by Switzerland; and on the eaſt by the circle of Bavaria. Of all the circles of the empire, Suabia is the moſt divided; it contains four eccleſiaſtic and thirteen lay principalities, nineteen independent prelacies and abbeys, twenty-ſix earldoms and lordſhips, and thirty-one free cities. The prime directors of the circle, as they are termed, are the Biſhop of Conſtance and the Duke of Wirtemberg. The duke has the ſole direction of all that relates to war.

The mixture of the various forms of government and religious ſects; the oppreſſion exerciſed by the great on the poor; the game conſtantly played by the emperor, who poſſeſſes many pieces of detached country in Suabia, which depend not on the circle, and can, in conſequence of his privileges as archduke of Auſtria, extend his poſſeſſions in it by various ways; are circumſtances (ſays Baron Rieſbeck) which give the cultivation of the country, and the character of the inhabitants, a moſt extraordinaay caſt. In ſeveral of the poſt towns where you ſtop you ſee the higheſt degree of cultivation in the midſt of the moſt ſavage wildneſs; a great degree of knowledge and poliſh of manners, mixed with tl e groſſeſt ignorance and ſuperſtition; traces of liberty, under the deepeſt oppreſſion; national pride, together with the contempt and neglect of the native country; in ſhort, all the ſocial qualities in ſtriking contraſt and oppoſition to each other. Thoſe parts of Suabia which belong to the great potentates, ſuch as Wirtemberg, Auſtria, and Baden, are certainly the moſt improved. The whole of Suabia may comprehend about nine hundred German ſquare miles, and two millions of people. More than half of theſe are ſubjects of the three above-mentioned princes, though they are not proprietors of near one half of the lands.

SUARES (Francis), a Jeſuit, was born in Granada on the 5th of January, 1548. He was a profeſſor of theology at Alcala, Salamanca, Rome, and Coimbra in Portugal. He died at Liſbon in 1617, with the greateſt reſignation; "I never thought (ſaid he) that it was ſo eaſy to die." His memory was aſtoniſhing, he could repeat the whole of his voluminous works by heart. His writings fill twenty-three folio volumes, and are moſtly on theological and moral ſubjects. His Treatiſe of Laws has been reprinted in this country. His Defence of the Catholic Faith againſt the Errors of England, was written at the requeſt of Pope Paul V. This book was publicly burnt at London by order of James I. When Suares heard it, he is ſaid to have exclaimed, "O that I too could ſeal with my blood the truths which I have defended with my pen!"

SUBAH, the general name of the viceroyſhips, or greater governments, into which the Mogul empire was divided, conſiſting of ſeveral provinces. The juriſdiction of a ſubahdar, the ſame as ſubahſhip, ſubaedaree, or nizamut.

SUBAHDAR, the viceroy, lord-lieutenant, or governor, holding a ſubah; the ſame as nabob or nazim. Alſo the black commander of a company of Seapoys.

SUBALTERN, a ſubordinate officer, or one who diſcharges his poſt under the command and ſubject to the direction of another; ſuch are lieutenants, ſub-lieutenants, cornets, and enſigns, who ſerve under the captain.

SUBCLAVIAN, in anatomy, is applied to any thing under the arm-pit or ſhoulder, whether artery, nerve, vein, or muſcle.

SUB-DEACON, an inferior miniſter, who anciently attended at the altar, prepared the ſacred veſſels, delivered them to the deacons in time of divine ſervice, attended the doors of the church during communion-ſervice, went on the biſhop's embaſſies with his letters or meſſages to foreign churches, and was inveſted with the firſt of the holy orders. They were ſo ſubordinate to the ſuperior rulers of the church, that, by a canon of the council of Laodicea, they were forbidden to ſit in the preſence of a deacon without his leave. According to the canons, a perſon muſt be twenty-two years of age to be promoted to the order of ſub-deacon. See DEACON.

SUBDOMINANT, in muſic, a name given by M. Rameau to the fourth note of the tone, which of conſequence is the ſame interval from the tonic when deſcending as the dominant in riſing. This denomination ariſes from the affinity which this author finds by inverſion between the minor mode of the ſubdominant and the major mode of the tonic.

SUBDUPLE RATIO, is when any number or quantity is contained in another twice. Thus 3 is ſaid to be ſubduple of 6, as 6 is duple of 3. See RATIO.

SUBDUPLICATE RATIO of any two quantities, is the ratio of their ſquare roots.

SUBER, the CORK-TREE, in botany. See QUERCUS.

SUBJECT, a perſon under the rule and dominion of a ſovereign prince or ſtate.

SUBJECT is alſo uſed for the matter of an art or ſcience, or that which it conſiders, or whereon it is employed: thus the human body is the ſubject of medicine.

SUBINFEUDATION, was where the inferior lords, in imitation of their ſuperiors, began to carve out and grant to others minuter eſtates than their own, to be held of themſelves; and were ſo proceeding downwards *in infinitum*, till the ſuperior lords obſerved, that by this method of ſubinfeudation they loſt all their feodal profits, of wardſhips, marriages, and eſcheats, which fell into the hands of theſe meſne or middle lords, who were the immediate ſuperiors of the terre-tenant, or him who occupied the land. This occaſioned the ſtat. of Weſtm. 3. or *quia emptores*, 18 Edw. I. to be made; which directs, that, upon all ſales or feoffments of lands, the feoffee ſhall hold the ſame, not of his immediate feoffer, but of the chief lord of the fee of whom ſuch feoffer himſelf held it. And from hence it is held, that all manors exiſting at this day muſt have exiſted by immemorial preſcription; or at leaſt ever ſince the 18th Edw. I. when the ſtatue of *quia emptores* was made.

SUBITO, in the Italian muſic, is uſed to ſignify that a thing is to be performed quickly and haſtily: thus we meet with *volti ſubito*, turn over the leaf quickly.

SUBJUNCTIVE, in grammar. See GRAMMAR.

SUBLIMATE, a chemical preparation, conſiſting of quickſilver united with the marine acid. In the laſt London Diſpenſatory it is called *hydrargyrus muriatus*. See CHEMISTRY.

SUBLIMATION, in chemiſtry, the condenſing and collecting, in a ſolid form, by means of veſſels aptly conſtructed, the fumes of bodies raiſed from them by the application of a proper heat. See CHEMISTRY.

SUBLIME, or SUBLIMITY. See the article GRANDEUR and SUBLIMITY.

SUBLINGUAL ARTERY. See ANATOMY.

Sublingual *Glands*, in anatomy, two glands under the tongue, placed one on each side thereof.

SUBMULTIPLE, in geometry, &c. A submultiple number, or quantity, is that which is contained a certain number of times in another, and which, therefore, repeated a certain number of times, becomes exactly equal thereto. Thus 3 is a submultiple of 21. In which sense a submultiple coincides with an aliquot part.

Submultiple *Ratio*, is that between the quantity contained and the quantity containing. Thus the ratio of 3 to 21 is submultiple. In both cases submultiple is the reverse of multiple: 21, *e. gr.* being a multiple of 3, and the ratio of 21 to 3 a multiple ratio.

SUBORDINARIES. See Heraldry.

SUBORDINATION, a relative term, expressing an inferiority betwixt one person and another.

SUBORNATION, in law, a secret, underhand, preparing, instructing, or bringing in a false witness; and from hence *subornation of perjury* is the preparing or corrupt alluring to perjury. The punishment for this crime was formerly death, then banishment or cutting out the tongue, afterwards forfeiture of goods; and it is now a fine and imprisonment, and never more to be received as evidence. The statute 2 Geo. II. c. 25. superadded a power for the court to order the offender to be sent to the house of correction for a term not exceeding seven years, or be transported for the same period.

SUBPŒNA, in law, a writ whereby common persons are called into chancery, in such cases where the common law hath provided no ordinary remedy; and the name of it proceeds from the words therein, which charge the party called to appear at the day and place assigned, *sub pœna centum librarum*, &c. The subpœna is the leading process in the courts of equity; and by statute, when a bill is filed against any person, process of subpœna shall be taken out to oblige the defendant to appear and answer the bill, &c.

Subpœna *ad testificandum*, a writ or process to bring in witnesses to give their testimony. If a witness on being served with this process does not appear, the court will issue an attachment against him; or a party, plaintiff or defendant, injured by his non-attendance, may maintain an action against the witness. See *Blackst. Com.* Vol. III. p. 369.

Subpœna *in Equity*, a process in equity, calling on a defendant to appear and answer to the complainant's bill. See statute 5th Geo. II. c. 25. which enacts, that where the party cannot be found to be served with a subpœna, and absconds (as believed) to avoid being served, a day shall be appointed him to appear to the bill of the plaintiff; which is to be inserted in the London Gazette, read in the parish-church where the defendant last lived, and fixed up at the Royal Exchange: and if the defendant doth not appear upon that day, the bill shall be taken *pro confesso*.

SUBREPTITIOUS, a term applied to a letter, licence, patent, or other act, fraudulently obtained of a superior, by concealing some truth which, had it been known, would have prevented the concession or grant.

SUBROGATION, or Surrogation, in the Civil Law, the act of substituting a person in the place, and intitling him to the rights, of another. In its general sense, subrogation implies a succession of any kind, whether of a person to a person, or of a person to a thing. There are two kinds of subrogation: the one *conventional*, the other *legal*. *Convential* subrogation is a contract whereby a creditor transfers his debt, with all appurtenances thereof, to the profit of a third person. *Legal* subrogation is that which the law makes in favour of a person who discharges an antecedent creditor; in which case there is a legal translation of all rights of the ancient creditor to the person of the new one.

SUBSCRIPTION, in general, signifies the signature put at the bottom of a letter, writing, or instrument. In commerce, it is used for the share or interest which particular persons take in a public stock or a trading company, by writing their names, and the shares they require, in the books or register thereof.

Subscription to articles of faith is required of the clergy of every established church, and of some churches not established. Whether such subscription serves any good purpose, in a religious or theological view, is a very doubtful question. It may be necessary in an establishment, as a test of loyalty to the prince, and of attachment to the constitution, civil and ecclesiastical, but it cannot produce uniformity of opinion. As all language is more or less ambiguous, it becomes difficult, if not impossible, to determine in what sense the words of long established creeds are to be interpreted; and we believe that the clergy of the churches of England and Scotland seldom consider themselves as fettered by the Thirty-nine Articles, or the Confession of Faith, when composing instructions either for their respective parishes or for the public at large. See Independents.

Subscription, in the commerce of books, signifies an engagement to take a certain number of copies of a book intended to be printed, and a reciprocal obligation of the bookseller or publisher to deliver the said copies, on certain terms. —These subscriptions, which had their rise in England about the middle of the last century, were lately very frequent in France and Holland, and are now very common among ourselves.

SUBSEQUENT, something that comes after another, particularly with regard to the order of time.

SUBSIDY, in law, signifies an aid or tax granted to the king by parliament, for the necessary occasions of the kingdom; and is to be levied on every subject of ability, according to the rate or value of his lands or goods: but this word, in some of our statutes, is confounded with that of customs. See Tax.

SUBSTANCE, the subject to which we suppose qualities belong. Thus gold is the substance to which the qualities of ductility, yellowness, density, &c. belong. See Metaphysics.

SUBSTANTIAL, in the schools, something belonging to the nature of substance.

SUBSTANTIVE, in grammar. See Grammar.

SUBSTISTUTE, a person who officiates for another in his absence.

SUBSTITUTION, in the civil law, a disposition of a testament, whereby the testator substitutes one heir for another, who has only the usufruit, and not the property, of the thing left him.

SUBSTRACTION, or Subtraction, in arithmetic, the second rule, or rather operation, in arithmetic, whereby we deduct a less number from a greater, to learn their precise difference. See Arithmetic and Algebra.

SUBTANGENT of a Curve, the line that determines the intersection of a tangent with the axis; or that determines the point wherein the tangent cuts the axis prolonged.

SUBTENSE, formed from *sub* "under," and *tendo* "I stretch," in geometry, a right line which is opposite to an angle, and drawn between the two extremities of the arch which measures that angle.

SUBTERRANEOUS, whatever is under ground: thus naturalists speak of subterraneous fires, subterraneous damps, &c.

Subterraneous *Cavern*. See Quarries.

SUBTILE, in physics, an appellation given to whatever is extremely small, fine, and delicate; such as the animal-spirits, the effluvia of odorous bodies, &c. are supposed to be.

SUBULARIA, Rough-leaved Alysson, or *Awl-wort*, in botany: a genus of plants belonging to the clafs of *tetradynamia*, and order of *filiculofa*; and in the natural order ranging under the 39th order, *filiquofæ*. The filicula is entire and ovate; the valves are ovate, concave, and contrary to the partitions. The ftyle is fhorter than the filicula. There is only one fpecies, the *aquatica*, which is a native of Britain. It is about an inch high. The leaves are awl-fhaped, and grow in clufters round the root. The ftalk is naked, and produces four or five fmall white flowers growing alternately on fhort footftalks. It flowers under water, whereas moft aquatic plants emerge above water at the time of flowering. The Author of Nature has, however, carefully prevented the tender flower from receiving any injury from the water, by making the petals clofe, and form themfelves into a kind of arch. This plant grows on the borders of the Highland lakes, in Loch Tay, in Scotland, alfo in Wales and Ireland.

SUBULATED, fomething fhaped like an awl.

SUCCEDANEUM, in pharmacy, denotes a drug fubftituted in the place of another.

SUCCESSION, in metaphyfics, the idea which we get by reflecting on the ideas that follow one another in our mind; and from the fucceffion of ideas we get the idea of *time*. See Metaphysics.

Succession, in law. See Descent.

Succession *to the Crown*. See Hereditary *Right*.

SUCCINIC Acid, an acid extracted from amber by fublimation in a gentle heat, and rifes in a concrete form into the neck of the fubliming veffel. The operation muft not be pufhed too far, or by too ftrong a fire, otherwife the oil of the amber rifes along with the acid. The falt is dried upon blotting paper, and purified by repeated folution and cryftallization. The acid is foluble in twenty-four times its weight of cold water, and in a much fmaller quantity of hot water. It poffeffes the qualities of an acid in a very fmall degree, and only affects the blue vegetable colours very lightly. The affinities of this acid with the falifiable bafes were determined by Mr. de Morveau, who is the firft chemift that has endeavoured to afcertain them. See Chemistry.

SUCCINUM, Amber, in mineralogy, a fpecies of bitumen claffed under the inflammable fubftances. As a full account of this mineral was given under the word Amber, nothing remains but to mention a few things which recent experiments enable us to add. According to Dr. Kirwan, 100 grains of amber afford about 72 of petroleum, 4.5 of fuccinic acid, and a refidue of fixed matter and water. Mr. Scheele fays, that, when diftilled, it yields an aqueous acid refembling vinegar in its qualities. This would induce us to believe it to be of vegetable origin. But its origin is a point not yet afcertained. Its fpecific gravity is from 1,065 to 1,100, and melts at 550° of Fahrenheit. Wallerius affirms, that mirrors, prifms, &c. may be made of amber.

SUCCORY, in botany. See Cichorium.

SUCCOTH (anc. geog.), a town which lay between the brook Jabbok and the river Jordan, where Jacob fixed his tents. There was another Succoth where the Ifraelites firft encamped after their departure from Ramefes towards the Red Sea. Succoth fignifies *tents*.

SUCCUBUS, a term ufed by fome writers for a dæmon who affumes the fhape of a woman, and as fuch lies with a man; in which fenfe it ftands oppofed to *incubus*, which was a dæmon in form of a man, that lies with a woman. But the truth is, the fuccubus is only a fpecies of the night-mare. See Medicine.

SUCCULA, in mechanics, an axis or cylinder, with ftaves in it to move it round; but without any tympanum or peritrochium.

SUCCULENT Plants, among botanifts, fuch whofe leaves are thick and full of juice.

SUCKER, in ichthyology. See Cyclopterus.

SUCKERS, in gardening, the fame with Offsets.

SUCKING-fish. See Echeneis.

SUCKLING (Sir John), an Englifh poet and dramatic writer, was the fon of Sir John Suckling, comptroller of the houfehold to King Charles I. and born at Witham in Effex in 1613. He difcovered an uncommon propenfity to the acquiring of languages, infomuch that he is reported to have fpoken Latin at five years of age, and to have written it at nine. When he was grown up, he travelled; but feems to have affected nothing more than the character of a courtier and fine gentleman: which he fo far attained, that he was allowed to have the peculiar happinefs of making every thing he did become him. In his travels he made a campaign under the great Guftavus Adolphus; and his loyalty, if not his valour, appeared in the beginning of our civil wars; for, after his return to England, he raifed a troop of horfe for the king's fervice entirely at his own charge; and mounted them fo completely and richly, that they are faid to have coft him 12,000l. This troop, with Sir John at its head, behaved fo ill in the engagement with the Scots, upon the Englifh borders, in 1639, as to occafion the famous lampoon compofed by Sir John Mennis; "Sir John he got him an ambling nag," &c. This ballad, which was fet to a brifk tune, was much fung by the parliamentarians, and continues to be fung to this day. This difaftrous expedition, and the ridicule that attended it, was fuppofed to have haftened his death; being feized by a fever, of which he died, at twenty-eight years of age. He was a fprightly wit, and an eafy verfifier, but no great poet. His works, confifting of a few poems, letters, and plays, have neverthelefs gone through feveral editions.

SUCTION, the act of fucking or drawing up a fluid, as air, water, milk, or the like, by means of the mouth and lungs; or, in a fimilar manner, by artificial means. See Pneumatics and Hydrostatics.

SUDATORY, a name given by the ancient Romans to their hot or fweating rooms; fometimes alfo called *Laconica*.

SUDEROE. See Ferro-*Iflands*.

SUDORIFIC, an appellation given to any medicine that caufes or promotes fweat.

SUESSIONES, a branch of the Remi, a people of Gallia Belgica (Pliny); called fometimes *Sueffones*, in the lower age *Sueffi*; fituated between the Remi to the eaft, the Nervii to the north, the Veromandui to the weft, and the Meldæ to the fouth, in the tract now called *le Soiffonois*.—*Sueffiones*, *Sueffones*, and *Sueffonæ*, the name of their city in the lower age; thought to have been formerly called *Noviodunum* (Cæfar), is now called *Soiffons*.

SUET, Sevum, or *Sebum*, in anatomy, the folid fat found in feveral animals, as fheep, oxen, &c. but not in the human fpecies. See the article Fat.—It is of the fevum that tallow is made.

SUETONIUS tranquillus (Caius), a famous Latin hiftorian, was born at Rome, and became fecretary to the emperor Adrian, about the 118th year of the Chriftian era; but that poft was taken from him three years after, when feveral perfons fell under that prince's difpleafure for not fhowing the emprefs Sabina all the refpect fhe deferved. During his difgrace he compofed many works, which are loft. Thofe now extant are his Hiftory of the XII firft Emperors, and a part of his Treatife of the Illuftrious Grammarians and Rhetoricians. Pliny the Younger was his intimate friend, and perfuaded him to publifh his books. His Hiftory of the XII Roman Emperors has been much commended by moft of our polite fcholars. He reprefents, in a continued feries of

curious and interesting particulars, without any digressions or reflections, the actions of the emperors, without omitting their vices, which he exposes with all their deformity, and with the same freedom mentions the good qualities of the very same persons; but the horrid dissoluteness and obscene actions he relates of Tiberius, Caligula, Nero, &c. have made some say, that he wrote the lives of the emperors with the same licentiousness with which they lived. The edition of this history procured by Grævius at Utrecht in 1672, with the excellent Commentaries of Torrentius and Casaubon, and the notes of some other learned critics, is much esteemed. Burman also published an edition in two vols. 4to. with notes.

SUEVI, the Catti or Chatti of Cæsar (Strabo), placed on the Rhine: the reason of Cæsar's calling them thus does not appear, though considerably distant from the proper Suevi or Alemanni.

SUEVI (Tacitus), a common name of the people situated between the Elbe and the Vistula, distinguished otherwise by particular names; as in Ptolemy, *Suevi Angeli, Suevi Sennones*.

SUEVUS (anc. geog.), a river of Germany, thought to be the same with the Viadrus or Oder, emptying itself at three mouths into the Baltic, the middlemost of which is called *Swine* or *Swene*; which last comes nearer the name *Suevus*.

SUEZ, a seaport of Egypt, situated on a point of land, in the form of a peninsula, on the western coast of the Red Sea. It is not surrounded with walls; but the houses are built so closely together, that there are only two passages into the city, of which that nearest the sea is open, the other shut by a very insufficient gate. The houses are very indifferent structures; the khans being the only solid buildings in the city. Hardly any part now remains of the castle which the Turks built upon the ruins of the ancient Kolsum. It is very thinly inhabited. Among its inhabitants are some Greeks, and a few families of Copts. But, about the time of the departure of the fleet, it is crowded with strangers. The ground lying around it is all one bed of rock, slightly covered with sand. Scarcely a plant is to be seen any-where in the neighbourhood. Trees, gardens, meadows, and fields, are entirely unknown at Suez. Fish is the only article of provisions plentiful here. All other necessaries of life, for both men and the domestic animals, are brought from afar; from Cairo, which is three days' journey distant from Suez; Mount Sinai, at the distance of six days' journey; or Ghasso, at the distance of seven. The only water fit for drinking that is to be had here, comes from the wells of Naba, upon the other side of the gulf, and more than two leagues distant from Suez. The Arabs are the carriers; and they sell this water at the rate of nine French sous a skin; but, though reputed the best, it is still very bad. Several vessels are annually employed in the navigation between this port and Jidda: four or five are freighted by the sultan with corn for Mecca and Medina, which they convey to Jidda and Jambo; fourteen others serve to carry passengers between Jidda and Suez. The commerce of Cairo with Suez is only carried on by means of caravans, which wait the arrival, and set out on the departure of the vessels, that is, towards the end of April, or the beginning of May, and in the course of the months of July and August. That which M. Volney accompanied, in 1783, consisted of about 3000 camels, and 5000 or 6000 men. The merchandize consisted in wood, sails, and cordage, for the ships at Suez; in some anchors, carried each of them by four camels, iron bars, carded wool, and lead; it likewise carried bales of cloth, and barrels of cochineal, corn, barley, and beans, Turkish piastres, Venetian sequins, and Imperial dollars. All these commodities were destined for Jidda, Mecca, and Mocha, where they were to be bartered for Indian goods, and the coffee of Arabia, which forms the principal article of the returns: sixty miles ESE. Cairo. Long 50. 15. E. Ferro. Lat. 29. 45. N.

SUFFETULA (anc. geog.), a town of Africa, in the dominions of Carthage; probably so called from Suffetes, the title of the magistrates of that city. It is now called *Spaitla*, in the kingdom of Tunis, and has many elegant remains of antiquity. There are three temples in a great measure entire; one of them of the Composite order, the other two Corinthian. "A beautiful and perfect capital of the Composite order," says Mr. Bruce, "the only perfect one that now exists, is designed in all its parts in a very large size; and with the detail of the rest of the ruin, is a precious monument of what that order was, now in the collection of the king." The town itself, he says, is situated in the most beautiful spot in Barbary, surrounded by great numbers of juniper-trees, and watered by a pleasant stream, which sinks under the earth at that place, without appearing any more.

SUFFOCATION, in medicine, the privation of respiration or breathing. See the articles DROWNING, HANGING, &c.

SUFFOLK, a county of England, bounded on the north by Norfolk, on the east by the German Sea, on the south by Essex, and on the west by Cambridgeshire; about forty-seven miles in length, and twenty-seven in its mean breadth; in shape inclining to a crescent, and supposed to contain about 800,000 acres. It is divided into twenty-three hundreds, in which are found thirty-one towns, and 575 parishes. The surface is, in general, level, with few eminences. In the centre of the county the soil is principally a strong loam; on the north-west extremity is some fenn-land; and between the two some sand: it is chiefly a sandy soil on the sea-coast; towards the south-east, between the Orwel and the Stour, to the south of Ipswich, is a tract of rich loam. The cows of this county are in much repute for the quantity of milk they give; they are not of a large size, and universally without horns: and their draught-horses are excellent: the number of sheep is estimated at 240,000. Butter forms one of the most considerable exports of the country, with a considerable quantity of grain: hemp is cultivated in the northern part toward Bungay, and there are some plantations of hops on the borders of Essex, in the neighbourhood of Sudbury. The principal rivers are the Little Ouse, Waveney, Stour, Orwel, Deben, Blyth, Alde, and Larke. The manufactures of Suffolk are inconsiderable. This county returns two members to the British parliament, as likewise do the towns of Ipswich, Aldborough, Bury St. Edmunds, Dunwich, Eye, Orford, and Sudbury. Other towns are Beccles, Billton, Blythborough, Brandon, Bottesdale, Bungay, Clare, Debenham, Framlingham, Hadley, Halesworth, Haveril (in part), Ixworth, Lavenham, Lowestoff, Mendlesham, Mildenhall, Needham, Neyland, Southwold, Stow Market, Saxmundham, Woodbridge, and Woolpit. Ipswich is the county town.

SUFFRAGAN, an appellation given to simple bishops with regard to archbishops, on whom they depend, and to whom appeals lie from the bishops courts. Suffragan is likewise the appellation given to a bishop, who is occasionally appointed to reside in a town or village, and assist the diocesan.

SUFFRAGE, denotes a vote given in an assembly, where something is deliberated on, or where a person is elected to an office or benefice.

SUFFRUTEX, among botanists, denotes an undershrub, or the lowest kind of woody plants, as lavender.

SUGAR, in natural history, is properly the essential part of the sugar-cane. The sugar-cane grows *naturally* in both Indies; where it is likewise *cultivated* for its juice. In the manner of their growth, form of their leaves, and make of their panicle, the sugar-canes resemble the reeds which grow in wet marshy grounds in England or elsewhere; except that the canes are

far larger, and, inſtead of being hollow as the reeds, are filled with a white pith, containing the ſweet juice or liquid, which ſtamps ſuch an amazing value upon theſe plants. The intermediate diſtance between each joint of a cane is of different lengths, according to the nature of the ſoil, richneſs of the manure, and different temperature of the weather during its growth; it ſeldom exceeds, however, four inches in length and an inch in diameter. The length of the whole cane likewiſe depends upon the above circumſtances. It generally grows to perfection in about fourteen months, when its height, at a medium, is about ſix feet, ſometimes more, ſometimes leſs. The body of the cane is ſtrong, but brittle; of a fine ſtraw-colour, inclining to a yellow. The extremity of each is covered, for a conſiderable length, with many long graſſy leaves or blades, ſharply and finely ſawed on their edges; the middle longitudinal rib being high and prominent.

The bottom part of the ſugar-cane top is about the thickneſs of one's finger; and as it contains a good deal of the natural ſweetneſs of the plant, it is uſually cut into pieces of an inch and a half long, and given to the ſaddle-horſes in the Weſt Indies. It is very nouriſhing food, and fattens them apace. The mill horſes, mules, and aſſes, are likewiſe fed, during crop time, on ſugar-cane tops and the ſkimming of the ſugar-coppers; which laſt muſt be adminiſtered ſparingly at firſt for fear of griping, and perhaps killing them.

The canes, when ripe, are ſqueezed between the iron-caſed rollers of wind-mills or cattle mills. The juice thus preſſed out, is boiled firſt in a very large copper or cauldron, being mixed with a very ſmall quantity of lime. In default of lime, a ſtrong ley of aſhes will anſwer the ſame purpoſe, and was indeed originally uſed, though the firſt is generally thought to have greater efficacy. The benefits ariſing from either ſubſtance are probably to be attributed, in great meaſure, to their alkaline qualities. The ſugar cane, when ripe, is of all plants the ſweeteſt; there is, however, a latent acid ſtill lurking in the juice, as is manifeſt by its turning ſour if ſuffered to remain unboiled any conſiderable time after expreſſion. The addition, therefore, of white lime, which the planters call *temper*, is neceſſary to deſtroy, in a great meaſure, the remaining acid, and to form a neutral ſalt.

Lime, or the ſtrong ley juſt mentioned, likewiſe ſerves to carry off all impurities from the liquor. When the quantity of temper is duly proportioned, if the liquor is put into a glaſs, the immediate ſeparation will follow; the ſordes ſettle at the bottom, and the juice remains tranſparent at top. On the other hand, if there is a deficiency of temper, the ſeparation will be imperfect; and if there is a ſuperfluity, there will be no ſeparation at all.

After the lime is mixed with the juice in the copper or cauldron, the impurities in queſtion being no longer intimately united with the boiling liquor, and being forced about with the heat of the fire, are eaſily entangled in a viſcous tough ſubſtance, naturally in the cane-juice, with which they riſe to the top of the copper, forming a thick tough ſcum.

The clarification of the liquor, as far as is done in the firſt copper, is perfected after the more groſs ſcum is taken off; the remaining impurity, as the liquor boils, is ſkimmed off from the four or five remaining coppers, into which the liquor is ſucceſſively poured; each of the coppers being gradually leſs, as containing a leſs quantity of liquor.

In its paſſage to the fourth copper, the liquor is ſtrained through a thick woollen cloth, where it leaves all the remaining impurities that had eſcaped the ſkimmer.

After this a light white ſcum is taken off; and when this ceaſes to ariſe in any conſiderable quantity, and the liquor, by long boiling, becomes more of a ſyrup than a thin liquid, it is then poured into the firſt tache, and from this to a leſſer, till it is conveyed to the laſt. When it has here attained the due conſiſtence neceſſary to become ſugar, it may be aſſerted, ſays Hughes, from whom this account is chiefly extracted, that no more than a ſeventh part of the whole remains; which diminution is occaſioned by the impurities being ſcummed off, and the watery particles evaporated.

From this laſt ſtage it is conveyed, whilſt of the conſiſtency of a thick granulated ſyrup, into a large braſs cooler, where it ſhoots into cryſtals, which are the genuine and eſſential ſalts of the plant; theſe are forwarded by gently ſtirring the whole maſs, by which means the air is admitted to every part, and the particles of ſugar diſengage themſelves from the clammy ſubſtance, which is termed *melaſſes*.

When it has grained or cryſtallized, it is removed from the cooler into pots or moulds, which are earthen, and of a pyramidal form, containing from eight to thirteen gallons.

About twenty-four hours after the ſugar is potted, the ſmall round hole in the bottom of each pot is unſtopped, and the pots put upon earthen jars, containing about four gallons each: into theſe veſſels the melaſſes drain from the ſugar; which, in this degree of perfection, is called *muſcavado*, and is fit for exportation in a month, or ſooner.

From the abovementioned ſkimmings, mixed with a quantity of water and melaſſes, and fermented, is extracted that ſpirituous liquor called *rum*; and from the great quantity of oil in the cane-juice, which is tranſmitted in abundance to the rum, proceeds the excellency of that ſpirit, compared with brandy. The latter wanting this oilineſs, ſtimulates and lacerates the coats of the ſtomach; whereas the former, if meliorated by age and drank moderately, ſerves, by its oilineſs, to lubricate and preſerve the bowels. See Rum.

The moſt natural, and perhaps the only proper, method of producing canes, is by ſuckers, or with the tender tops of old canes. Theſe being cut into pieces of about a foot long, planted in holes of about ſix inches deep, and two feet wide, and covered with good manure, each piece will produce from its roots a great number of canes.

But it may not be unacceptable to give a more particular account both of the cultivation of the plant, and the proceſs of ſugar-making, according to the moſt approved methods.

1. *Beſt Method of cultivating Sugar-canes.*—In ſtiff ſoils, where canes require moſt age, half the quantity of land intended for the crop ſhould be planted in September; but in hot looſe ſoils in October and November; and the whole planting ſeaſon ſhould conclude with the month of January or February (A), when the tops of the firſt canes cut may furniſh the laſt pieces planted. By ſtrict obſervance of this method, the canes will be at full maturity in the proper ſeaſon for yielding moſt ſugar, which is from the 1ſt of January (if the weather permits) to the 29th of July. But by grinding later, we hazard not only the deſtruction of our wind-mills by hurricanes, but make bad ſugar, at infinite expence of time and labour, both of negroes and cattle, when the juice of the canes becomes weak and wateriſh. There is not therefore a greater error in the whole practice of planterſhip, than to make ſugar

(A) In light luxuriant ſoils, canes planted in April or May often produce largely; but it ſeems not prudent to delay ſo long, for fear of a diſappointment by drought.

or to plant canes at improper ſeaſons of the year; for, by miſmanagements of this kind, every ſucceeding crop is put out of regular order.

The land being well manured and mellowed by fallowing, let it be lined into ſpaces of four feet diſtance, and then holed either backwards or ſidewiſe (B) as the manager thinks beſt; taking particular care that the cane-holes be made ſquare at the bottom, and heaping the banks high, ſo as to take up little ſpace. After holing, the land ſhould lie in that poſture until every little lump crumbles into fine mould, and then be planted before weeds ſpring up in any great abundance: for if planting in due time is neglected, the ſoil ſubſides, grows compact again, and defeats much of all the former tillage. The land being thus holed and mellowed by fallowing, let two good plants be put into each hole at equal diſtance from the centre; for if many plants be put into an hole, the ſprouts will riſe too plentifully, ſo as to hinder each other's growth, and produce very ſmall ſpindling canes, which can yield but little ſugar; for ſugar-canes require more air and ſun-ſhine than moſt other vegetables.

The plants being thus placed in each hole, with the eyes horizontally, muſt be covered, in looſe dry ſoils, not above two inches deep; but in ſtiff ground one inch is ſufficient, leaving the banks to be added by ſmall acceſſions at every weeding, and the one-third to be reſerved for covering the ſtools of the rattoons, which will much forward their growth: but let the common cuſtom of drawing mould into hillocks round each ſtool of young canes be avoided; becauſe that practice breaks the young ſuperficial fibres, and leaves them bare to periſh by the ſcorching ſun. Stiff or clay ſoils, if well drained in the manner before directed, may be planted hollow, as the lighteſt, to the ſame advantage; for covering the ſtools of rattoons with one-third of the bank left for that purpoſe, is preferable to hoe-ploughing alone. As ſuch level ſtiff ſoils, free from ſtones, are moſt improveable by the plough, the huſbandman's chief care ſhould be to plough the land into ridges, riſing gradually from the ſides to the centres: for then the rain-water will paſs off with eaſe through the furrows, and ſave all the hand-labour of draining, except ſmall trenches round each field, through which the water may paſs gently without waſhing away the mould: for where all preceding arts are practiſed to pulveriſe the ſoil, peculiar care muſt be taken to prevent its waſhing away by floods of rain, or the land will ſoon become barren.

It has been ſuggeſted before, that two good plants are ſufficient for an hole of the dimenſions above mentioned; but in ſmaller holes, one only is uſed by ſome judicious planters with good ſucceſs. Drawn plants from rattoon-ſprouts of ſix or eight months old are very good; and in ſome reſpects preferable to the tops of old canes, as having ſhort joints, and of courſe more eyes, and plumper than the others. It is, however, generally obſerved, that the tops of old canes are the hardieſt plants, capable of bearing the extremity of dry or wet weather better than any other; but if the fibrous roots of drawn plants are cut off, no man will have reaſon to complain. To uſe the tops of grown canes for the laſt pieces planted, from January to May, is very good management: but drawn plants will anſwer perfectly well at all other ſeaſons of the year; and of theſe an abundance may be provided by a right forecaſt, if unſeaſonable droughts do not prevent; and good allowance muſt be made for ſuch events. By that the planter divides his plantation into three, four, or five equal parts, in proportion to his ſtrength of hands and cattle, allowing one third, fourth, or fifth part to be planted every year: and if he contrives to cut plants always from a contiguous field, much cartage in wet weather will be prevented; much of his negroes' time ſaved in paſſing from one diſtant field to another, and ſtill more if mules are employed to carry plants.

But after all this care in the preceding proceſs, ſure diſappointment will attend the planter who neglects timely weeding his young canes; which, by once being over-run by weeds, will be ſo ſtinted as never to become very good by any ſubſequent helps: let therefore every manager be as careful and nice in preſerving his canes clean from all weeds, as the floriſt is of his parterre; poſtponing every other work when that calls for his labour. And if inſtead of ſcraping up theſe weeds with common hoes, according to the preſent practice, he could employ the Kentiſh hoe-plough, infinite hand-labour may be ſaved: or if the nature of his ſoil be ſtiff or ſtony, ſo that the hoe-plough cannot be uſed, it is very probable, that by digging all weeds into the ſoil with ſpades or hoes, and looſening it by that means, as gardeners do in England, the ſugar-canes would be ſo invigorated, as to recompenſe the labour beyond our preſent conception. No devaſtation by that pernicious inſect called the *blaſt* could then take place. All the ſchemes hitherto propoſed for curing that evil are vain impracticable ſpeculations, or a waſte of time and labour to little purpoſe. But if it be a fact, that the blaſt commits moſt ravage in poor land, and affects not the luxuriant ſugar-canes of a rich ſoil, the cure of the evil is certain and obvious. Manure and cultivate your lands ſo as to render them rich and fruitful, and you will prevent the blaſt (C); more eſpecially if (according to the Engliſh huſbandry) the produce is changed, by planting potatoes, yams, or corn, in dry ſoils, and eddoes or potatoes in ſtiff lands: for by theſe arts the planter may be ſure (if favoured by natural ſeaſons) of canes that will reward his labour by plentiful crops of ſugar; and it muſt then be his intereſt, by ſkill and care, to make it as good as poſſible; which ſhall be the ſubject of the following ſection, after having given ſome new directions for the cultivation of rattoons.

It has been obſerved above, that the ſtools or roots from whence canes are cut, are apt to corrupt at the parts left above ground, and theſe of courſe canker the whole ſtool: hence it is that rattoons, or canes ſpringing from thoſe ſtools, are ſeldom very good, except in very rich ſoils; and therefore ſome good planters, to prevent thoſe ſtubs above ground, draw their canes for ſugar from the roots, which we believe effectual, but very laborious: but by a late experiment, it is found a leſs laborious method, after uncovering the ſtools, by taking off the traſh, ſo ſoon as the canes are carried out of the field, to cut by a ſharp hoe all the heads of the cane-ſtools, three inches below the ſurface of the ſoil, and then fill the hole with fine mold; by which means all the ſprouts riſing from below derive more nutriment, and grow with vigour far beyond expectation.

2. *Beſt Method of making Sugar.* In making good ſugar, there is a great variety of incidents, of which if any one fails, the end is abſolutely fruſtrated: the wiſe planter, therefore,

(B) If the holes are made four feet wide one way, and five feet from bank to bank, the bottom of the hole will be a true ſquare.

(C) It is, however, certainly a miſtake to ſay, that the blaſt infects not the canes of a rich ſoil. The contrary is known to be true by experience: and therefore the beſt and only effectual cure is wiping the blades by wet cloths, until wet weather completes the cure.

muſt be very attentive to every minute ſtep throughout the whole proceſs. It muſt be his firſt care to keep his mill in perfect good order, ſo that common accidents may not retard his crop in the ſeaſon when canes yield the moſt and beſt ſugar: every part of his works muſt be very clean, and his coppers hung ſo judiciouſly, as to boil perfectly well with little fuel; for nothing contributes more to the making of good ſugar than quick boiling, after the cane-juice is well clarified. To this end, therefore, the great coppers, or firſt clarifiers, ſhould be hung ſingly, or to ſeparate fires, and pinned about ten or twelve inches from the bottom, that the ſcum may be ſeparated by ſlow degrees, and kept floating upon the ſurface long enough to be taken off perfectly: for if the liquor be ſuffered to boil with violence, the ſcum will incorporate again with it, and never after be ſeparable but by the refining-pan; and thus dark foul ſugar is made of that cane-juice which might have produced, by good management, fine bright ſugar of much greater value at the market. This is a point of great importance to every planter, whoſe profit depends much upon the goodneſs of his ſugar; for the worſt pays the ſame freight, duty, and charges, as the very beſt.

The cane-juice, therefore, after being ſtrained at the mill through a braſs-wire ſieve, ought to run down to the boiling-houſe in ſpouts lined with lead, to preſerve it from tainting (D); and being let into the firſt clarifier, muſt be there boiled over a moderate fire until perfectly freed from all ſcum; afterwards it muſt be ſtrained through a thick coarſe blanket, and then boiled to ſugar with all poſſible celerity. But let the coppers be ever ſo judiciouſly hung, the liquor cannot be boiled with due quickneſs, unleſs the manager takes peculiar care to provide great plenty of dry fuel or mill-traſh. The good planter, therefore, will lay up a ſtock of bruſh-wood cut from the hedges of his boundary before the crop begins; or, if he has plenty of wood, enough to ſerve the uſes of his ſtill-houſe: by which means he may ſoon lay up a large fund of mill-traſh, and pack it either in ricks or in a large traſh-houſe, that the progreſs of his crop may not be hindered by every ſhower, or his ſugar ſpoiled by dull fires.

The judicious boiler's next care is to provide quicklime of the beſt ſort to temper his liquor; for otherwiſe the ſugar will be clammy, than which it cannot have a worſe quality. That defect in ſugar ariſes from two very different cauſes; for ſlow boiling and bad temper-lime have the very ſame effect. The lime made from marble, or any other land lime-ſtones, is the ſtrongeſt, and preferable to that made from white ſea-coral; and the newer it is from the kiln, the better: for by keeping it in the tighteſt caſks for any long duration, ſome of its good qualities evaporate; and therefore, in the daily uſe of it, the air muſt be excluded.

It is impoſſible to preſcribe exactly the quantity of lime neceſſary for every ſort of cane-juice. It has, however, been obſerved, that five ounces of the beſt quick-lime are ſufficient for 100 gallons of good cane-juice. Inſtead of increaſing the quantity of lime, Mr. Martin adviſes the uſe of powdered alum; one quarter of an ounce of which, or leſs, to a ſtrike of ſugar, will give both firmneſs and largeneſs of grain: experiment will ſoon determine whether more or leſs alum will be requiſite. It is a good rule in general to give a full quantity, which can only be determined preciſely by the firſt ſugar made; but by dipping a ſkimmer into the tach when the liquor is boiled to near a ſyrup height, and by giving it two or three quick twirls, and then hanging the edges of it downward, an obſerving eye will diſcern the liquor falling from the ſkimmer in glaſſy flakes. If theſe hang long, the liquor is not ſufficiently tempered; but if ſhort, breaking near to the edge of the ſkimmer, it is tempered enough. When cane-juice is tainted by exceſſive drought, ſo as to make foxy bad ſugar, there are various methods in uſe of extracting the taint. Among theſe, Mr. Martin never found any ſo effectual as by high tempering the liquor; and, when it is boiled to a thick ſyrup, throwing into the tach two or three gallons of fair water, which, by ſudden ſolution, throws up the taint or viſcous ſcum (conſiſting of the lighteſt particles) upon the ſurface; from whence it muſt be ſkimmed off with all expedition, and reſerved for diſtillation. This is a very effectual method of making ſtrong bright ſugar from cane-juice very much tainted, provided it be rich or at full maturity; but if the ſugar-canes are much tainted while the juice is wateriſh, all attempts to make good ſugar of it are vain and fruitleſs: for then it is fit only for diſtillation. Indeed a ſtrong or large-grained ſugar cannot by any art be made from wateriſh juice, even though untainted by drought; and therefore, when the planter finds his cane-juice of that ſort, let him ſtrip his canes from all the traſh, ſuffering them to ſtand for ſix weeks expoſed to the air and ſun; and he will find that labour amply recompenſed by a large product of very good ſugar, as experience has often evinced.

After duly tempering the cane-juice with the ſtrongeſt quicklime, clarifying it over a moderate fire, and ſtraining it as before deſcribed, let it be boiled with the utmoſt quickneſs to a middling ſugar-height, which will give it a large grain, and a fair colour, never-failing qualities to procure the beſt price at market. This art of boiling ſugar, though of the greateſt importance to every planter, is generally leaſt underſtood either by overſeers or their maſters; but that point of greateſt conſequence is truſted wholly to the ſkill of negro-boilers, who indeed arrive by long habit to ſome degree of judgment by *the eye only*. To that eye-art Mr. Martin ſays he has attended with all diligence, but could never acquire a critical exactneſs: for the ſight, of all the other ſenſes, is moſt fallible and ſubject to deception: a little more or leſs butter thrown into the tach will alter the whole appearance, and often deceive the moſt attentive and experienced eye; and no doubt there are other cauſes leſs obſervable, which produce the like effect; and therefore he recommends boiling by the *touch* alſo, which is abundantly more certain, as two witneſſes are better than one.

This art of boiling by the touch is called *taking a proof;* but to impart by words the knowledge of it is as impoſſible as to teach any other mechanic art, which can be attained by practice only. However, the method of doing it is by a pan-ſtick, of four feet and an half long, eighteen inches of which is made rounding for the graſp of the left hand, and three feet flatwiſe, about two inches broad, and an inch thick: by immerging this pan-ſtick into the liquor when boiled to a pretty thick conſiſtence, it will be ſmeared: upon which the boiler puts his right thumb, taking up a ſufficient quantity, and touching then the thumb with the fore-finger, draws the liquid ſugar like a thread at the inſtant when the heat is going off: this thread, when broken, will ſhrink from the thumb to the ſuſpended fore-finger in ſeveral lengths, as the boiler intends: for the different lengths at which this thread hangs to the fore-finger determine preciſely the different degrees of boiling ſugar; and theſe degrees are proportioned to the ſeveral ſizes of moulds, or ſugar-pots, in which it is cured. The denominations by which theſe degrees are determined by

(D) Mill-ciſterns, and all receivers through which cane-juice paſſes, ſhould be lined with lead; becauſe wood ſoon taints it; and the greateſt artiſt cannot make the beſt ſugar with tainted juice.

refiners, are, *piece*, *lump*, and *loaf height*. *Piece-height* is the highest degree, and suited to the moulds of the largest size, which contain about nine gallons: the thread of *piece-height* is about three inches long; that of *lump-height*, suitable to moulds of half the former sizes, is when the thread stands at about an inch from the suspended fore-finger: and *loaf-height*, suitable to the smallest moulds, is determined by the thread of a quarter of an inch long from the suspended finger: and this *latter proof* is generally most suitable to the planter's purposes of making muscovado-sugar; which ought to be of a large grain, well separated from melasses. It has been said above, that the boiler must take a sufficient quantity of the liquid sugar upon his thumb, to make an exact proof. That sufficiency cannot be expressed in words precisely; but must be just enough to allow the drawing of a thread, and not more; for that will occasion some deception. In like manner, if the thread is drawn any other time than at the critical moment when the heat of the liquid sugar goes off the thumb, the boiler will be deceived; for, if the liquid sugar is either too hot or too cold when drawn into a string, it will vary the appearance. In taking proof, the young learner must expect to blister his thumb; but, to give him as little pain as possible, when he takes up the liquid sugar, let him observe to keep his finger and thumb nimbly moving from and to each other in gentle contact, and then draw the string at that instant when the intense heat is going off; by which means he will save his thumb from blistering, and obtain an exact *proof*, according to the rules above prescribed.

The method of boiling muscovado-sugar is below loaf-height (E); and if then it is cooled with quickness in a broad superficies, and in a wooden cooler, the sugar will be of a larger grain than if cooled in a deep or copper vessel. But if the sugar is intended to be cured in pots or earthen moulds, it must be cooled in copper or deep wooden coolers, that it may be conveyed from thence into the pots while in the state of a thick liquid. This will occasion the grain of sugar to be smaller (and more especially if judiciously stirred while in the cooler), which is an advantage to the colour of clayed sugar: for a multitude of surfaces will reflect more rays of light, and consequently appear whiter than larger particles, which have fewer surfaces. For that reason the most expert planters of Barbadoes generally boil their sugar higher than most other people; but whether to so much profit, must be determined by future experience: for if a much less quantity of very white sugar is obtained by boiling high, then, by the contrary method, the question is, whether the greater price is an adequate recompence for so great a loss of weight. In Mr. Martin's opinion it is not: however, it is worth the trouble to determine that point by exact weight and measure. In such computations the refined Barbadoes managers exceed all our islanders.

The quantity and thinness of the clay-batter must be exactly proportioned, *not to the quantity of sugar* so much as to the degree of height to which it is boiled, which the *face* or surface of the sugar in each pot must determine: for if the crust breaks near the centre, the sugar is high-boiled, and will require a thinner batter; and so, *vice versa*, the nearer to the edge of the pot the surface cracks, the thicker must be the clay: for clay-batter is only the means of filtering the water through the sugar by easy degrees, so as to wash the grains from all the yellowness, or tinge of melasses, without dissolving the smallest particles. In this proportion, therefore, consists chiefly the art of claying, not to sink the pot of sugar, by a double clay lower from the brim than five inches, and yet to whiten the whole mass alike to the bottom. But this cannot be effected without great judgment in boiling equally; and in separating the pots into several classes, so as to clay each parcel in a manner suitable to the degree of boiling; for want of this art it is that a planter may grow poorer by claying his sugar, than if he makes only plain muscovado: for the loss of sugar dissolved into melasses by claying injudiciously, cannot be compensated by converting it into rum. He therefore who proposes to clay sugar to advantage, must first learn the art of boiling by the *touch*, as the only criterion of boiling to a degree of exactness: he must learn also all the other process of halling and stirring the sugar after it is filled into the pots, by which small errors in boiling may be in some measure rectified. The same skill is requisite to boil sugar which is intended to be cured in pots, *without being clayed*; and therefore that practice is very unprofitable: for though sugar properly boiled will cure best in pots, yet if there be the least error in boiling, it will occasion the sugar to be of a very small grain, as is generally the case of Jamaica-sugar. For if the same sugar, which is of a small grain, had, by being put into pots been cooled with quickness in a broad wooden cooler, and cured in hogsheads, the grain would have been much larger, as a single experiment will evince But if, in conformity to old customs, a manager will choose to cure in pots, let him cool his sugar in a shallow broad cooler, till it becomes very thick, and only liquid enough to be taken up with a ladle, and put into the pots: for by that means he will have a much larger-grained sugar, than by the practice of putting it hot into pots It is a common practice to stir hot sugar once or twice after being put into the coolers; which is a sure means of breaking the grain, at the very instant while the sugar is granulating.

3. *Refining of sugar*.—Sugar is afterwards refined from the coarse state in which it generally comes from abroad, to various degrees of purity by new solutions, and is sold at different prices, and under different names, according to the degree of purity it is brought to. Our sugar-refiners first dissolve it in water, then clarify the solution by boiling with whites of eggs and despumation; and after due evaporation pour it into moulds; where the fluid part being drained off, and the sugar concreted, its surface is covered with moist clay as before. The sugar thus once refined, by repetition of the process, becomes the double-refined sugar of the shops.

The *candy sugar*, or that in crystals, is prepared by boiling down solutions of sugar to a certain pitch, and then removing them into a hot room, with sticks placed across the vessel for the sugar to shoot upon: and these crystals prove of a white or brown colour, according as the sugar used in the process was pure or impure.

Sugar *from different Plants*.—In some parts of North America, particularly in Canada, a kind of sugar is prepared from the juice which issues upon wounding or boring certain species of the maple-tree, one of which is named from hence the *sugar-maple*; as also from the wild or black birch, the honey-locust, and the hickery. The maple is most commonly made use of for this purpose, as being the richest, and as best enduring the long and severe winters of that climate. The juice is boiled down, without any addition, to a thick consistence; then taken off from the fire, kept stirring till its heat is abated, and set in a cold place; where the sugar quickly concretes into grains, resembling common brown powder-sugar.

(E) That is the greatest height for rich cane-juice; but when waterish, it will be high enough when a thread can be drawn. It is a general maxim, that the weak cane-juice must be tempered very high and boiled low. The former is absolutely false; for a due temper must be observed; to boil it very low, is right, and that is a candy height.

The trees are tapped early in the ſpring, about the time that the ſnow begins to melt. It is obſervable, that when the weather begins to grow warm, they bleed no more; and that, after the bleeding has ſtopt, they begin to run again upon covering the roots with ſnow. The more ſevere the winter has been, the juice is found to be richer and in greater quantity. The trees which grow on hills or high land yield a richer juice than thoſe which are produced in low countries; and the middle-aged than the young or the old.

Mr. Kalm informs us, in the Swediſh Tranſactions for the year 1751, that one tree, if the ſummer does not come on haſtily, will yield about forty-two gallons of juice (Engliſh wine-meaſure), and that the quantity which iſſues in one day is from three to ſix gallons: that eleven gallons of juice of middling quality give a pound of ſugar, and that ſometimes a pound has been gained from three gallons and a half: that two perſons can in one ſpring prepare commodiouſly 200 pounds. He obſerves, that this ſugar is weaker than that from the ſugar-cane; but that for ſome purpoſes it anſwers better, as for chocolate and preſerves. It is likewiſe eſteemed more medicinal. Conſiderable quantities are brought annually into Europe, particularly France, and there employed in diſorders of the breaſt. It is reckoned that a pound of common ſugar goes as far in ſweetening as two pounds of maple-ſugar.

The large maple, commonly called *ſycamore tree*, bleeds alſo in Europe a ſweet juice, from which an actual ſugar has been prepared. In the Tranſactions above mentioned, for the year 1754, there is an account of ſome experiments made in this view upon the Swediſh maple. Eight trees, none of them under thirty years, bled in four days fourteen gallons of juice; which, inſpiſſated, gave two pounds and a half of brown-ſugar. Another time, the ſame eight trees bled in three days ten gallons and a half; which yielded one pound four ounces of ſugar, with half a pound of ſyrup. It is the ſaccharine juice of the maple-tree, which, exuding upon the leaves, renders them ſo apt to be preyed upon by inſects.

The common birch bleeds alſo a large quantity of a ſweetiſh juice, which yields, on being inſpiſſated, a ſweet ſaline concrete, not however perfectly of the ſaccharine kind, but ſeeming to approach more to the nature of manna.

There are ſundry other vegetables, raiſed in our own country, which afford ſaccharine concretes; as beet-roots, ſkirrets, parſneps, potatoes, celeri, red-cabbage ſtalks, the young ſhoots of Indian wheat. The ſugar is moſt readily obtained from theſe, by making a tincture of the ſubject in rectified ſpirit of wine; which, when ſaturated by heat, will depoſit the ſugar upon ſtanding in the cold.

SUGAR *of Milk*. See *Sugar of Milk*.

Acid of SUGAR. See CHEMISTRY.

SUGILLATION, in medicine, an extravaſation of blood in the coats of the eye, which at firſt appears of a reddiſh colour, and afterwards livid or black. If the diſorder is great, bleeding and purging are proper, as are alſo diſcutients.

SUICIDE, the crime of ſelf-murder, or the perſon who commits it. In the commiſſion of it we ſee the pretended heroiſm, but real cowardice, of the Stoic philoſophers, who deſtroyed themſelves to avoid thoſe ills which they had not the fortitude to endure: though the attempting it ſeems to be countenanced by the civil law, yet was puniſhed by the Athenian law with cutting off the hand which committed the deſperate deed. And alſo the law of England wiſely and religiouſly conſiders, that no man hath a power to deſtroy life but by commiſſion from God the author of it: and as the ſuicide is guilty of a double offence; one ſpiritual, in invading the prerogative of the Almighty, and ruſhing into his immediate preſence uncalled for; the other temporal, againſt the king, who hath an intereſt in the preſervation of all his ſubjects; the law has therefore ranked this among the higheſt crimes, making it a peculiar ſpecies of felony, a felony committed on one's ſelf. And this admits of acceſſories before the fact, as well as other felonies; for if one perſuades another to kill himſelf, and he does ſo, the adviſer is guilty of murder. A *felo de ſe*, therefore, is he that deliberately puts an end to his own exiſtence, or commits any unlawful malicious act, the conſequence of which is his own death: as if, attempting to kill another, he runs upon his antagoniſt's ſword; or, ſhooting at another, the gun burſts and kills himſelf. The party muſt be of years of diſcretion, and in his ſenſes, elſe it is no crime. But this excuſe ought not to be reſtrained to that length to which our coroners juries are apt to carry it, viz. that the very act of ſuicide is an evidence of inſanity; as if every man, who acts contrary to reaſon, had no reaſon at all: for the ſame argument would prove every other criminal *non compos*, as well as the ſelf-murderer. The law very rationally judges, that every melancholy or hypochondriac fit does not deprive a man of the capacity of diſcerning right from wrong; which is neceſſary to form a legal excuſe. And therefore, if a real lunatic kills himſelf in a lucid interval, he is a *felo de ſe* as much as another man.

But now the queſtion follows, what puniſhment can human laws inflict on one who has withdrawn himſelf from their reach? They can only act upon what he has left behind him, his reputation and fortune: on the former, by an ignominious burial in the highway, with a ſtake driven through his body; on the latter, by a forfeiture of all his goods and chattels to the king: hoping, that his care for either his own reputation, or the welfare of his family, would be ſome motive to reſtrain him from ſo deſperate and wicked an act. And it is obſervable, that this forfeiture has relation to the time of the act, done in the felon's life-time, which was the cauſe of his death. As if huſband and wife be poſſeſſed jointly of a term of years in land, and the huſband drowns himſelf; the land ſhall be forfeited to the king, and the wife ſhall not have it by ſurvivorſhip. For by the act of caſting himſelf into the water he forfeits the term; which gives a title to the king, prior to the wife's title by ſurvivorſhip, which could not accrue till the inſtant of her huſband's death. And though it muſt be owned that the letter of the law herein borders a little upon ſeverity; yet it is ſome alleviation, that the power of mitigation is left in the breaſt of the ſovereign, who upon this (as on all other occaſions) is reminded by the oath of his office, to execute judgment in mercy.

SUIDAS, a Greek writer, according to ſome, flouriſhed in the 11th century, under the reign of the Emperor Alexius Comnenus; according to others, before the 10th century. He wrote in Greek an Hiſtorical and Geographical Dictionary or Lexicon; a work which, though not always ſtrictly accurate, is nevertheleſs of great importance, as it contains many things taken from the ancients that are no-where elſe to be found. The beſt edition of Suidas is that of Kuiſter, in Greek and Latin, with notes, printed in 3 vols. fol. which has been much improved by Toup.

LAPIS SUILLUS. See *Swine*-STONE.

SUIT, is uſed in different ſenſes; as, 1. Suit of court, or ſuit-ſervice, which is an attendance the tenant owes to his lord's court. 2. Suit-covenant, where a perſon has covenanted to do ſervice in the court of the lord. 3. Suit-cuſtom, which is where one and his anceſtors have owed ſuit time out of mind. 4. It is uſed for a petition to the king or any perſon of dignity, where a lord diſtrains his tenant for ſuit, and none is due. In this caſe, the party may have an attachment againſt him to appear in the king's court.

Suit, in law, the ſame with action. The Romans introduced pretty early ſet forms for actions and ſuits into their law, after the example of the Greeks; and made it a rule, that each injury ſhould be redreſſed by its proper remedy only. "*Actiones* (ſay the Pandects), *compoſitæ ſunt quibus inter ſe homines diſceptarent, quas actiones ne populus prout vellet inſtitueret, certas ſolemneſque eſſe voluerunt.*" The forms of theſe actions were originally preſerved in the books of the pontifical college as choice and ineſtimable ſecrets, till one Cneius Flavius, the ſecretary of Appius Claudius, ſtole a copy and publiſhed them to the people. The concealment was ridiculous: but the eſtabliſhment of ſome ſtandard was undoubtedly neceſſary to fix the true ſtate of a queſtion of right; leſt, in a long and arbitrary proceſs, it might be ſhifted continually, and be at length no longer diſcernible. Or, as Cicero expreſſes it, "*ſunt jura, ſunt formulæ, de omnibus rebus conſtitutæ, ne quis aut in genere injuriæ, aut in ratione actionis, errare poſſit. Expreſſæ enim ſunt ex uniuſcujuſque damno, dolore, incommodo, calamitate, injuria, publicæ à prætore formulæ, ad quas privata lis accommodatur.*" And in the ſame manner Bracton, ſpeaking of the original writs upon which all our actions are founded, declares them to be fixed and immutable, unleſs by authority of parliament. And all the modern legiſlators of Europe have found it expedient, from the ſame reaſons, to fall into the ſame or a ſimilar method. In England, the ſeveral ſuits, or remedial inſtruments of juſtice, are, from the ſubject of them, diſtinguiſhed into three kinds; actions *perſonal, real,* and *mixed.*

Perſonal actions are ſuch whereby a man claims a debt, or perſonal duty, or damages in lieu thereof; and likewiſe whereby a man claims a ſatisfaction in damages for ſome injury done to his perſon or property. The former are ſaid to be founded upon contracts, the latter upon *torts* or wrongs: and they are the ſame which the civil law calls "*actiones in perſonam, quæ adverſus eum intenduntur qui ex contractu vel delicto obligatus eſt aliquid dare vel concedere.*" Of the former nature are all actions upon debt or promiſes; of the latter are all actions of treſpaſſes, nuiſances, aſſaults, defamatory words, and the like.

Real actions (or, as they are called in the Mirror, *feodal actions)*, which concern real property only, are ſuch whereby the plaintiff, here called the *demandant,* claims title to have any lands or tenements, rents, commons, or other hereditaments, in fee-ſimple, fee-tail, or for term of life. By theſe actions formerly all diſputes concerning real eſtates were decided; but they are now pretty generally laid aſide in practice, upon account of the great nicety required in their management, and the inconvenient length of their proceſs; a much more expeditious method of trying titles being ſince introduced, by other actions perſonal and mixed.

Mixed actions are ſuits partaking of the mixture of the other two, wherein ſome real property is demanded, and alſo perſonal damages for a wrong ſuſtained. As for inſtance, an action of waſte: which is brought by him who hath the inheritance, in remainder or reverſion, againſt the tenant for life, who hath committed waſte therein, to recover not only the land waſted, which would make it merely a real action; but alſo treble damages, in purſuance of the ſtatute of Glouceſter, which is a perſonal recompenſe; and ſo both, being joined together, denominate it a *mixed action.*

The orderly parts of a ſuit are theſe: 1. The original *writ.* 2. The *proceſs.* 3. The *pleadings.* 4. The *iſſue* or demurrer. 5. The *trial.* 6. The *judgment,* and its incidents. 7. The proceedings in nature of *appeals.* 8. The *execution.* See theſe articles.

SULLY. See Bethune.

SULPHAT, in the new chemical nomenclature, denotes a compound of the ſulphuric acid with ſome other ſubſtance.

SULPHUR, a well-known ſubſtance, which is yellow, taſteleſs, hard, brittle, and when rubbed becomes electric. Its ſpecific gravity is from 1,9 to 2,35. According to Bergman, it gently evaporates at 170, melts at 185, and flames at 302 of Fahrenheit. It burns with a blue flame, and a diſagreeable ſuffocating ſmell; in cloſe veſſels it ſublimes without decompoſition, or only a decompoſition proportionable to the quantity of air they contain; when melted it becomes red, but recovers its colour on cooling. It is inſoluble in water, though by long trituration it is ſaid water will take up ſome of it, but it is rather diffuſed than diſſolved in it; neither can ſpirit of wine unite to it, except when both are in a vaporous ſtate, and then 72 parts of ſpirit of wine take up 1 of ſulphur; it is ſoluble in hot oils, and alſo in fixed alkalis, both in the dry and liquid way; it is decompoſed by boiling in concentrated nitrous acid, partly decompoſed and partly diſſolved by the vitriolic and oxygenated muriatic acid. See Chemistry-*Index.*

Sulphur was formerly ſuppoſed to conſiſt of ſulphuric acid and phlogiſton, in the proportion of 60 parts of the former to 40 of the latter; but by the new ſyſtem which is now generally adopted, ſulphur is reckoned a ſimple ſubſtance, and the ſulphuric acid a compound of ſulphur and oxygene or vital air. This concluſion is founded on the following facts: 1. Sulphur does not burn unleſs vital air have acceſs to it. 2. During combuſtion it abſorbs vital air from the atmoſphere. 3. The ſulphuric produced by the combuſtion of ſulphur is equal in weight to the ſulphur employed and the quantity of air that has been conſumed.

Sulphur is found ſometimes pure, and ſometimes in combination with other ſubſtances. Of pure ſulphur there are ſeven varieties. 1. Tranſparent ſulphur, in eight-ſided cryſtals, with two truncated pyramids. It is generally depoſited by water on the ſurface of calcareous ſpar. Cadiz ſulphur is of this kind. 2. Tranſparent ſulphur in irregular fragments. Such is the ſulphur of Switzerland. 3. Whitiſh pulverulent ſulphur, depoſited in ſiliceous geodes. In Franche Compté there are flints full of ſulphur. 4. Pulverulent ſulphur depoſited on the ſurface of mineral waters, ſuch as thoſe of Aix-la-Chapelle. 5. Cryſtalline ſulphur that has been ſublimed, found in the neighbourhood of volcanoes. 6. Pulverulent ſulphur ſublimed from volcanoes, found in abundance at Solfatara in the vicinity of Naples. 7. Sulphur in ſtalactites, formed by volcanic fires.

Sulphur is alſo found united with different ſubſtances, as with metals, when it is called Pyrites. Sometimes it is combined with calcareous earth, as in fetid calcareous ſtones and ſwine-ſtone. It has lately been diſcovered, that ſulphur is formed by a natural proceſs in animals and vegetables beginning to putrefy. It is found on ſtable-walls and in privies. It is alſo extracted from vegetables, from dock-root, cochlearia, &c. M. Deyeux obtained it from the white of eggs. It has been alſo procured from horſe-dung.

The ſulphur uſed in Great Britain is generally brought in a pure ſtate from volcanic countries, where it abounds in an inexhauſtible quantity. It is well known, however, that ſome of the metallic ores in this country abound with it; but from the common mode of purifying them, the ſulphur is diſſipated and loſt. Dr. Watſon has ſhown, in a paper on lead-ore in the Philoſophical Tranſactions, that not leſs than 700 tons are annually diſſipated in the various lead-mines of England.

It is extracted from pyrites in the following manner in Saxony and Bohemia. The pyrites is put in ſmall pieces into earthen tubes: one of the tubes is placed on a furnace, and the other paſſes into a ſquare veſſel of caſt-iron containing water. The ſulphur is diſunited by the heat from the pyrites, and paſſes into the veſſel; but it is then very impure. It is

afterwards melted in an iron ladle, when the earthy and metallic particles are depofited by their weight, and the fulphur being light rifes to the top. It is then poured off into a copper boiler, where it is farther purified, and afterwards poured into cylindrical moulds of wood, from which it receives the fhape in which it is ufually fold.

When melted fulphur is gently heated, it flies off in a yellow powder, which is called *flowers of fulphur*. The operation is performed in this manner: Common fulphur in powder is put into an earthen cucurbit, to the top of which a number of earthen pots inferted in one another is fixed, known by the name of *aludels*. The cucurbit is then heated till the fulphur become liquid: it then rifes and attaches itfelf to the fides of the aludels.

Sulphur combined with an alkali is called *hepar fulphuris, liver of fulphur,* becaufe it refembles in colour the liver of animals. In the French nomenclature it is called *fulphure*, and by thofe Britifh chemifts who have adopted the new fyftem *fulphuret*.

Water decompofes the fulphuret. The fulphur is precipitated by acids, when a particular gas is extricated commonly called *hepatic gas*, or, what is more expreffive of its compofition, *fulphurated hydrogenous gas*. The fetor of this gas is infufferable, and is fatal to animals. It communicates a green colour to fyrup of violets, and burns with a light-blue flame. It acts on metals and metallic oxides, efpecially thofe of lead and bifmuth, which it foon blackens. It is decompofed by vital air; and accordingly, when it comes into contact with atmofpheric air, a portion of the fulphur is feparated. For this reafon fulphureous waters do not contain genuine liver of fulphur.

The mineral acids act differently on fulphur. If the fulphuric acid be boiled on fulphur, the acid acquires an amber colour, and a fulphureous fmell; the fulphur melts and fwims like oil. When cooled, it concretes into globules of a greenifh hue; but a fmall portion of the fulphur is diffolved in the acid, which may be precipitated by an alkali. The flaming red nitrous acid acts powerfully on fulphur. When poured upon melted fulphur, it occafions detonation and inflammation. The common muriatic acid produces no effect upon it; but the oxygenated muriatic acid acts upon it with force.

Sulphur unites readily with all metallic fubftances, excepting gold, platina, and zinc; at leaft we have not found the means of uniting it with thefe directly, and without fome intermediate fubftance. The degrees of affinity with which fulphur combines with thofe metals to which it may be readily united are different; for it not only unites more eafily and abundantly with fome than with others, but it alfo quits thofe with which it has a lefs affinity, to unite with others to which it has a ftronger affinity.

The affinities of fulphur, according to Mr. Geoffroy's table, are, fixed alkali, iron, copper, lead, filver, regulus of antimony, mercury, and gold; and, according to Mr. Gellert's table, they are, iron, copper, tin, lead, filver, bifmuth, regulus of antimony, mercury, arfenic, and cobalt; gold and zinc are marked in this table as being incapable of uniting with fulphur.

The compounds formed by fulphur with different metals are different; but all of them poffefs a metallic luftre, without any ductility: thefe combinations of fulphur and of metals are very frequently found in a natural ftate. Almoft all the metals which we dig from the earth are naturally found combined with fulphur, forming moft of the ores and metallic minerals.

It is a curious phenomenon, that nitre mixed with fulphur burns rapidly, even in clofe veffels; this is eafily explained by the new fyftem. Nitre, when heat is applied to it, yields a great quantity of vital air; and fulphur is a combuftible body, or, which is the fame thing, has a ftrong attraction for vital air. As vital air is thus fupplied, which is the only principle neceffary to combuftion, communication with the atmofpheric air is unneceffary. The fulphur will burn till the whole vital air which the nitre furnifhes be confumed. The products obtained by this procefs are different according to the proportions of nitre and fulphur which are employed. If eight parts of fulphur and one of nitre be fet on fire in a clofe veffel, fulphuric acid is produced; and this is the method by which oil of vitriol or ftrong fulphuric acid was formerly made in Great Britain. The veffels in which the operation was performed were large glafs balloons, with very large necks, each containing 400 or 500 pints. But it was attended with great expence, on account of the high price and brittlenefs of the balloons. A few years ago a cheaper method has been attempted with fuccefs in France. The fulphur is burned on a kind of gridirons, in large apartments lined with lead. As the acid condenfes it is conveyed by gutters into a refervoir, and afterwards concentrated. It muft be obferved, that the fulphuric acid thus obtained is always combined with a little fulphur and fulphat of pot-afh, a fmall quantity of aluminous fulphat and fulphat of lead; but thefe fubftances are in fo fmall a proportion, that for common ufe it is not neceffary to feparate them. If neceffary, however, it may eafily be done by diftilling the acid to drynefs.

Gunpowder, the terrible effects of which are owing to its ftrong tendency to combuftion, is a mixture of fulphur, nitre, and charcoal. (See GUNPOWDER.) But there is another mixture of which fulphur is an ingredient ftill more violent in its effects: This is called *fulminating powder*, and is compofed of three parts of nitre, two parts of the carbonate of pot-afh, and one of powdered fulphur. Thefe being clofely united together by trituration in a hot marble mortar, when expofed to a flight degree of heat, will melt, and produce a violent detonation like the report of a cannon. A dram of this mixture is fufficient for the experiment.

Sulphur is of great ufe in chemiftry, in medicine, and the arts. Sulphur is ufeful in making fome fufions, precipitations, and feparations of metals and minerals; but is particularly ufeful, as being the fubftance from which the fulphuric acid is obtained. Hepar fulphuris is employed in chemiftry for making feveral folutions.

Sulphur is employed in medicine both internally and externally. It is given either in flowers or in lozenges, made up with fugar, or joined to magnefia, cryftals of tartar, manna, caffia, lenitive electuary, &c. Two or three drams generally prove laxative; and it is given in fuch dofes in cafes of piles, of uterine, and other hemorrhagies; becaufe it does not ftimulate nor heat during its operation, nor leave a difpofition to coftivenefs, as rhubarb, aloes, and other hot refinous purges do. Sulphur was formerly much recommended in coughs and difeafes of the breaft, but of late its virtues as a pectoral have been much doubted. When applied externally, it is mixed with fome unctuous fubftance, as hogs'-lard, butter, &c. and is rubbed on fuch parts of the body as are affected with eruptions.

Some phyficians and chemifts, confidering that fulphur is infoluble in water, and capable of refifting the action of moft menftruums, have affirmed, that it can produce no effect when taken internally, fingle and unaltered; but this affertion feems to be without foundation; for it is certain, that the fweat and perfpiration of thofe who take fulphur internally have a fmell evidently fulphureous. Befides, fulphur is much more foluble than is generally believed. It is attacked by all oily and faponaceous fubftances, and confequently by almoft all animal liquors.

We cannot eafily form a very diftinct and clear idea of the manner in which fulphur acts internally upon our bodies; but, from obfervations made upon its effects, it appears to be dividing, ftimulating, and fomewhat heating: it principally acts upon the perfpirable parts of the body, the chief of which are the fkin and lungs; and from this property it is particularly ufeful in fome difeafes of thefe parts.

Sulphur is alfo a powerful repellent, as appears from its curing feveral kinds of itch, merely by external application, in form of ointments and pomatums. Several mineral waters, which are drunk or ufed as baths for fome difeafes, owe their good qualities to fulphur contained in them.

Sulphur is alfo ufed in feveral arts. By means of it fine impreffions of engraved ftones are taken. Matches are formed of it; and its utility as an ingredient in the preparation of gunpowder and fireworks is well known. Laftly, it is ufed for whitening wool, filk, and many other matters expofed to its vapour during its combuftion; the colours and rednefs of which could not be deftroyed by any other fubftance, but are quickly effaced by this acid vapour.

SULPHUR-*Wort*, in botany. See PEUCEDANUM.

SULPHURIC-ACID, the name adopted by the French chemifts for the vitriolic acid. It is formed by a combination of fulphur with vital air, as defcribed under the article SULPHUR. When fulphur is burned with a low degree of heat, it burns with a blue flame, and diffufes a fuffocating vapour, which, when collected, it called *fulphureous acid.* When fulphur is expofed to ftrong heat it burns rapidly, and emits a lively white flame, and has no fmell; the refidue is called *fulphuric acid.* The fulphureous is a weaker acid than the fulphuric, owing to its containing a lefs quantity of oxygene.

SULPICIA, an ancient Roman poetefs, who lived under the reign of Domitian, and has been fo much admired as to be termed the *Roman Sappho.* We have nothing, however, left of her writings but a fatire, or rather the fragment of one, againft Domitian, who publifhed a decree for the banifhment of philofophers from Rome: which fatire is to be found in Scaliger's *Appendix Virgiliana.* She is mentioned by Martial and Sidonius Apollinaris; and is faid to have addreffed a poem on conjugal love to her hufband Calenus, a Roman knight.

SULPICIUS (Severus), an ecclefiaftical writer who flourifhed about the beginning of the 5th century, and was contemporary with Rufinus and St. Jerome. He was the difciple of St. Martin of Tours, whofe life he has written; and the friend of Paulinus bifhop of Nola, with whom he held an intimate correfpondence. The principal of his works is his *Hiftoria Sacra,* from the creation of the world to the confulate of Stilicho and Aurelian, about the year 400; in which his ftyle is elegant beyond the age he lived in.

SULTAN, or SOLDAN, a title or appellation given to the emperor of the Turks. Vattier will have the word Turkifh, and to fignify *king of kings*; adding, that it was firft given to the Turkifh princes Angrolipex and Mafgud, about the year 1055: others will have it originally Perfian, alleging, in proof hereof, an ancient medal of Cofroe: others derive it from *foldanus, quafi folus dominus:* others from the Hebrew שלט, *fchalat* or *fheleth,* "to rule, reign." It had its rife under Mahmoud, fon of Sebecteghin, the firft emperor of the dynafty of the Gaznevides, towards the clofe of the fourth century of the era of the Hegira: when that prince going to Segeftan to reduce Kalaf governor of that province, who affected the fovereignty, Kalaf was no fooner advertifed of his coming than he went out to meet him, delivered the keys of his fortrefs, and owned him his *fultan,* that is, his lord or commander. The title pleafed Mahmoud fo well, that he affumed it ever afterwards; and from him it paffed to his defcendants, and to other Mahometan princes. It is chiefly confined to the Turkifh and Perfian monarchs.

SULZER (M.), a celebrated philofopher, was born at Winterthun, in the canton of Zurich, October 16, 1720. He was the youngeft of twenty-five children. His early education did not promife much, though it was by no means neglected. He had little inclination for what is called in the fchools the ftudy of *humanity,* and made but a fmall progrefs in the learned languages, which were to prepare him for the ftudy of theology, for which profeffion his parents defigned him. At the age of fixteen, when he went to the academical fchool of Zurich, he had not the fmalleft notion of the fciences, or of elegant literature, and confequently no tafte for ftudy. The firft incident that developed a hidden germ of philofophical genius, was his meeting with Wolfe's Metaphyfics: this was the birth of his tafte for fcience; but he wanted a guide. The clergyman with whom he lodged was an ignorant man; and the academical prelections were, as yet, above the reach of his comprehenfion. On the other hand, a fedentary life was not the thing he liked, nor to which he had been accuftomed; and, moreover, a fociable turn of mind led him often into company, where he loft much time in frivolous amufements, yet without corrupting his morals. Who, that obferved him at this period, fays Mr. Formey in his *Eulogium,* would have thought that Sulzer would one day be numbered among the moft knowing and wife men of his time? The learned Gefner was the inftrument of Providence that rendered Sulzer's inclination to ftudy triumphant over his paffion for amufement and company. Animated by the counfels and example of this worthy and learned man, he applied himfelf to philofophy and mathematics with great ardour, and refumed the purfuit of Grecian literature and the Oriental languages. The contemplation of nature became his noble and favourite paffion. An ecclefiaftical fettlement in a rural fcene, that exhibited happy objects and occafions for this delightful ftudy, began to render his days happy and ufeful; and he publifhed, in 1741, *Moral Contemplations of the Works of Nature*; and the year following an *Account* of a journey he had made through the Alps; which fhowed, at the fame time, his knowledge of natural hiftory, and the tafte and fenfibility with which he furveyed the beauties of nature, and the grandeur and goodnefs of its Author. He afterwards became private tutor to a young gentleman at Magdeburg. This procured him the acquaintance of Meffrs. Maupertuis, Euler, and Sack, which opened to his merit the path of preferment, and advanced him fucceffively to the place of mathematical profeffor in the King's College at Berlin, in 1747, and to that of member of the Royal Academy in 1750.

In this laft quality he diftinguifhed himfelf in a very eminent manner, enriched the clafs of fpeculative philofophy with a great number of excellent memoirs, and was juftly confidered as one of the firft-rate metaphyficians in Germany. But his genius was not confined to this branch of fcience. His *Univerfal Theory of the Fine Arts* is a valuable production. A profound knowledge of the arts and fciences, and a perfect acquaintance with true tafte, are eminently difplayed in this work, and will fecure to its author a permanent and diftinguifhed rank in the republic of letters. The firft volume of this excellent work was publifhed in 1771, and the fecond in 1774. We fhall not here give a catalogue of the writings of M. Sulzer; but we cannot help mentioning his *Remarks on the Philofophical Effays* of the late Mr. Hume, as a work of real merit, which does juftice to the acutenefs, while it often detects the fophiftry, of the Britifh Bayle. The moral character of M. Sulzer was amiable and virtuous: fociability and beneficence were its characteriftical lines; and his virtues were animated

by that facred philofophy that forms the Chriftian, ennobles man, and is the only fource of that heart-felt ferenity and fedate fortitude which fupport humanity, when every other object of confidence fails. His dying moments were calm, humble, and fublime; and when he expired, the placid and compofed air of his countenance made his mourning friends doubt, for fome time, whether it was death or fleep that had fufpended his converfation. He had no enemy; and his friends were numerous, affectionate, and worthy of the tender returns he made them.

The king of Pruffia diftinguifhed him by repeated marks of munificence and favour. We learn, however, that his royal protector had never feen him before the end of the year 1777, though he had been member of the academy from the year 1750. The audience, indeed, though late vouchfafed, was honourable to M. Sulzer, with whom the monarch converfed for a long time with the greateft affability and condefcenfion.

SUM, fignifies the quantity that arifes from the addition of two or other magnitudes, numbers, or quantities, together.

SUMACH, in botany. See RHUS.

SUMATRA, an ifland of Afia, the moft weftern of the Sunda Iflands, and conftituting on that fide the boundary of the Eaftern Archipelago. Its general direction is nearly northweft and fouth-eaft. The equator divides it into almoft equal parts, the one extremity being in 5. 33. N. and the other in 5. 56. S. lat. Acheen Head, at the north extremity of the ifland, is in longitude 95. 34. eaft. It lies expofed on the fouth-weft fide to the Indian Ocean; the north point ftretches into the bay of Bengal; to the north-eaft it is divided from the peninfula of Malacca by the ftraits of that name; to the eaft by the ftraits of Banca, from the ifland of that name; to the fouth-eaft by the commencement of what are called the *Chinefe Seas*; and on the fouth by the ftraits of Sunda, which feparates it from the ifland of Java. It is about 900 miles in length, but from 100 to 150 only in breadth. No account had been given of this ifland by any Englifhman till the year 1778, when Mr. Charles Miller (fon of the late botanical gardener) publifhed an account of the manners of a particular diftrict, in the 68th volume of the Philofophical Tranfactions.

SUMMARY, in matters of literature. See ABRIDGEMENT.

SUMMER, the name of one of the feafons of the year, being one of the quarters when the year is divided into four quarters, or one half when the year is divided only into two, fummer and winter. In the former cafe, fummer is the quarter during which, in northern climates, the fun is paffing through the three figns Cancer, Leo, Virgo, or from the time of the greateft declination, till the fun come to the equinoctial again, or have no declination; which is from about the 21ft of June till about the 22d of September. In the latter cafe, fummer contains the fix warmer months, while the fun is on one fide of the equinoctial; and winter the other fix months, when the fun is on the other fide of it. It is faid that a frofty winter produces a dry fummer, and a mild winter a wet fummer.

SUMMER-*Iflands*. See BERMUDAS.

SUMMER *Red-Bird*. See MUSICAPA.

SUMMIT, the top or vertex of any body or figure, as of a triangle, cone, pyramid, &c.

SUMMONS, in law, a citing or calling a perfon to any court, to anfwer a complaint or to give his evidence.

SUMMONS, in war. To fummon a place is to fend a drum or trumpet to command the governor to furrender, and to declare that if the place be taken by ftorm, all muft fubmit to the mercy of the conqueror. See CAPITULATION and CHAMADE.

SUMMUM BONUM, in ethics, the chief good.

SUMP, in metallurgy, a round pit of ftone, lined with clay within, for the receiving the metal on its firft fufion from the ore.

SUMP, in the Britifh falt-works, where fea-water is boiled into falt, is the name of a fort of pond, which is made at fome diftance from the faltern on the fea-fhore, between full fea and low water mark. From this pond a pipe is laid, through which, when the fea is in, the water runs into a well adjoining to the faltern; and from this well it is pumped into troughs, through which it is carried to the cifterns, in order to be ready to fupply the pans. See SALT.

SUMPH, in mining, denotes a pit funk down in the bottom of the mine, to cut or prove the lode ftill deeper than before; and in order to flope and dig it away if neceffary, and alfo to drive on the lode in depth. The fumph principally ferves as a bafon or refervoir, to collect the water of a mine together, that it may be cleaned out by an engine or machine.

SUMPTER-HORSE, is a horfe that carries provifions and neceffaries for a journey.

SUMPTUARY LAWS *(Leges Sumptuariæ)*, are laws made to reftrain excefs in apparel, coftly furniture, eating, &c. Moft ages and nations have had their fumptuary laws; and fome retain them ftill, as the Venetians, &c. But it is obferved, that no laws are worfe executed than fumptuary laws. Political writers have been much divided in opinion with refpect to the utility of thefe laws to a ftate. Montefquieu obferves, that luxury is neceffary in monarchies, as in France, but ruinous to democracies, as in Holland. With regard to England, whofe government is compounded of both fpecies, it may ftill be a dubious queftion, fays Judge Blackftone, how far private luxury is a public evil; and as fuch cognizable by public laws. The fumptuary laws of that ancient Locrian legiflator Zaleucus are famous: by thefe it was ordained, that no woman fhould go attended with more than one maid in the ftreet except fhe were drunk: that fhe fhould not go out of the city in the night, unlefs fhe went to commit fornication: that fhe fhould not wear any gold or embroidered apparel, unlefs fhe propofed to be a common ftrumpet; and that men fhould not wear rings or tiffues except when they went a whoring, &c.

Among the Romans, the fumptuary laws were very numerous: by the *Lex Orchia*, the number of guefts at feafts was limited, though without any limitation of the charges: by the Fannian law, made twenty-two years afterwards, it was enacted, that more than ten *affes* fhould not be fpent at any ordinary feaft: for the folemn feafts, as the Saturnalia, &c. an hundred affes were allowed; ten of which, Gellius informs us, was the price of a fheep, and a hundred of an ox. By the Didian law, which was preferred eighteen years after, it was decreed, that the former fumptuary laws fhould be in force, not only in Rome, but throughout all Italy; and that for every tranfgreffion, not only the mafter of the feaft, but all the guefts too, fhould be liable to the penalty.

The Englifh have had their fhare of fumptuary laws, chiefly made in the reigns of Edw. III. Edw. IV. and Henry VIII. againft fhoes with long points, fhort doublets, and long coats; though all repealed by ftatute 1 Jac. I. c. 25. As to excefs in diet, there remains ftill one law unrepealed. Under King Henry IV. Camden tells us, pride was got fo much into the foot, that it was proclaimed, that no man fhould wear fhoes above fix inches broad at the toes. And their other garments were fo fhort, that it was enacted, 25 Edw. IV. that no perfon, under the condition of a lord, fhould, from that time, wear any mantle or gown, unlefs of fuch length, that, ftanding upright, it might cover his privy members and buttocks.

SUN, SOL, ☉, in aftronomy, the great luminary which

enlightens the world, and by its presence constitutes day. See ASTRONOMY.

Mock-SUN. See PARHELION.

SUN-*Fish of the Irish*. See SQUALUS.

SUN-*Flower*, in botany. See HELIANTHUS.

SUN-*Dew*, in botany. See DROSERA.

SUNDA-ISLANDS, a general name for a cluster of islands in the India Ocean, between 93° and 120° of east longitude, and between 8° north and 8° south latitude. The particular names of the islands are *Borneo, Sumatra, Java, Bully, Banca*, &c.

SUNDAY, or the LORD'S-DAY, a solemn festival observed by Christians on the first day of every week, in memory of our Saviour's resurrection. See SABBATH. In the breviary and other offices we meet with Sundays of the first and second class. Those of the first class are, Palm, Easter, Advent, and Whitsunday, those of *Quasimodo* and *Quadragesima*. Those of the second class are the common Sundays. Anciently each Sunday in the year had its particular name, which was taken from the introit of the day; which custom has only been continued to some few in lent, as *Reminiscere, Oculi, Lætare, Judica*.

Some are of opinion that the Lord's day, mentioned in the Apocalypse, is our Sunday; which they believe was so early instituted by the apostles. Be this as it will, it is certain a regard was had to this day even in the earliest ages of the church; as appears from the first apology of Justin Martyr, where he describes the exercise of the day not much unlike to ours. But it was Constantine the Great who first made a law for the proper observation of Sunday; and who, according to Eusebius, appointed it should be regularly celebrated throughout the Roman empire. Before him, and even in his time, they observed the Jewish Sabbath as well as Sunday; both to satisfy the law of Moses and to imitate the apostles, who used to meet together on the first day. By Constantine's laws, made in 321, it was decreed, that for the future the Sunday should be kept a day of rest in all cities and towns; but he allowed the country people to follow their work. In 538 the council of Orleans prohibited country labour; but because there were still many Jews in Gaul, and the people fell into many superstitious usages in the celebration of the new Sabbath, like those of the Jews among that of the old, the council declares, that to hold it unlawful to travel with horses, cattle, and carriages, to prepare food, or to do any thing necessary to the cleanliness and decency of houses or persons, favours more of Judaism than of Christianity. See SABBATH-*Breaking*.

SUOVETAURILIA, an ancient Roman sacrifice, so called because it consisted of a pig *(sus)*, a sheep or rather ram *(ovis)*, and a bull *(taurus)*. They were all males, to denote the masculine courage of the Roman people. It was likewise called *solitaurilia*, because the animals offered up were always *solida*, whole or uncut.

SUPERCARGO, a person employed by merchants to go a voyage, and oversee their cargo or lading, and dispose of it to the best advantage.

SUPERCILIUM, in anatomy, the eye-brow. See ANATOMY.

SUPEREROGATION, in theology, what a man does beyond his duty, or more than he is commanded to do. The Romanists stand up strenuously for works of supererogation, and maintain that the observance of evangelical councils is such. By means hereof, a stock of merit is laid up, which the church has the disposal of, and which she distributes in indulgences to such as need. This absurd doctrine was first invented towards the close of the 12th century, and modified and embellished by St. Thomas in the 13th; according to which, it was pretended that there actually existed an immense treasure of merit, composed of the pious deeds and virtuous actions which the saints had performed beyond what was necessary for their own salvation, and which were therefore applicable to the benefit of others; that the guardian and dispenser of this precious treasure was the Roman pontiff; and that of consequence he was empowered to assign to such as he thought proper a portion of this inexhaustible source of merit, suitable to their respective guilt, and sufficient to deliver them from the punishment due to their crimes. The reformed church do not allow of any work of supererogation; but hold with the apostles, that when we have done our best, we are but unprofitable servants.

SUPERFETATION, in medicine, a second or after-conception, happening when the mother, already pregnant, conceives of a latter coition; so that she bears at once two fœtuses of unequal age and bulk, and is delivered of them at different times. We meet with instances of superfetations in Hippocrates, Aristotle, Du Laurens, &c.: but they are said to be much more frequent in hares and swine.

SUPERFICIES, or SURFACE, in geometry, the outside or exterior face of any body. This is considered as having the two dimensions of length and breadth only, but no thickness; and therefore it makes no part of the substance or solid content or matter of the body. The terms, or bounds, or extremities, of a superficies, are lines; and superficies may be considered as generated by the motions of lines. Superficies are either rectilinear, curvilinear, plane, concave, or convex. A rectilinear superficies is that which is bounded by right lines. Curvilinear superficies is bounded by curve lines. Plane superficies is that which has no inequality in it, nor risings, nor sinkings, but lies evenly and straight throughout, so that a right line may wholly coincide with it in all parts and directions. Convex superficies is that which is curved and rises outwards. Concave superficies is curved and sinks inward. See GEOMETRY.

SUPERFINE, in the manufactories, a term used to express the superlative fineness of a stuff: thus a cloth, a camblet, &c. are said to be superfine when made of the finest wool, &c. or when they are the finest that can be made.

SUPERFLUOUS INTERVAL, in music, is one that exceeds a true diatonic interval by a semitone minor. See INTERVAL.

SUPERINTENDANT, denotes an ecclesiastical superior in several reformed churches where episcopacy is not admitted; particularly among the Lutherans in Germany, and the Calvinists in some other places. The superintendant is similar to a bishop; only his power is somewhat more restrained than that of our diocesan bishops. He is the chief pastor, and has the direction of all the inferior pastors within his district or diocese. In Germany they had formerly superintendants general, who were superior to the ordinary superintendants. These, in reality, were archbishops; but the dignity is sunk into disuse; and at present none but the superintendant of Wirtemberg assumes the quality of superintendant general.

SUPERIOR, a person raised above another in rank, office, or talents.

SUPERLATIVE, in grammar, one of the three degrees of comparison, being that inflection of adjective nouns that serves to augment and heighten their signification, and shows the quality of the thing denoted to be in the highest degree. See GRAMMAR.

SUPERNUMERARY, something over and above a fixed number. In several of the offices are supernumerary clerks, to be ready on extraordinary occasions.

SUPERPARTICULAR PROPORTION, or *Ratio*, is that

in which the greater term exceeds the lefs by unit or 1. As the ratio of 1 to 2, or 2 to 3, or 3 to 4, &c.

SUPERPARTIENT PROPORTION, or *Ratio*, is when the greater term contains the lefs term once, and leaves fome number greater than one remaining. As the ratio

of 3 to 5, which is equal to that of 1 to $1\frac{2}{3}$;
of 7 to 10, which is equal to that of 1 to $1\frac{3}{7}$, &c.

SUPERSEDEAS, in law, a writ iffued in divers cafes, importing in general a command to ftay or forbear fome ordinary proceedings in law, which in appearance ought to be done or purfued, were it not for the caufe whereon this writ is granted. Thus a man regularly is to have a furety of peace againft him of whom he will fwear he is afraid; and the juftice required hereunto cannot deny it him: yet, if the party be formerly bound to the peace, either in chancery or elfewhere, this writ lies to ftay the juftice from doing that which otherwife he ought not to deny.

SUPERSTITION, a word that has been ufed fo indefinitely, that it is difficult to determine its precife meaning. From its refemblance in found to the Latin word *fuperftes*, "a furvivor," it is evidently derived from it, and different attempts have been made to trace their connection in fignification. Balbus, in the dialogue *De Natura Deorum* of Cicero, fays, that they who prayed and facrificed whole days that their children might *furvive* them, were called fuperftitious. Lactantius cenfures this etymology, and fays they were not called fuperftitious who wifhed that their children might furvive them (for this we all wifh), but becaufe they who furvived their parents worfhipped their images. Others again fay, that fuperftition is derived from *fuperftes*, becaufe it confifted in confidering the dead as if they were alive. But thefe etymologies are folely conjectural; and we confider conjectures as abfurd in philology as we do in fcience: they may miflead, but are feldom of any benefit. The ufual meaning affixed to the word *fuperftition*, both in the Latin and Englifh languages, is fo different from *fuperftes*, that its change of meaning muft be owing to fome accident which it is in vain to inquire after. If we had not known that the word *paganus* "a pagan" was derived from *pagus* "a village," becaufe the heathens in a certain period of the Chriftian hiftory lived in villages, the whims and fancies of etymologifts would not have thrown much light on the fubject. Without labouring, from the aid of etymology, to define fuperftition, which is a word of a very extenfive fignification, we will confider to what objects it is applied; and then, by obferving what is common to them all, we fhall be enabled to fix with fome degree of precifion the meaning of the term. We apply it to the idolatry of the heathens; we apply it alfo to the Jews, who made the will of God of no effect by their traditions, and fubftituted ceremonies in place of the religion of their fathers. We fay alfo that Chriftians are guilty of fuperftition; the Roman Catholics, who believe in tranfubftantiation and in the efficacy of prayers to faints; and thofe Proteftants who efteem baptifm and the Lord's fupper, and the punctual performance of other ceremonies, without regard to morality, as fufficient to enfure falvation. Thofe perfons alfo are reckoned fuperftitious who believe, without any evidence, that prophecies are ftill uttered by the divine infpiration, and that miracles are ftill performed. The word is alfo extended to thofe who believe in witchcraft, magic, and apparitions, or that the divine will is declared by omens or augury; that the fortune of individuals can be affected by things indifferent, by things deemed lucky or unlucky, or that difeafes can be cured by words, charms, and incantations.

SUPERVISOR, a furveyor or overfeer.

SUPINATION, in anatomy, the action of a fupinator mufcle, or the motion whereby it turns the hand fo as that the palm is lifted up towards heaven.

SUPINE, in Latin grammar, part of the conjugation of a verb, being a verbal fubftantive of the fingular number and the fourth declenfion. There are two kinds of fupines: one, called the *firft fupine*, ending in *um* of the accufative cafe, which is always of an active fignification, and follows a verb of motion; as *abiit deambulatum*. The other, called the *laft fupine*, and ending in *u* of the ablative cafe, is of a paffive fignification, and is governed by fubftantives or adjectives; as *facile dictu*, &c. They have their name, fays Probus, and after him Voffius, *quod ad inftar* fupinorum *& otioforum hominum omnia habent confufa*: or, according to Prifcian, *quod nafcantur a participiis paffivis, quæ* fupina *appellata funt, quia in infimo loco fita, totam conjugationis molem fufcipiant*.

SUPPER, the evening repaft.—Suppers that are heavy fhould be avoided, becaufe the ftomach is more oppreffed with the fame quantity of food in an horizontal pofture than in an erect one, and becaufe digeftion goes on more flowly when we fleep than when we are awake. They fhould be eaten long enough before bed-time that they may be nearly digefted before going to fleep; and then a draught of pure water will dilute that which remains in the ftomach.

SUPPER *of the Lord*, otherwife called the *Eucharift*, is a facrament ordained by Chrift in his church, of which the outward part is bread and wine, and the inward part or thing fignified the body and blood of Chrift, which the majority of Chriftians believe to be in fome fenfe or other taken and received by the faithful communicants. See SACRAMENT. There is no ordinance of the gofpel which has been the fubject of more violent controverfies between different churches, and even between different divines of the fame church, than this facrament: and though all confefs that one purpofe of its inftitution was to be a bond of love and union among Chriftians, it has, by the perverfenefs of mankind, been too often converted into an occafion of hatred. The outward and vifible fign, and the inward and fpiritual grace, have equally afforded matter of difputation to angry controvertifts. Many members of the church of Rome condemn the Greek church and the Proteftants for ufing leavened bread in the Lord's Supper, contrary to the example fet them by our Saviour; whilft the Greek church in general, and fome Proteftant focieties in particular, unite with the church of Rome in cenfuring all churches which mix not the wine with water, as deviating improperly from primitive practice. See EUCHARIST.

SUPPLEMENT, in literature, an appendage to fupply what is wanting in a book. Books of various kinds require fuch an appendage; but none fo much as a dictionary of arts and fciences, which, from the progreffive courfe of phyfical fcience, cannot be completed without it.

SUPPORTED, in heraldry, a term applied to the uppermoft quarters of a fhield when divided into feveral quarters, thefe feeming as it were fupported or fuftained by thofe below. The chief is faid to be fupported when it is of two colours, and the upper colour takes up two-thirds of it. In this cafe it is fupported by the colour underneath.

SUPPORTERS, in heraldry, figures in an atchievement placed by the fide of the fhield, and feeming to fupport or hold up the fame. Supporters are chiefly figures of beafts; figures of human creatures for the like purpofe are called *tenants*.

SUPPOSITION, in mufic, is when one of the parts dwells on a note, while another part makes two or more leffer notes equivalent to it, by conjoint degrees. Suppofition is defined by a late author the ufing of two fucceffive notes, of the fame value as to time; the one whereof, being a difcord, fuppofes the other a concord. The harmony, Mr. Malcolm obferves, is always to be full on the accented parts of the bar or meafure;

but on the unaccented, difcords may tranfiently pafs, without any offence, to the ear. This tranfient ufe of difcord, followed by concords, make what we, after the French, call *fupp fition.* Concords by fuppofition are thofe where the continued bafs adds or fuppofes a new found below the fundamental bafs; whence fuch concords always exceed the extent of the octave. Of thefe concords there are three forts, all which are concords of the feventh: the firft, when the added found is a third below the fundamental found; fuch is the concord of the ninth; and if the concord of the ninth is formed by the mediant, added below the fenfible concord in the minor mode, then the concord is called the *fuperfluous fifth.* The fecond kind is, when the fuppofed found is a fifth below the fundamental found, as in the concord of the fourth or eleventh; and if the concord is fenfible, and the tonic be fuppofed, this concord is called the *fuperfluous feventh.* The third kind is that where the fuppofed found is below a concord of the diminifhed feventh: if it is a fifth below, *i. e.* if the fuppofed found be the mediant, the concord is called the concord of the *fourth* and *fuperfluous fifth:* if it is a feventh below, *i. e.* if the fuppofed found be the tonic, the concord is called the *leffer fixth* and *fuperfluous feventh.*

SUPPOSITORY, a kind of medicated cone or ball, which is introduced into the anus for opening the belly. It is ufually compofed of common honey, mixed up with either foap or oil, and formed into pieces of the length and thicknefs of the little finger, only pyramidal. To the compofition is fometimes alfo added powder of fcammony, euphorbium, colocynthis, falt, aloes, &c. according to the eafe of the patient. The fuppofitory was invented for the convenience of fuch as have an averfion to the taking of clyfters; or to be ufed when the difeafe does not allow thereof.

SUPPRESSION, in medicine, is generally ufed to fignify a retention of urine or of the menfes.

SUPPURATION, the fecond way wherein an inflammation terminates; being a converfion of the infpiffated blood and the firft adjacent parts, as the veffels and fat, into pus or matter; which diforder, when it has not yet found an opening, is generally called an *abfcefs.*

SUPRACOSTALES, in anatomy. See *Table of the mufcles* in ANATOMY.

SUPRALAPSARIANS, in theology, perfons who hold that God, without any regard to the good or evil works of men, has refolved, by an eternal decree, *fupra lapfum,* antecedently to any knowledge of the fall of Adam, and independently of it, to fave fome and to damn others; or, in other words, that God intended to glorify his juftice in the condemnation of fome, as well as his mercy in the falvation of others; and for that purpofe decreed that Adam fhould neceffarily fall, and by that fall bring himfelf and all his offspring into a ftate of everlafting condemnation. Thefe are alfo called *antelapfaries,* and are oppofed to fublapfaries and infralapfaries. According to the fupralapfarians, the object of predeftination is *homo creabilis et labilis;* and, according to the fublapfarians and infralapfarians, *homo creatus et lapfus.*

SUPRASPINATUS, in anatomy. See *Table of the Mufcles* in ANATOMY,

SUPREMACY, the fuperiority or fovereignty of the king. See SOVEREIGNTY.

SUR, or SHUR (anc. geog.), a defert of Arabia Petræa, extending between Paleftine and the Arabian Gulph; into which the Ifraelites, after marching through the Red Sea, firft came (Exod. xv. 22.) Again (Numb. xxxiii. 8), it is faid, that from the fea they went three days' journey into the Wildernefs of Etham; whence fome conclude that Etham and Shur are the fame wildernefs; or only differ as a part from the whole, Shur being the general name, and Etham that part of it lying neareft to the place of encampment of the fame name. We know fo little of the geography of thefe places that there is more room for difputation than for decifion. As to the route which the Ifraelites followed in their paffage through the Red Sea, Mr. Bryant, we think, has given the moft fatisfactory account in his late work on the Plagues of Egypt.—Shur is now called *Corondel.*

SURAT, a city of Hindooftan, in the country of Guzerat, fituated in a large and fertile plain, on the fouth bank of the Taptee. On the land fide it is encompaffed with two brick walls, which divide it into the Inner and the Outer Town. The citadel ftands within the inner, on the fhore of the Taptee, and is divided by trenches from the town. One may walk round the outer walls in two hours and a half; the fpace which it inclofes is chiefly occupied by gardens, having but a very few houfes. The larger houfes are flat-roofed here, as through the reft of the eaft, with courts before them. The houfes of the common people are high-roofed. Although Surat has been long under the dominion of the Mahometan Moguls, yet here is no handfome mofque with towers, as among the Turks and Arabians. The fquares of this city are large, and the ftreets fpacious, but not paved, fo that the duft is very troublefome. Each ftreet has gates of its own, with which it is fhut up in times of turbulence. At Surat provifions are plenteous and cheap; the air, too, is wholefome, notwithftanding the warmth of the climate. Fahrenheit's thermometer ftood at 98 in the month of March, while the wind blew from the north. In the month of May, the thermometer ftood at 93 degrees at Bombay, which lies two degrees farther to the fouth. One thing unfavourable for Surat is, that fhips cannot enter the harbour, becaufe the Taptee is full of fand-banks. This river is too low in the dry feafon; and in the rains fwells too fuddenly, to fuch a height, as to overflow all the neighbourhood. Were the river confined by dikes, the ftream which, during the rains, often rifes eight-and-twenty feet above its ordinary level, would carry away all the fand, and thus clearing the channel, would afford fhips accefs to the very walls; but the defpotic governments of Afia neglect every thing that might contribute to the general good of their fubjects. General toleration and entire liberty are enjoyed in this city by all religious profeffions; and its inhabitants are accordingly very numerous. The Europeans refiding here eftimate the population of the city at a million of fouls; but M. Niebuhr thinks this calculation is evidently above the truth, by two-thirds. One thing fingular in Surat is, that here is no hofpital for human beings, but an extenfive eftablifhment of this nature for fick or maimed animals. When the Europeans turn out an old horfe, or any other domeftic animal, to perifh as ufelefs, the Indians voluntarily affume the care of it, and place it in this houfe, which is full of infirm, decrepid cows, fheep, rabbits, hens, pigeons, &c. The charitable Indians keep a phyfician to look after thefe animals. The environs of Surat are not without gardens, which are the property either of Europeans, or of natives of the country. The fineft of thofe belonging to Europeans, is the property of the Dutch Eaft-India company. Its afpect is rich and charming. The principal inhabitants of Surat are Mahometans, and moftly ftrangers, although employed in the fervice of the government. They are equally zealous in the obfervance of their law, as the Turks and Arabians. Although of the fect of the Sunnites, they tolerate the Shiites, and even permit them to celebrate the feftival of Haffein. They make no fcruple of drinking wine publicly, or of lending money upon intereft. All people of diftinction in Surat, and through the reft of India, fpeak and write the Perfian language. Hence has this language been received at the courts, and the knowledge of it is very ufeful for the difpatch of bufinefs. In trade, corrupt Portuguefe is the language ufed; and this is in India, what the

Lingua Franca is in the Levant. The Hindoos, the aboriginal inhabitants of the country, compoſe the moſt conſiderable part of the population of Surat. They are almoſt all of the caſt of the Banians; and hence their ſkill and dexterity in matters of calculation and œconomy often raiſe them to places of conſiderable truſt, in the collection of the taxes and cuſtoms for the Mahometans. Theſe Banians, being born to trade, have engroſſed the commerce of India to ſuch a degree, that all foreign nations are obliged to employ them as brokers; in which employment they give better ſatisfaction than the Jews in Turkey. Europeans have never found reaſon to repent the intruſting even of their whole fortune to the Banians, who continue to give aſtoniſhing proofs of their probity and fidelity. Some of them are very rich, but they live all in a ſtyle of moderate ſimplicity, wearing for dreſs only a plain robe of white cotton. At Surat are numbers of Perſees, or Perſians, who are ſkilful merchants, induſtrious artiſans, and good ſervants. In the ſame city are alſo Armenians, Georgians, and Jews; but of none of theſe any conſiderable number. The Indian Catholics, commonly called Portugueſe, from their ſpeaking the India dialect of the Portugueſe language, are numerous. At Surat, the day is reckoned from ſunſet to ſunſet, and is divided, not into twenty-four hours, but into ſixty garris. Here are no clocks; the progreſs of the day is meaſured by different means. In a conſpicuous ſituation, a man ſtands to put a cup of copper, pierced with a hole in the bottom, from time to time under water; every time the cup ſinks, a garri is counted, and the man announces its lapſe, by ſtriking the number which it makes, upon a plate of metal, that ſounds like a clock. Each garri conſiſts of 24 of our minutes. In the houſes of the great too, where clocks and watches are not wanting, this old faſhion of meaſuring time is ſtill kept up. Surat, and the great diſtrict of which it is the capital, belonged, for a long time, to the Great Mogul, who, to keep ſo diſtant a province the more effectually in obedience, put it under the government of two nabobs, independent on one another. The one reſided in the city, and was properly the governor of the province; the other had the command of the citadel, and enjoyed the title of admiral, with a ſmall revenue appropriate to the maintenance of a ſmall fleet, for the defence of the coaſt againſt pirates. After Shah Nadir's expedition into Hindooſtan, the diſtant nabobs of this vaſt empire aimed all at independence, and left the mogul nothing but a ſhadow of authority; aſking him, only for form's ſake, to confirm them in their places. Teg Beg Khan, nabob of Surat, a rich and powerful man, followed this example, and procured his brother to be declared nabob of the citadel. The two brothers then looked upon the whole province as their patrimony, and acquired immenſe wealth. Teg Beg Khan dying in 1746, without children, left his fortune to his relations, by which ſeveral of them were raiſed to a condition which enabled them to aſpire to the government of the city. His brother died in the following year; and his widow, a woman extremely rich and ambitious, ſtrove to make her ſon-in-law nabob at once of the town and citadel. The conteſt of the different competitors for the ſupreme authority, produced a civil war in the town of Surat. Each of the rivals raiſed as many troops as he poſſibly could; with theſe he cantoned and intrenched himſelf in his houſes and gardens, and, from time to time, endeavoured to ſurpriſe or drive away his opponents. During theſe hoſtile operations, which were not attended with great ſlaughter, the inhabitants were content with ſhutting the gates, neareſt to the ſcene of action, and continued to go about their ordinary affairs, without fear of being pillaged. Nay they were ſure of receiving compenſation whenever any caſual injury was done to any perſon, through means of the diſturbances. Hence trade ſuffered no interruption. Some of the rival candidates, imprudently called in the Mahrattas; and they, without doing any thing for any party, made the victors pay for their aſſiſtance, although they had apparently favoured the vanquiſhed. Since that time, the Mahrattas have enjoyed a third part of the amount of the cuſtoms of Surat; and one of their officers conſtantly attends to receive this tribute. The Engliſh and Dutch had always kept their factories in a ſtate of defence, and on the occaſion of the diſturbances, they increaſed their military preparations. The nobles of the country then had recourſe to thoſe powerful traders. Each of the two European nations took part with one of the competitors, furniſhed him with ammunition, intrenched themſelves in their factories, and fought againſt each other, although not openly at war. The nabob, protected by the Engliſh, was at laſt expelled from the city. But, in 1758 he returned, and his mother-in-law, the rich widow above mentioned, made ſo good an uſe of her treaſures, that the nabob for whom he had been expelled, was obliged to yield to him the government of the city. When the Engliſh ſaw the city in the hands of their creature, they began to think ſeriouſly of gaining poſſeſſion of the citadel. The council of Bombay, in 1759, ſent Mr. Spencer, one of their members, a man of ability, and beloved by the Indians, to Surat, with a conſiderable force. The nabob opened the gates of the city to the Engliſh, and allowed them to lay ſiege to the citadel undiſturbed. It was taken in a few days. To avoid giving offence to the Indians, the Engliſh declared, that they made the conqueſt in the name of the great mogul, and waved his flag from the walls of the citadel. This expedition thus accompliſhed, Mr. Spencer ſent a long repreſentation to the court of Delhi, in which he ſtated the reaſons which had induced the merchants of Surat to put themſelves under the protection of the Engliſh, and to expel the uſurping nabob from the citadel. He aſſerted, that thoſe petty tyrants had ſuffered the fleet neceſſary for the protection of trade to fall into a ſtate of decay, and that none but the Engliſh could reſtore it. He offered, at the ſame time, that if the mogul would grant to the company the poſt of admiral, with the revenues annexed to it, they would maintain a fleet which ſhould give full ſecurity to trade. Theſe facts were atteſted, and the propoſals ſeconded by the principal inhabitants of Surat, who ſigned the memorial. The great mogul, who in his preſent weakneſs durſt not ſend a governor to the province, but conſidered it as loſt, readily granted the company's requeſt, and a member of the council of Bombay now diſcharges the office of nabob and admiral at Surat. Upon this title, the company enjoy a third of the revenue from the cuſtoms of this city, with other funds of income, ſtill more conſiderable, which enables them to keep on foot a body of troops, with ſome ſhips of war. The Engliſh are the actual ſovereigns of Surat. They keep the nabob of the city in a ſtate of abſolute dependence, allowing him only an income on which he may live ſuitable to his dignity. The Indians are in part content with their new maſters. The merchants are no longer in danger of the avaricious extortions of the nabobs, yet they complain of the ſelfiſh ſpirit of their maſters. The Indians dare not ſail without a paſſport from the admiral. The great trade carried on at Surat, renders this city the ſtore-houſe of the moſt precious productions of Hindooſtan. Hither is brought from the interior parts of the empire an immenſe quantity of goods, which the merchants carry in their ſhips to the Arabic Gulph, the Perſian Gulph, the coaſt of Malabar, the coaſt of Coromandel, and even to China. The provinces near this city are full of manufactures of all ſorts. Of foreign nations, the Dutch have, next after the Engliſh, the moſt conſiderable eſtabliſhment at Surat. They have here a director, ſeveral merchants, a number of writers and ſervants, and a few ſoldiers. Their trade has, however, declined, till it has become trifling. The affairs of the French are yet in a worſe ſtate. This nation are here in no eſtimation, but what is paid

to their capuchin friars, who are generally beloved and refpected at Surat. Thefe good regular clergy have done effential fervice to the public, by keeping a regifter of all events that have happened in Hindooftan, from 1676 to the prefent time. Such, nearly, is alfo the condition of the Portuguefe in India. In all appearance, the Englifh muft fhortly engrofs the whole trade of this city. Being at once fovereigns and rich merchants, they have every means in their power, by which foreign nations can be excluded, or the Indians reftrained from this fource of opulence: 112 miles S. Amadabad, and 200 WNW. Aurungabad. Long. 72. 49. E. Greenwich. Lat. 21. 12. N.

SURCHARGE OF THE FOREST, is when a commoner puts more beafts in the foreft than he has a right to. See FOREST.

SURCHARGE *of Common*, is a difturbance of common of pafture, by putting more cattle therein than the pafture and herbage will fuftain, or the party hath a right to do. This injury can only happen where the common is appendant or appurtenant, and of courfe limitable by law; or where, when in grofs, it is exprefsly limited and certain; for where a man hath common in grofs, *fans nombre*, or without ftint, he cannot be a furcharge. In this cafe indeed there muft be left fufficient for the lord's own beafts. The ufual remedies for furcharging the common are by the lord's diftraining the furplus number, or by his bringing an action of trefpafs, of by a fpecial action on the cafe, in which any commoner may be plaintiff. The ancient and moft effectual method of proceeding is by writ of admeafurement of pafture.

Writ of Second SURCHARGE, *de fecunda fuperoneratione*, is given by the ftatute of Weftm. 2. 13 Edw. I. cap. 8. when, after the admeafurement of pafture hath afcertained the right, the fame defendant furcharges the common again; and thereby the fheriff is directed to inquire by a jury whether the defendant has in fact again furcharged the common: and if he has, he fhall then forfeit to the king the fupernumerary cattle put in, and alfo fhall pay damages to the plaintiff.

SURCINGLE, a girdle wherewith the clergy of the church of England ufually tie their caffocks. See GIRDLE.

SURCOAT, a coat of arms, to be worn over body armour. The furcoat is properly a loofe thin taffety coat, with arms embroidered or painted on it. Such as is worn by heralds, anciently alfo ufed by military men over their armour to diftinguifh themfelves by.

SURD, in arithmetic and algebra, denotes any number or quantity that is incommenfurable to unity: otherwife called an *irrational number* or *quantity*. See ALGEBRA.

SURETY, in law, generally fignifies the fame with BAIL.

SURF, is a term ufed by feamen to exprefs a peculiar fwell and breaking of the fea upon the fhore. It fometimes forms but a fingle range along the fhore, and at others three or four behind one another, extending perhaps half a mile out to fea. The furf begins to affume its form at fome diftance from the place where it breaks, gradually accumulating as it moves forward till it gain, not uncommonly, in places within the limits of the trade-winds, a height of fifteen or twenty feet, when it overhangs at top, and falls like a cafcade with great force and a prodigious noife. Countries where furfs prevail require boats of a particular conftruction very different from the greater part of thofe which are built in Europe. In fome places furfs are great at high, and in others at low water; but we believe they are uniformly moft violent during the fpring-tides.

It is not eafy to affign the caufe of furfs. That they are affected by the winds can hardly be queftioned; but that they do not proceed from the *immediate* operation of the wind in the places where they happen, is evident from this circumftance, that the furf is often higheft and moft violent where there is leaft wind, and *vice verfa*. On the coaft of Sumatra the higheft are experienced during the fouth-eaft monfoon, which is never attended with fuch gales as the north-weft. As they are moft general in the tropical latitudes, Mr. Marfden, who feems to have paid much attention to the fubject, attributes them to the trade-winds which prevail at a diftance from fhore between the parallels of thirty degrees north and fouth, whofe uniform and invariable action caufes a long and conftant fwell, that exifts even in the calmeft weather, about the line, towards which its direction tends from either fide. This fwell, when a fquall happens, or the wind frefhens up, will for the time have other fubfidiary waves on the extent of its furface, breaking often in a direction contrary to it, and which will again fubfide as a calm returns, without having produced on it any perceptible effect. Sumatra, though not continually expofed to the fouth-eaft trade-wind, is not fo diftant but that its influence may be prefumed to extend to it; and accordingly at Poolo Pefang, near the fouthern extremity of the ifland, a conftant foutherly fea is obferved, even after a ftrong north-weft wind. This inceffant and powerful fwell rolling in from an ocean, open even to the pole, feems an agent adequate to the prodigious effects produced on the coaft; whilft its very fize contributes to its being overlooked. It reconciles almoft all the difficulties which the phenomena feem to prefent, and in particular it accounts for the decreafe of the furf during the north-weft monfoon, the local wind then counteracting the operation of the general one; and it is corroborated by an obfervation, that the furfs on the Sumatran coaft ever begin to break at their fouthern extreme, the motion of the fwell not being perpendicular to the direction of the fhore. This explanation of the phenomena is certainly plaufible; but, as the author candidly acknowledges, objections may be urged to it. The trade-winds and the fwell occafioned by them are remarkably fteady and uniform; but the furfs are much the reverfe. How then comes an uniform caufe to produce unfteady effects?

In the opinion of our author it produces no unfteady effects. The irregularity of the furfs, he fays, is perceived only within the remoter limits of the trade-winds. But the equatorial parts of the earth performing their diurnal revolution with greater velocity than the reft, a larger circle being defcribed in the fame time, the waters thereabout, from the ftronger centrifugal force, may be fuppofed more buoyant; to feel lefs reftraint from the fluggifh principle of matter; to have lefs gravity; and therefore to be more obedient to external impulfes of every kind, whether from the winds or any other caufe.

SURFACE. See SUPERFICIES.

SURFEIT, a vulgar term, in medicine, denoting a ficknefs with a fenfation of a load at the ftomach, ufually proceeding from fome error in diet, either with regard to its quantity or quality. Sometimes, however, a furfeit is only a plethora from indolence and full but improper feeding; in which cafe perfpiration is fuppofed defective; and eruptions form themfelves on the fkin.

SURFEIT, in farriery. See FARRIERY.

SURGE, in the fea-language, the fame with a wave. See WAVE.

SURGEON, or CHIRURGEON, one that profeffes the art of furgery. There have been Royal Colleges of Surgeons in Scotland and Ireland fome years; and lately, the Company of Surgeons in London have been erected into a Royal College by charter. Henry VIII. refcued this ufeful profeffion from the difgrace of being united with the barbers. Vide ftat. 32 Hen. VIII. c. 42.

SURGERY.

THAT part of medicine which treats of difeafes to be cured or alleviated by the hand, by inftruments, or by external applications.

INTRODUCTION.

THAT furgery was coeval with the other branches of medicine, or perhaps antecedent to any of them, will not admit of a doubt. The wars and contentions which have taken place among mankind almoft ever fince their creation, neceffarily imply that there would be occafion for furgeons at a very early period; and probably thefe external injuries would for fome time be the only difeafes for which a cure would be attempted, or perhaps thought practicable.—In the facred writings we find much mention of balfams, particularly the balm of Gilead, as excellent in the cure of wounds; though at the fame time we are informed that there were fome wounds which this balfam could not heal.

Concerning the furgery practifed among the Egyptians, Jews, and Afiatic nations, we know little or nothing. The Greeks were thofe from whom the art defcended to us, though they confeffedly received it from the eaftern nations. The firft Greek furgeons on record are Æfculapius and his fons Podalirius and Machaon. Æfculapius flourifhed about fifty years before the Trojan war; and his two fons diftinguifhed themfelves in that war both by their valour and fkill in curing wounds. This indeed is the whole of the medical fkill attributed to them by Homer; for in the plague which broke out in the Grecian camp, he does not mention their being at all confulted. Nay, what is ftill more ftrange, though he fometimes mentions his heroes having their bones broke, he never takes notice of their being reduced or cured by any other than fupernatural means; as in the cafe of Æneas, whofe thigh-bone was broken by a ftone caft at him by Diomed. The methods which thefe two famous furgeons ufed in curing the wounds of their fellow-foldiers feem to have been the extracting or cutting out the darts which inflicted them, and applying emollient fomentations or ftyptics to them when neceffary: and to thefe they undoubtedly attributed much more virtue than they could poffibly poffefs; as appears from the lines, where Homer defcribes Eurypylus as wounded and under the hands of Patroclus, who would certainly practife according to the directions of the furgeons.

Till the days of Hippocrates we know very little of what was the practice of the Greek furgeons. From him, however, we learn, that the practice of blood-letting, cupping, and fcarification, was known to them; alfo the ufe of warm and emollient fomentations, iffues made with hot irons, peffaries, injections, fumigations, &c. Hippocrates alfo gives directions with regard to fractures, luxations, ulcers, fiftulas. He directs the extenfion, reduction, bandages, and fplints, proper to be ufed in fractures and luxations of different bones, with feveral machines to increafe the extenfion when neceffary. He directs the laxity and tightnefs of the bandages; the intervals for unloofing and binding them on again; the pofition and repofe of the fractured member, and the proper regimen; and he mentions the time when a callus is ufually formed. He treats alfo of fractures of the fkull, and the method of applying the trepan. In his treatment of ulcers, he fpeaks of reducing fungous flefh by means of efcharotics, fome of which are alum, nitre, verdigris, quicklime, &c.

In the time of Ptolemy Philopater of Egypt, medicine, all the branches of which had hitherto been practifed by the fame perfon, was now divided into three, viz. the dietetic, pharmaceutic, and furgical; from which time to the prefent, furgery has continued to be reckoned a diftinct profeffion from medicine, though very improperly, in the opinion of the beft authors.

Surgery appears not to have exifted in Rome, notwithftanding the warlike genius of the people, for more than 500 years. Archagathus, a Greek, was the firft profeffor of that art in the city; and fo frequently employed the knife, hot irons, and other cruel methods of cure, that he was branded with the opprobrious title of *carnifex*, and expelled the city, where no phyfician or furgeon of eminence again made his appearance for 180 years. At this time Afclepiades undertook the profeffion of medicine; but feems to have dealt little in furgery. Neither have we any thing of importance on that fubject till the time of Celfus, who flourifhed during the reigns of Auguftus and Tiberius.—In his furgery, all the improvements from Hippocrates to his own days are collected; the moft minute and trifling difeafes are not omitted. An eminent furgeon of the moderns, emphatically exhorts every perfon in that profeffion "to keep Celfus in his hands by day and by night." He defcribes the figns of a fractured fkull, the method of examining for the fracture, of laying the fkull bare by an incifion in the form of the letter X, and afterwards of cutting away the angles, and of applying the trepan, with the figns of danger and of recovery. He obferved that fometimes, though very rarely, a fatal concuffion of the brain might happen, the blood-veffels within the fkull being burft, yet the bone remaining entire. After the operation of the trepan, fponges and cloths wetted with vinegar, and feveral other applications, were made to the head; and, throughout, fevere abftinence was enjoined. In violent fractures of the ribs, he ordered venefection; low diet; to guard againft all agitation of the mind, loud fpeaking, motion, and every thing that might excite coughing or fneezing. Cloths wetted with wine, rofes and oil, and other applications, were laid over the fracture. The cure of fractures, in the upper and lower extremities, he faid, were nearly alike; that fractures differ in degree of violence and danger, in being fimple or compound, that is, with or without a wound of the flefh, and in being near to the joint. He directs the extenfion of the member by affiftants; the reduction, by the furgeon's hands, of the fractured bones into their natural fituation; and to bind the fractured part with bandages of different lengths, previoufly dipped in wine and oil: on the third day frefh bandages are to be applied, and the fractured member fomented with warm vapour, efpecially during the inflammation. Splints, if neceffary, are to be applied, to retain the bones in a fixed pofition. The fractured arm is to be fufpended in a broad fling hung round the neck: the fractured leg is to be inclofed in a kind of cafe, reaching above the ham, and accommodated likewife with a fupport to the foot, and with ftraps at the fide, to keep the leg fteady: in the fractured thigh-bone, the cafe is to extend from the top of the hip to the foot. He defcribes the method of treating compound fractures, and of removing fmall fragments of fplinters of bones; and the manner of extracting darts. In luxations of

the ſhoulder, he mentions ſeveral methods of giving force to the extenſion, and of replacing the diſlocated bone. One method ſimilar to that of Hippocrates was, to ſuſpend the patient by the arm; the fore-part of the ſhoulder, at the ſame time, reſting upon the top of a door, or any other ſuch firm fulcrum. Another method was to lay the patient ſupine, ſome aſſiſtants retaining the body in a fixed poſition, and others extending the arm in the contrary direction; the ſurgeon, in the mean time, attempting, by his hands, forcibly to reduce the bone into its former place.

If a large inflammation was expected to enſue after a wound, it was ſuffered to bleed for ſome time, and blood was drawn from the arm. To wounds accompanied with conſiderable hæmorrhagy, he applied a ſponge wet in vinegar, and conſtant preſſure: if neceſſary, on account of the violence of the hæmorrhagy, ligatures were made round the veſſels, and ſometimes the bleeding orifice was ſeared up with the point of a hot iron. On the third day freſh dreſſings were applied. In conſiderable contuſions, with a ſmall wound of the fleſh, if neither blood-veſſels nor nerves prevented, the wound was to be enlarged. Abſtinence and low diet, upon all ſuch accidents, were preſcribed; cloths wet with vinegar, and ſeveral other applications, were to be applied to the inflamed part. He obſerves, that freſh wounds may be healed without compound applications. In external gangrene, he cut into the ſound fleſh; and when the diſeaſe, in ſpite of every effort, ſpread, he adviſed amputation of the member. After cutting to the bone, the fleſh was then ſeparated from it, and drawn back, in order to ſave as much fleſh as poſſible to cover the extremity of the bone. Celſus, though extremely diffuſe in the deſcription of ſurgical diſeaſes, and of various remedies and external applications, treats ſlightly of the method of amputating; from which, comparing his treatiſe with the modern ſyſtems, we might infer that the operation was then ſeldomer practiſed than at preſent. He deſcribes the ſymptoms of that dangerous inflammation the carbuncle, and directs, immediately to burn, or to corrode the gangrened part. To promote the ſuppuration of abſceſſes, he orders poultices of barley-meal, or of marſhmallows, or the ſeeds of linſeed and fenugreek. He alſo mentions the compoſitions of ſeveral repellent cataplaſms. In the *eryſipelas*, he applies ceruſe, mixed with the juice of nightſhade; and ſal-ammoniac was ſometimes mixed with his plaſters.

He is very minute in deſcribing diſeaſes of the eyes, ears, and teeth, and in preſcribing a multitude of remedies and applications. In inflammation of the eyes, he enjoined abſtinence and low diet, reſt, and a dark room: if the inflammation was violent, with great pain, he ordered veneſection, and a purgative; a ſmall poultice of fine flour, ſaffron, and the white of an egg, to be laid to the forehead to ſuppreſs the flow of pituita; the ſoft inſide of warm wheat bread dipped in wine, to be laid to the eye; poppy and roſes were alſo added to his collyriums, and various ingredients too tedious to enumerate. In chronic watery defluxions of the eyes, he applied aſtringents, cupped the temples, and burnt the veins over the temple and forehead. He couched cataracts by depreſſing the cryſtalline lens to the bottom of the orbit. Teeth looſened by any accident, he directs, after the example of Hippocrates, to be faſtened with a gold thread to thoſe adjoining on each ſide. Previous to drawing a tooth, he ordered the gum to be cut round its neck; and if the tooth was hollow, it was to be filled with lead before extraction, to prevent its breaking by the forceps. He deſcribes not only the inflammation, but likewiſe the elongation, of the uvula; he alſo deſcribes the polypus, and ſome other diſeaſes affecting the noſe.

He deſcribes ſeveral ſpecies of herniæ or rupture, and the manual aſſiſtance required in thoſe complaints, after the return of the inteſtines into the abdomen, a firm compreſs was applied to that part of the groin through which they protruded, and was ſecured by a bandage round the loins. In ſome caſes, after the return of inteſtinal ruptures, he diminiſhed the quantity of looſe ſkin, and formed a cicatrix, ſo as to contract over the part, to render it more rigid and capable of reſiſting. He deſcribes various diſeaſes of the genital parts, the hydrocele or dropſy of the ſcrotum, a difficulty of urine, and the manner of drawing off the water by a catheter; the ſigns of ſtone in the bladder, and the method of ſounding or feeling for that ſtone. Lithotomy was at that time performed by introducing two fingers into the anus; the ſtone was then preſſed forward to the perinæum, and a cut made into the bladder; and by the finger or by a ſcoop the ſtone was extracted. He deſcribes the manner of performing this operation on both the ſexes, of treating the patient, and the ſigns of recovery and of danger.

Celſus directed various corroſive applications and injections to fiſtulas; and, in the laſt extremity, opened them to the bottom with a knife, cutting upon a grooved inſtrument or conductor. In old callous ulcers, he made a new wound, by either cutting away the hard edges, or corroding them with verdigris, quicklime, alum, nitre, and with ſome vegetable eſcharotics. He mentions the ſymptoms of caries in the bone; directs the bone to be laid bare, and to be pierced with ſeveral holes, or to be burnt or raſped, in order to promote an exfoliation of the corrupted part; afterwards to apply nitre and ſeveral other ingredients. One of his applications to a cancer was auripigmentum or arſenic. He directs the manner of tapping the abdomen in aſcites, and of drawing blood by the lancet and cupping-glaſſes. His cupping-glaſſes ſeem not to have been ſo convenient as the modern: they were made either of braſs or horn, and were unprovided with a pump. He cured varicoſe veins by uſtion or by inciſion. He gives directions for extracting the dead fœtus from the womb, in whatever poſition it ſhould preſent; and, after delivery, to apply to the private parts ſoft cloths wet in an infuſion of vinegar and roſes. In Celſus's works there is a great redundance and ſuperfluity of plaſters, ointments, eſcharotics, collyriums, of ſuppurating and diſcutient cataplaſms, and external applications of every kind, both ſimple and compound: perhaps, amongſt the multitude, there are a few uſeful remedies now laid aſide and neglected.

The laſt writer of conſequence who flouriſhed at Rome was Galen, phyſician to the emperor Marcus Aurelius. His works are for the moſt part purely medicinal; although he wrote alſo on ſurgery, and made Commentaries on the Surgery of Hippocrates. He opened the jugular veins, and performed arteriotomy at the temples; directed leeches, ſcarification, and cupping-glaſſes, to draw blood. He alſo deſcribed with accuracy the different ſpecies of herniæ or ruptures.

In the year 500 flouriſhed Aëtius, in whoſe works we meet with many obſervations omitted by Celſus and Galen, particularly on the ſurgical operations, the diſeaſes of women, the cauſes of difficult labours, and modes of delivery. He alſo takes notice of the dracunculus, or Guinea worm. Aëtius, however, is greatly excelled by Paulus Egineta, who flouriſhed in 640; whoſe treatiſe on ſurgery is ſuperior to that of all the other ancients. He directs how to extract darts; to perform the operation ſometimes required in dangerous caſes of rupture or hernia. He treats alſo of aneuriſm. Galen, Paulus, and all the ancients, ſpeak only of one ſpecies of aneuriſm, and define it to be "a tumor ariſing from arterial blood extravaſated from a ruptured artery." The aneuriſm from a dilatation of the artery is a diſcovery of the moderns. In violent inflammations of the throat, where immediate danger

of fuffocation was threatened, Paulus performed the operation of bronchotomy. In obftinate defluxions upon the eyes, he opened the jugular veins. He defcribes the manner of opening the arteries behind the ears in chronic pains of the head. He wrote alfo upon midwifery. Fabricius ab Aquapendente, a celebrated furgeon of the 16th century, has followed Celfus and Paulus as text-books.

From the time of Paulus Egineta to the year 900, no writer of any confequence, either on medicine or furgery, appeared. At this time the Arabian phyficians, Rhazes and Avicenna, revived in the eaft the medical art, which, as well as others, was almoft entirely extinguifhed in the weft. Avicenna's *Canon Medicinæ*, or General Syftem of Medicine and Surgery, was for many ages celebrated through all the fchools of phyfic. It was principally compiled from the writings of Galen and Rhazes. The latter had correctly defcribed the fpina ventofa, accompanied with an enlargement of the bone, caries, and acute pain. In difficult labours, he recommends the fillet to affift in the extraction of the fœtus; and for the fame purpofe, Avicenna recommends the forceps. He defcribes the compofition of feveral cofmetics to polifh the fkin, and make the hair grow, or fall off.

Notwithftanding this, however, it was not till the time of Albucafis that furgery came into repute among the Arabians. Rhazes complains of their grofs ignorance, and that the manual operations were performed by the phyficians' fervants. Albucafis enumerates a tremendous lift of operations, fufficient to fill us with horror. The hot iron and cauteries were favourite remedies of the Arabians; and, in inveterate pains, they repofed, like the Egyptians and eaftern Afiatics, great confidence in burning the part. He defcribes accurately the manner of tapping in afcites; mentions feveral kinds of inftruments for drawing blood; and has left a more ample and correct delineation of furgical inftruments than any of the ancients. He gives various obftetrical directions for extracting the fœtus in cafes of difficult labour. He mentions the bronchocele, or prominent tumor on the neck, which, he tells us, was moft frequent among the female fex. We are alfo informed by this writer, that the delicacy of the Arabian women did not permit male furgeons to perform lithotomy on females; but when neceffary, it was executed by one of their own fex.

From the 11th century to the middle of the 14th, the hiftory of furgery affords nothing remarkable except the importation of that naufeous difeafe the leprofy into Europe. Towards the end of the 15th century the venereal difeafe is faid to have been imported from America by the firft difcoverers of that continent.

At the beginning of the 16th century, furgery was held in contempt in this ifland, and was practifed indifcriminately by barbers, farriers, and fow-gelders. Barbers and furgeons continued, for 200 years after, to be incorporated in one company both in London and Paris. In Holland and fome parts of Germany, even at this day, barbers exercife the razor and lancet alternately.

It is within the laft three centuries that we have any confiderable improvement in furgery; nor do we know of any eminent Britifh furgical writers until within the laft 130 years. "In Germany (fays Heifter) all the different furgical operations, at the beginning even of the 18th century, were left to empirics; while regular practitioners were contented to cure a wound, open a vein or an abfcefs, return a fractured or luxated bone; but they feldom or never ventured to perform any of the difficult operations." He alfo fpeaks of their grofs ignorance of the Latin Language.

The firft furgical work of the 16th century worthy of notice is that of J. Carpus. F. ab Aquapendente, an Italian, publifhed a Syftem of Surgery; containing a defcription of the various difeafes, accidents, and operations. Boerhaave pays this author the following compliment: *Ille fuperavit omnes, et nemo illi hanc difputat gloriam; omnibus potius quam hocce carere poffumus.* About the fame period, A. Parey, a Frenchman, made feveral important additions to furgery, particularly in his collection of cafes of wounds, fractures, and other accidents which occur during war. The ancients, who were ignorant of powder and fire-arms, are defective in this part of military furgery. Parey pretends to have firft invented the method of tying with a needle and ftrong filk-thread waxed the extremities of large arteries, after the amputation of a member. The ligature of the blood veffels is, however, merely a revival of the ancient practice, which had fallen into difufe: throughout the dark ages, the hot iron, cauteries, and ftrong aftringents, were fubftituted in its place. B. Maggius and L. Botallus wrote on the cure of gun-fhot wounds. J. A. Cruce wrote a fyftem of furgery.

In the 17th century, furgery was enriched with feveral fyftems, and with detached or mifcellaneous obfervations. The principal authors are, M. A. Severinus, V. Vidius, R. Wifeman, Le Clerc, J. Scultetus, J. Mangetus, C. Magatus, Spigellius, F. Hildanus, T. Bartholin, P. de Marchett.

Since the commencement of the prefent century, furgery has been enriched with many valuable and important improvements, of the greateft part of which we have availed ourfelves in the courfe of the following treatife. But as it would far exceed the limits of a work of this nature to enumerate the names and writings of fuch authors as have lived within the above period, and befides, as it appears very unimportant to do fo, we fhall at once proceed to the next part of our fubject.

Chap. I. *Of Wounds.*

Sect. I. *Of Simple Wounds.*

The firft thing to be confidered in the infpection of a wound is, whether it is likely to prove mortal or not. This knowledge can only be had from anatomy, by which the furgeon will be able to determine what parts are injured; and, from the offices which thefe parts are calculated to perform, whether the human frame can fubfift under fuch injuries. It is not, however, eafy for the moft expert anatomift always to prognofticate the event with certainty; but this rule he ought always to lay down to himfelf, to draw the moft favourable prognofis the cafe will bear, or even more than the rules of his art will allow. This is particularly incumbent on him in fea engagements, where the fentence of death is executed as foon as pronounced, and the miferable patient is thrown alive into the fea, upon the furgeon's declaring his wound to be mortal. There are, befides, many inftances on record, where wounds have healed, which the moft fkilful furgeons have deemed mortal. The following wounds may be reckoned mortal.

1. Thofe which penetrate the cavities of the heart, and all thofe wounds of the vifcera where the large blood-veffels are opened; becaufe their fituation will not admit of proper applications to reftrain the flux of blood.

2. Thofe which obftruct or entirely cut off the paffage of the nervous influence through the body. Such are wounds of the brain, cerebellum, medulla oblongata, and fpinal marrow; though the brain is fometimes injured, and yet the patient recovers. Wounds likewife of the fmall blood-veffels within the brain are attended with great danger, from the effufed fluids preffing upon the brain. Nor is there lefs danger where the nerves which tend to the heart are wounded, or entirely

divided; for, after this, it is impoffible for the heart to continue its motion.

3. All wounds which entirely deprive the animal of the faculty of breathing.

4. Thofe wounds which interrupt the courfe of the chyle to the heart; fuch are wounds of the receptacle of the chyle, thoracic duct, and larger lacteals, &c.

5. There are other wounds which prove fatal if neglected and left to nature: fuch are wounds of the larger external blood-veffels, which might be remedied by ligature.

In examining wounds, the next confideration is, whether the parts injured are fuch as may be fuppofed to induce dangerous fymptoms, either immediately or in fome time during the courfe of the cure. In order to proceed with any degree of certainty, it is neceffary to be well acquainted with thofe fymptoms which attend injuries of the different parts of the body. If the fkin only and part of the cellular fubftance is divided, the firft confequence is an effufion of blood; the lips of the wound retract, become tumefied, red and inflamed, leaving a gap of confiderable widenefs according to the length and deepnefs of the wound. Befides, if a very confiderable portion of fkin and cellular fubftance is divided, a flight fever feizes the patient; the effufion of blood in the mean time ftops, and the wound is partly filled up with a cake of coagulated blood. Below this cake, the fmall veffels pour forth a clear liquor, which in a fhort time is converted into pus (fee the articles Pus and Mucus). Below this pus granulations of new flefh arife, the cake of coagulated blood loofens, a new fkin covers the place where the wound was, and the whole is healed up; only there remains a mark, called a *cicatrix* or *fcar*, fhowing where the injury had been received.

All wounds are accompanied with a confiderable degree of pain, efpecially when the inflammation comes on, though the divifion reaches no farther than the fkin and cellular fubftance. If the mufcular fibres are divided, the pain is much greater, becaufe the found part of the mufcle is ftretched by the contraction of the divided part and the action of the antagonift mufcle, which it is now lefs fitted to bear. The wound alfo gaps much more than where the cellular fubftance only is divided, infomuch that, if left to itfelf, the fkin will cover the mufcular fibres, without any intervention of cellular fubftance; and not only a very unfightly cicatrix remains, but the ufe of the mufcle is in fome meafure loft.—If the mufcle happens to be totally divided, its parts retract to a very confiderable diftance; and unlefs proper methods be taken, the ufe of it is certainly loft ever afterwards.

If by a wound any confiderable *artery* happens to be divided, the blood flows out with great velocity, and by ftarts; the patient foon becomes faint with lofs of blood; nor does the hæmorrhagy ftop until he faints away altogether, when the ends of the divided veffel clofe by their natural contractility; and if as much *vis vitæ* ftill remains as is fufficient to renew the operations of life, he recovers after fome time, and the wound heals up as ufual. The part of the artery which is below the wound in the mean time becomes ufelefs, and its fides collapfe, fo that all the inferior part of the limb would be deprived of blood, were it not that the fmall branches fent off from the artery above the wounded place become enlarged, and capable of carrying on the circulation. Nature alfo, after a wonderful manner, often produces new veffels from the fuperior extremity of the divided artery, by which the circulation is carried on as formerly. However, the confequences of fuch a profufe hæmorrhagy may be very dangerous to the patient, by inducing extreme debility, polypous concretions in the heart and large veffels, or an univerfal dropfy. This happens efpecially where the artery is partially divided; becaufe then the veffel cannot contract in fuch a manner as to clofe the orifice: however, if the wound is but fmall, the blood gets into the cellular fubftance, fwelling up the member to an extreme degree, forming what is called a *diffufed aneurifm*. Thus the hæmorrhagy foon ftops externally, but great mifchief is apt to flow from the confinement of the extravafated blood, which is found to have the power of diffolving not only the flefhy parts, but alfo the bones themfelves; and thus not only the ufe of the limb is entirely loft, but the patient is brought into great danger of his life, if proper affiftance be not obtained in a fhort time.

Wounds of the *ligaments*, *nerves*, and *tendons*, are likewife attended with bad confequences. When a nerve is entirely divided, the pain is but trifling, though the confequences are often dangerous. If the nerve is large, all the parts to which it is diftributed below the wound immediately lofe the power of motion and fenfation; nor is it uncommon, in fuch cafes, for them to be feized with a gangrene. This, however, takes place only when all or the greateft part of the nerves belonging to a particular part are divided. If the fpinal marrow, for inftance, be divided near the head, the parts below foon lofe their action irrecoverably; or if the bundle of nerves paffing out of the axilla be divided or tied, fenfation in the greateft part of the arm below will probably be loft. But though a nerve fhould be divided, and a temporary palfy be produced, it may again reunite, and perform its former functions. If a nerve be wounded only, inftead of being divided, the worft fymptoms frequently enfue.

Wounds which penetrate the cavities of the *thorax* are always exceedingly dangerous, becaufe there is fcarce a poffibility of all the vifcera efcaping unhurt. A wound is known to have penetrated the cavity of the thorax principally by the difcharge of air from it at each infpiration of the patient, by an extreme difficulty of breathing, coughing up blood, &c. Such wounds, however, are not always mortal; the lungs have frequently been wounded, and yet the patient has recovered.—Wounds of the diaphragm are almoft always mortal, either by inducing fatal convulfions immediately, or by the afcent of the ftomach, which the preffure of the abdominal mufcles forces up through the wound into the cavity of the thorax; of this Van Swieten gives feveral inftances.—Even though the wound does not penetrate into the cavity of the thorax, the very worft fymptoms may follow. For if the wound defcends deeply among the mufcles, and its orifice lies higher, the extravafated humours will be therein collected, ftagnate, and corrupt in fuch a manner as to form various finufes; and after having eroded the pleura, it may at length pafs into the cavity of the thorax. The matter having once found a vent into this cavity, will be continually augmenting from the difcharge of the finuous ulcer, and the lungs will at laft fuffer by the furrounding matter. If, in cafes of wounds in the thorax, the ribs or fternum happen to become carious, the cure will be extremely tedious and difficult. Galen relates the cafe of a lad who received a blow upon his fternum in the field of exercife: it was firft neglected, and afterwards badly healed; but, four months afterwards, matter appeared in the part which had received the blow. A phyfician made an incifion into the part, and it was foon after cicatrized: but in a fhort time a new collection of matter made its appearance, and upon a fecond incifion the wound refufed to heal. Galen found the fternum carious; and having cut off the difeafed part, the pericardium itfelf was obferved to be corroded, fo that the heart could be feen quite naked; notwithftanding which, the wound was cured in no very long time.

There is fometimes difficulty in determining whether the wound has really penetrated into the thorax or the abdomen; for the former defcends much farther towards the fides than at the middle. But as the lungs are almoft always wounded

when the cavity of the thorax is penetrated, the ſymptoms ariſing from thence can ſcarcely be miſtaken.—Another ſymptom which frequently, though not always, attends wounds of the thorax, is an *emphyſema*. This is occaſioned by the air eſcaping from the wounded lungs, and inſinuating itſelf into the cellular ſubſtance; which being pervious to it over the whole body, the tumor paſſes from one part to another, till at laſt every part is inflated to a ſurpriſing degree. An inſtance is given in the Memoirs of the Royal Academy, of a tumor of this kind, which on the thorax was eleven inches thick, on the abdomen nine, on the neck ſix, and on the reſt of the body four; the eyes were in a great meaſure thruſt out of their orbits by the inflation of the cellular ſubſtance; and the patient died the fifth day. This was occaſioned by a ſtab with a ſword.

Wounds of the *abdomen* are not leſs dangerous than thoſe of the thorax, on account of the importance of the viſcera which are lodged there. When the wound does not penetrate the cavity, there is ſome danger of an hernia being formed by the protruſion of the peritonæum through the weakened integuments, and the danger is greater the larger the wound is. Thoſe wounds which run obliquely betwixt the interſtices of the muſcles often produce ſinuous ulcers of a bad kind. For as there is always a large quantity of fat interpoſed everywhere betwixt the muſcles of the abdomen, if a wound happens to run between them, the extravaſated humours, or matter there collected, not meeting with free egreſs through the mouth of the wound, often makes its way in a ſurpriſing manner through the cellular ſubſtance, and forms deep ſinuoſities between the muſcles; in which caſe the cure is always difficult, and ſometimes impoſſible.

If a large wound penetrates the cavity of the abdomen, ſome of the viſcera will certainly be protruded through it; or if the wound is but ſmall, and cloſed up with fat ſo that none of the inteſtines can be protruded, we may know that the cavity of the abdomen is pierced, and probably ſome of the viſcera wounded, by the acute pain and fever, paleneſs, anxiety, faintings, hickcough, cold ſweats, and weakened pulſe, all of which accompany injuries of the internal parts. The miſchiefs which attend wounds of this kind proceed not only from the injury done to the viſcera themſelves, but from the extravaſation of blood and the diſcharge of the contents of the inteſtines into the cavity of the abdomen; which, being of a very putreſcent nature, ſoon bring on the moſt violent diſorders. Hence wounds of the abdominal viſcera are very often mortal. This, however, is not always the caſe, for the ſmall inteſtines have been totally divided, and yet the patient has recovered. Wounds both of the ſmall and large inteſtines have healed ſpontaneouſly, even when they were of ſuch magnitude that the contents of the inteſtine was freely diſcharged through the wound in it, and after part of the inteſtine itſelf has been protruded through the wound of the integuments.

When the *meſentery* is injured, the danger is extreme, on account of the numerous veſſels and nerves ſituated there. Wounds of the liver, ſpleen, and pancreas, are alſo exceedingly dangerous, although there are ſome inſtances of the ſpleen being cut out of living animals without any conſiderable injury.

From the preceding account of the ſymptoms attending wounds in the different parts of the body, the ſurgeon may be enabled to judge in ſome meaſure of the event; though it muſt always be remembered, that wounds, even thoſe which ſeemed to be of the ſlighteſt nature, have, contrary to all expectation, proved mortal, chiefly by inducing convulſions, or a locked jaw; ſo that no certain prognoſtic can be drawn on ſight of recent wounds. We ſhall now, however, proceed to conſider their treatment.

Treatment of wounds.] For the cure of wounds, it has been already obſerved, that the ancients imagined balſams, the juice of herbs, &c. to be a kind of ſpecifics. In after-ages, and in countries where balſams are not eaſily to be procured, ſalves have been ſubſtituted in their place; and even at this day there are many who reckon a ſalve or ointment eſſentially neceſſary for healing the ſlighteſt cut. It is certain, however, that the cure of wounds cannot be effected, nay, not even forwarded in the leaſt, by ointments, unleſs in particular caſes or by accident. That power which the human frame has of repairing the injuries done to itſelf, which by phyſicians is called *vis medicatrix naturæ*, is the ſole agent in curing external injuries; and without this the moſt celebrated balſams would prove ineffectual. When a wound has been made with a ſharp inſtrument, and is not extenſive, if it be immediately cleaned, and all the extravaſated blood ſucked out, it will almoſt always heal by the firſt intention in a very ſhort time. Indeed the cures performed by this ſimple proceſs are ſo ſurpriſing, that they would be incredible were we not aſſured of their reality by eye-witneſſes. When this proceſs is either neglected or proves unſucceſsful, there are three ſtages to be obſerved in the cure of a wound: the firſt, called *digeſtion*, takes place when the ends of the wounded veſſels contract themſelves, and pour out the liquor which is converted into pus. As ſoon as this appears, the ſecond ſtage, in which the fleſh begins to *grow up*, takes place; and as this proceeds, the edges of the wound acquire a fine bluiſh or pearl colour, which is that of the new ſkin beginning to cover the wound as far as the fleſh has filled it up. This proceſs continues, and the ſkin advances from all ſides towards the centre, which is called the *cicatrizing* of the wound. For the promoting of each of theſe proceſſes, ſeveral ointments were formerly much in vogue. But it is now found, that no ointment whatever is capable of promoting them; and that it is only neceſſary to keep the wound clean, and to prevent the air from having acceſs to it. This, indeed, nature takes care to do, by covering the wound with a cake of coagulated blood; but if a wound of any conſiderable magnitude ſhould be left entirely to nature, the pus would form below the cruſt of coagulated blood in ſuch quantity, that it would moſt probably corrupt, and the wound degenerate into a corroding ulcer. It is neceſſary, therefore, to cleanſe the wound frequently; and for this purpoſe it will be proper to apply a little ointment ſpread on ſoft ſcraped lint. For the firſt dreſſing, dry lint is uſually applied, and ought to be allowed to remain for two or three days, till the pus is perfectly formed; after which the ointment may be applied as juſt now directed; and, in a healthy body, the wound will heal without further trouble. As to the ointment employed, it is almoſt indifferent what it be, provided it has no acrid or ſtimulating ingredient in its compoſition.

But though, in general, wounds thus eaſily admit of a cure, there are ſeveral circumſtances which require a different treatment, even in ſimple diviſions of the fleſhy parts, when neither the membranous nor tendinous parts are injured. Theſe are, 1. Where the wound is large, and gapes very much, ſo that, if allowed to heal in the natural way, the patient might be greatly disfigured by the ſcar. It is proper to bring the lips of the wound near to each other, and to join them either by adheſive plaſter or by ſuture, as the wound is more ſuperficial, or lies deeper. 2. When foreign bodies are lodged in the wound, as when a cut is given by glaſs, &c. it is neceſſary by all means to extract them, before the wound is dreſſed; for it will never heal until they are diſcharged. When theſe bodies are ſituated in ſuch a manner as not to be

capable of being extracted without lacerating the adjacent parts, which would occasion violent pain and other bad symptoms, it is necessary to enlarge the wound, so that these offending bodies may be easily removed This treatment, however, is chiefly necessary in gunshot wounds, of which we shall treat in the next section. 3. When the wound is made in such a manner that it runs for some length below the skin, and the bottom is much lower than the orifice, the matter collected from all parts of the wound will be lodged in the bottom of it, where, corrupting by the heat, it will degenerate into a fistulous ulcer. To prevent this, we must use compresses, applied so that the bottom of the wound may suffer a more considerable pressure than the upper part of it. Thus the matter formed at the bottom will be gradually forced upwards, and that formed at the upper part will be incapable of descending by its weight; the divided parts, in the mean time, easily uniting when brought close together. Indeed, the power which nature has of uniting different parts of the human body is very surprising; for, according to authors of credit, even if a piece of flesh be totally cut out, and applied in a short time afterwards to the place from whence it was cut, the two will unite. That a part cut out of a living body does not entirely lose its vital power for some time, is evident from the modern practice of transplanting teeth; and from an experiment of Mr. Hunter's at London, he put the testicle of a cock into the belly of a living hen, which adhered to the liver, and became connected to it by means of blood-vessels. We have therefore the greatest reason to hope, that the divided parts of the human body, when closely applied to each other, will cohere without leaving any sinus or cavity between them. However, if this method should fail, and matter still be collected in the depending part of the wound, it will be necessary to make an opening in that part in order to let it out; after which the wound may be cured in the common way. 4. During the course of the cure, it sometimes happens that the wound, instead of filling up with fleshy granulations of a florid colour, shoots up into a glassy like substance which rises above the level of the surrounding skin, while, at the same time, instead of laudable pus, a thin ill-coloured and fetid ichor is discharged. In this case the lips of the wound lose their beautiful pearl colour, and become callous and white, nor does the cicatrizing of the wound at all advance. When this happens in a healthy patient, it generally proceeds from some improper management, especially the making use of too many emollient and relaxing medicines, an immoderate use of balsams and ointments. Frequently nothing more is requisite for taking down this fungus than dressing with dry lint; at other times deficcative powders, such as calamine, tutty, calcined alum, &c. will be necessary; and sometimes red precipitate mercury must be used. This last, however, is apt to give great pain, if sprinkled in its dry state upon the wound; it is therefore most proper to grind it with some yellow basilicon ointment, which makes a much more gentle, though at the same time an efficacious escharotic. Touching the overgrown parts with blue vitriol is also found very effectual.

Diet and regimen.] Hitherto we have considered the wounded patient as otherwise in a state of perfect health; but it must be observed, that a large wound is capable of disordering the system to a great degree, and inducing dangerous diseases which did not before exist.—If the patient be strong and vigorous, and the pain and inflammation of the wound great, a considerable degree of fever may arise, which it will be necessary to check by bleeding, low diet, and other parts of the antiphlogistic regimen, at the same time that the inflamed lips of the wound and parts adjacent are to be treated with emollient fomentations or cataplasms till the pain and swelling abate. On the other hand, it may happen, when the patient is of a weak and lax habit, that the vis vitæ may not be sufficient to excite such an inflammation in the wound as is absolutely necessary for its cure. In this case, the edges of the wound look pale and soft; the wound itself ichorous and bloody, without any signs of fleshy granulations; or if any new flesh shoots up, it is of the fungous glassy kind above mentioned. To such wounds all external applications are vain; it is necessary to strengthen the patient by proper internal remedies, among which the bark has a principal place, until the wound begins to alter its appearance. In such persons, too, there is some danger of a hectic fever by the absorption of matter into the body when the wound is large; and this will take place during the course of the cure, even when the appearances have been at first as favourable as could be wished. This happens generally when the wound is large, and a great quantity of matter formed: for by this discharge the patient is weakened; so that the pus is no sooner formed, than it is by the absorbent vessels re-conveyed into the body, and feverish heats immediately affect the patient. For this the best remedy is to exhibit the bark copiously, at the same time supporting the patient by proper cordials and nourishing diet. Indeed, in general, it will be found, that, in the case of wounds of any considerable magnitude, a more full and nourishing regimen is required than the patient, even in health, has been accustomed to; for the discharge of pus alone, where the quantity is considerable, proves very debilitating, if the patient is not strengthened by proper diet. And it is constantly found, that the cure of such sores goes on much more easily when the patient is kept in his usual habit of body, than when his system is much emaciated by a very low allowance; and, for the same reason, purgatives, and whatever else tends to weaken the constitution, are improper in the cure of wounds.

Hæmorrhagies.] Profuse bleeding very frequently happens in wounds, either from a division of one large artery, or of a number of small ones. In this case, the first step to be taken by the surgeon is to effect a temporary stoppage of the blood by means of compression. He is then to tie up all the vessels in the manner to be afterwards described.

When the principal arteries of a wound have been tied, and a little blood continues to be discharged, but appears to come from sundry small vessels only, an experienced surgeon is induced to think, that the necessary compression of the bandages will in all probability effect a total stoppage of the hæmorrhagy. In a general oozing of a small quantity of blood from the whole surface of a sore, and when no particular vessel can be distinguished, there is a necessity for trusting to this remedy; but whenever an artery can be discovered, of whatever size it may be, it ought unquestionably to be secured by a ligature. But it frequently happens, that considerable quantities of blood are discharged, not from any particular vessel, but from all the small arteries over the surface of the sore. In wounds of great extent, particularly after the extirpation of cancerous breasts, and in other operations where extensive sores are left, this species of hæmorrhagy often proves very troublesome by being exceedingly difficult to suppress.

Bleedings of this kind seem evidently to proceed from two very different and opposite causes. *First*, Either from too great a quantity of blood contained in the vessels, or from an over degree of tone in the vessels themselves; or, perhaps, from a combination of both these causes. But, *secondly*, Such evacuations undoubtedly happen most frequently in such constitutions as are very relaxed and debilitated; either from a particular state of the blood, or from a want of tone in the containing vessels, or, in some instances, from a concurrence of both.

In constitutions perfectly healthy, on the occurrence of

wounds even of the moſt extenſive nature, as ſoon as the larger arteries are ſecured, all the ſmall veſſels which have been divided are diminiſhed, not only in their diameters, but alſo in their length; in conſequence of which, they recede conſiderably within the ſurface of the ſurrounding parts. This cauſe of itſelf would probably, in the greateſt number of inſtances, prove ſufficient for reſtraining all loſs of blood from the ſmaller arteries. Another very powerful agent however is provided by nature for producing the ſame effect. From the extremities of the divided veſſels which at firſt diſcharged red blood only, there now, in their contracted ſtate, oozes out a more thin, though viſcid fluid, containing a great proportion of the coagulable parts of the blood; and this being equally diſtributed over the ſurface of the wound, by its balſamic agglutinating powers has a very conſiderable influence in reſtraining all ſuch hæmorrhagies.

When a tedious oozing occurs in a patient young and vigorous, and where the tone of the muſcular fibres is evidently great, the moſt effectual means of putting a ſtop to the diſcharge is to relax the vaſcular ſyſtem, either by opening a vein in ſome other part, or, what gives ſtill more immediate relief, by untying the ligature on one of the principal arteries of the part, ſo as to allow it to bleed freely: thoſe violent ſpaſmodic twitchings too, ſo frequent after operations on any of the extremities, when they do not depend on a nerve being included in the ligature with the artery, are in this manner more effectually relieved than by any other means.

By the ſame means the patient, from being in a febrile heat and much confuſed, ſoon becomes very tranquil: the violent pulſation of the heart and larger arteries abates, and the blood not being propelled with ſuch impetuoſity into the ſmaller veſſels of the part, they are thereby left at more liberty to retract. In the mean time the patient ought to be kept exceedingly cool; wine and other cordials ſhould be rigidly avoided; cold water, acidulated either with the mineral or vegetable acids, ought to be the only drink; motion of every kind, particularly of the part affected, ſhould be guarded againſt; and the wound being gently covered with ſoft charpie, ought to be tied up with a bandage ſo applied as to produce a moderate degree of preſſure on the extremities of the divided parts.

As ſoon as a ſufficient quantity of blood has been diſcharged, the wound being dreſſed, and the patient laid to reſt, a doſe of opium proportioned to the violence of the ſymptoms ought to be immediately exhibited. It ought to be remarked, however, that in all ſuch circumſtances, much larger doſes of the remedy are neceſſary than in ordinary caſes requiring the uſe of opiates. Small doſes, inſtead of anſwering any good purpoſe, ſeem frequently rather to aggravate the various ſymptoms; ſo that whenever they are here had recourſe to, they ought always to be given in quantities ſufficient for the intended effect.

But hæmorrhagies of this nature happen much more frequently in relaxed enfeebled habits, where the ſolids have loſt part of their natural firmneſs, and the fluids have acquired a morbid tenuity. In this caſe a moderate uſe of generous wine ought to be immediately preſcribed; for nothing tends ſo much, in ſuch circumſtances, to reſtrain hæmorrhagies, as a well directed uſe of proper cordials. By tending to invigorate and brace the ſolids, they enable the arterial ſyſtem to give a due reſiſtance to the contained fluids; and have alſo a conſiderable influence in reſtoring to the fluids that viſcidity of texture, of which in all ſuch inſtances we ſuppoſe them to be deprived.

A nouriſhing diet alſo becomes proper; the patient ought to be kept cool, and the mineral acids, from their known utility in every ſpecies of hæmorrhagy, ought alſo to be preſcribed. Reſt of body is here alſo proper; and opiates, when indicated either by pain or ſpaſmodic affections of the muſcles, ought never to be omitted.

Together with theſe remedies adapted to the general ſyſtem, particular dreſſings, appropriated to the ſtate of the parts to which they are to be applied, have been found very beneficial. In healthy conſtitutions, ſoon after the diſcharge of blood is over, the parts are covered with a viſcid coagulable effuſion from the mouths of the now retracted arteries; but in conſtitutions of an oppoſite nature, where the ſolids are much relaxed, the blood in general is found in ſuch an attenuated ſtate as to afford no ſecretion of this nature.

To ſupply as much as poſſible the deficiency of this natural balſam, different artificial applications have been invented. Duſting the part with ſtarch or wheat-flour has ſometimes been found of uſe, and gum-arabic in fine powder has been known to anſwer when theſe failed.

Applications of this kind, indeed, have been uſed with ſucceſs in all ſuch hæmorrhagies, with whatever habit of body they happen to be connected; but they have always proved more particularly ſerviceable in relaxed conſtitutions, attended with an attenuated ſtate of the blood and an enfeebled muſcular ſyſtem. Alcohol, or any other ardent ſpirits, impregnated with as great a quantity as they can diſſolve of myrrh, or any other of the heating viſcid gums, may be here uſed with freedom, though in conſtitutions of an oppoſite nature they ought never to be employed. The balſamum traumaticum of the ſhops, a remedy of this nature, has long been famous for its influence in ſuch caſes: but that indiſcriminate uſe of this and ſimilar applications which has long prevailed with ſome practitioners, has undoubtedly done much harm; for as they are all poſſeſſed of very ſtimulating powers, they of courſe tend to aggravate every ſymptom in wounds connected with a tenſe ſtate of fibres, when much pain, and eſpecially when ſpaſmodic muſcular affections prevail.

By a due perſeverance in one or other of the plans here pointed out, it will ſeldom happen that hæmorrhagies of this nature are not at laſt put a ſtop to: but when the contrary does occur, when, notwithſtanding the uſe of the remedies recommended, a diſcharge of blood ſtill continues; together with the means already adviſed, an equal moderate preſſure ought to be applied over the whole ſurface of the ſore, to be continued as long as the neceſſity of the caſe ſeems to indicate.

In finiſhing the dreſſings of ſuch wounds, after the charpie and compreſſes have been applied, a bandage properly adapted to the part ought to conclude the whole, and in ſuch a manner as to produce as equal a degree of preſſure over the ſurface of the ſore as poſſible. But it now and then happens that no bandage whatever can be ſo applied as to produce the deſired effect; and in ſuch caſes the hand of an aſſiſtant is the only reſource; which being firmly applied over the dreſſings, ſo as to produce a very equal degree of preſſure, will commonly ſucceed when no other remedy is found to have much influence.

Injuries from blood-letting.] Wounds of the nerves, tendons, and ligaments, are attended with much more violent ſymptoms than thoſe where even conſiderable arteries are divided, and frequently reſiſt every method of cure propoſed by the moſt ſkilful practitioners. In the ſimple proceſs of blood-letting, it frequently happens that the tendinous expanſion called the *aponeuroſis* of the biceps muſcle is wounded, or even the tendon of that muſcle itſelf is punctured, by the point of the lancet; or ſometimes a nerve which happens to lie in the neighbourhood is partially divided. Any one of theſe wounds, though they are the ſmalleſt we can well ſuppoſe to be given, are frequently very dangerous and difficult of

cure. It sometimes immediately happens on the introduction of the lancet, that the patient complains of a most exquisite degree of pain; and when this occurs, we may rest assured that either a nerve or tendon has been wounded. On some occasions, by proper management, such as evacuating a considerable quantity of blood at the orifice newly made, by keeping the part at perfect rest, and preserving the patient in as cool a state as possible, the pain at first complained of will gradually abate, and at last go off entirely, without any bad consequence whatever. At other times, however, this pain which occurs instantaneously on the introduction of the lancet, instead of abating, begins soon to increase; a fullness, or small degree of swelling, takes place in the parts contiguous to the wound; the lips of the sore become somewhat hard and inflamed; and in the course of twenty-four hours or so from the operation, a thin watery serum begins to be discharged at the orifice.

If, by the means employed, relief is not soon obtained, these symptoms generally continue in nearly the same state for two or perhaps three days longer. At this time the violent pain which at first took place becomes still more distressing; but instead of being sharp and acute as before, it is now attended with the sensation of a burning heat, which still goes on to increase, and proves, during the whole course of the aliment, a source of constant distress to the patient. The fullness and hardness in the lips of the wound begin to increase, and the swelling in the neighbouring parts gradually extends over the whole members. The parts at last become exceedingly tense and hard; an erysipelatous inflammatory colour frequently appears over the whole member; the pulse by this time has generally become very hard and quick; the pain is now intense, the patient exceedingly restless: twitchings of the tendons occur to a greater or lesser degree; on some occasions, a locked jaw and other convulsive affections supervene; and all these symptoms continuing to increase, it most frequently happens that the torture under which the patient has been groaning is at last terminated by death.

Different opinions have prevailed respecting the cause of these symptoms. By some they have been imputed to wounds of the tendons. By others the tendons are supposed to be so entirely destitute of sensibility, as to be quite incapable of producing so much distress; so that wounds of the nerves they consider, on all such occasions, as the true cause of the various symptoms we have mentioned.

One or other of these ideas continued to be the only source for explaining the various phenomena found to occur in this malady, till a different opinion was suggested by the late ingenious Mr. John Hunter. Mr. Hunter supposes, that all the dreadful symptoms found now and then to be induced by the operation of blood-letting, may be more readily accounted for from an inflamed state of the internal surface of the vein, than from any other cause. Such a state of the vein he has often traced in horses that have died of such symptoms from venesection, and the same appearances have sometimes occurred also in the human body. And on other occasions, inflammation having in this manner been once excited, has been known to terminate in suppuration; and the matter thus produced being in the course of circulation carried to the heart, Mr. Hunter supposes, that in such cases death may have been induced by that cause alone.

There can be no reason to doubt the fact held forth by Mr. Hunter, that in such instances the vein in which the orifice has been made has frequently after death been found greatly inflamed: but however ingenious his arguments may be for concluding that the state of the vein is the original cause of all the bad symptoms enumerated, and although we must allow that such an inflammatory affection of a vein must have a considerable influence in aggravating the various symptoms previously induced by other causes; yet we may very fairly conclude, that it could not probably in any one instance be able to account with satisfaction for their first production.

In many instances the patient, at the very instant of the operation, feels a very unusual degree of pain. In some cases, the violence of the pain is almost unsupportable. Now this we can never suppose to have been produced by the mere puncture of a vein; for although the coats of veins are not perhaps entirely destitute of feeling, yet we know well that they are not endowed with such a degree of sensibility as to render it probable such intense pain could ever be induced by their being punctured in any way whatever. This inflamed state of the veins therefore, as detected by Mr. Hunter after death, must be considered rather as being produced by, than as being productive of, such affections; and that such ailments should frequently produce an inflammation of the contiguous veins, is a very probable conjecture. In the course of forty-eight hours or so from the operation, when the febrile symptoms are just commencing, such a degree of hardness and evident inflammation is induced over all the parts contiguous to the orifice, that it would be surprising indeed if the vein, which is thus perhaps entirely surrounded with parts highly inflamed, should escape altogether. We shall therefore proceed upon the supposition of this inflamed state of the veins being a consequence rather than the cause of such ailments; and of course we now revert to one or other of the opinions long ago adopted on this subject, that all the train of bad symptoms found on some occasions to succeed venesection, proceeds either from the wound of a nerve or of a tendon.

That a partial wound of a nerve will now and then produce very distressing symptoms, no practitioner will deny: but it has been attempted to be shown, that tendons are almost totally destitute of sensibility; and it has therefore been supposed, that their being wounded can never account for the various symptoms known to occur in such cases. There is great reason however to think, that in different instances the same train of symptoms have been induced by different causes; that in one instance a wounded nerve, and in others pricks of the tendons, have given rise to them, as we have already supposed.

In order to prevent as much as possible the consequent inflammation and other symptoms which usually ensue, a considerable quantity of blood should be immediately discharged at the orifice just made: the limb, for several days at least, ought to be kept in a state of perfect rest, care being at the same time taken to keep the muscles of the part in as relaxed a state as possible: the patient should be kept cool; on a low diet; and, if necessary, gentle laxatives ought to be administered.

When, notwithstanding these means, the symptoms, instead of diminishing, rather become more violent; if the lips of the orifice turn hard and more inflamed, if the pain becomes more considerable, and especially if the swelling begins to spread, other remedies come then to be indicated. In this state of the complaint, topical blood-letting, by means of leeches applied as near as possible to the lips of the wound, frequently affords much relief; and when the pulse is full and quick, it even becomes necessary to evacuate large quantities of blood by opening a vein in some other part.

The external applications usually employed in this state of the complaint are warm emollient fomentations and poultices. In similar affections of other parts no remedies with which we are acquainted would probably be found more successful; but in the complaint now under consideration, all such applications, instead of being productive of any advantage, rather do harm. The heat of the part is here one of the most distressing

ſymptoms; and warm emollient applications rather tend to augment this ſource of uneaſineſs. The lips of the wound alſo are rendered ſtill more hard, ſwelled, and of courſe more painful; and the ſwelling of the contiguous parts is increaſed. The beſt external remedies are cooling aſtringents, eſpecially the faturnine applications. The parts chiefly affected being alternately covered over with cloths wet with a ſolution of ſaccharum ſaturni, and pledgits ſpread with Goulard's cerate, are kept more cool and eaſy than by any other remedy hitherto uſed. The febrile ſymptoms which occur muſt at the ſame time be attended to, by keeping the patient cool, on a low diet, preſerving a lax ſtate of the bowels; and, if neceſſary, further quantities of blood ought to be evacuated.

On account of the violence of the pain, which is ſometimes ſo exceſſive as to deſtroy entirely the patient's reſt, opiates ought to be freely exhibited: and when twitchings of the tendons and other convulſive ſymptoms ſupervene, medicines of this kind become ſtill more neceſſary. In order, however, to have a proper influence in this ſtate of the complaint, opiates ought to be given in very full doſes; otherwiſe, inſtead of anſwering any good purpoſe, they conſtantly tend to aggravate the different ſymptoms, not only by increaſing the heat and reſtleſſneſs, but by having an evident influence in rendering the ſyſtem more ſuſceptible than it was before of the pain and other diſtreſſing effects produced upon it by the wound.

It often happens, however, either from neglecting the wound or from improper treatment, that all theſe remedies are had recourſe to without any advantage whatever: the fever, pain, and ſwelling of the parts continuing, convulſive affections of the muſcles at laſt occur, all tending to indicate the moſt imminent danger. In this ſituation of matters, if we have not immediate recourſe to ſome effectual means, the patient will ſoon fall a victim to the diſorder: and the only remedy from which much real advantage is to be expected, is a free and extenſive diviſion of the parts in which the orifice producing all the miſchief was at firſt made. We know well, from the repeated experience of ages, that much more pain and diſtreſs of every kind is commonly produced by the partial diviſion either of a nerve or of a tendon, than from any of theſe parts being at once cut entirely acroſs. Now the intention of the operation here recommended, is to produce a complete diviſion of the nerve or tendon we ſuppoſe to have been wounded by the point of the lancet, and which we conſider as the ſole cauſe of all the ſubſequent diſtreſs.

This operation being attended with a good deal of pain, and being put in practice for the removal of ſymptoms from which it is perhaps difficult to perſuade the patient that much danger can occur, all the remedies we have mentioned ſhould be firſt made trial of before it is propoſed: but at the ſame time, care ought to be taken that the diſorder is not allowed to proceed too far before we have recourſe to it; for if the patient ſhould be previouſly much weakened by the feveriſh ſymptoms having continued violent for any length of time, neither this remedy, nor any other with which we are acquainted, would probably have much influence. So ſoon therefore as the courſe already preſcribed has been fairly tried, and is found to be inadequate to the effects expected from it, we ought immediately to have recourſe to a free diviſion of the parts chiefly affected.

Wherever a *wounded or ruptured tendon* may be ſituated, the limb ſhould be placed in ſuch a manner as will moſt readily admit of the retracted ends of the tendon being brought nearly together; and when in this ſituation, the muſcles of the whole limb in which the injury has happened muſt be tied down with a roller, ſo as to prevent them from all kinds of exertion during the cure, endeavouring at the ſame time to keep the parts eaſy and relaxed. Thus in a wound or rupture of the tendon of the rectus muſcle of the thigh, the patient's *leg* ſhould be kept as much as poſſible ſtretched out during the cure, while the thigh ſhould be in ſome degree bent, to relax the muſcle itſelf as far as poſſible.

In ſimilar affections of the tendo Achillis, the *knee* ſhould be kept conſtantly bent to relax the muſcles of the leg, and the foot ſhould be ſtretched out to admit of the ends of the ruptured tendon being brought nearly into contact. A roller ſhould be applied with a firmneſs quite ſufficient for ſecuring the muſcles and tendons in this ſituation; but care muſt be taken to prevent it from impeding the circulation. With this view, fine ſoft flannel ſhould be preferred either to linen or cotton; for being more elaſtic, it more readily yields to any ſwelling with which the limb may be attacked.

The late Dr. Monro was the firſt who gave any accurate directions for the treatment of rupture in the large tendons; and it is perhaps given with more preciſion, from his having himſelf experienced the effects of this misfortune in the tendo Achillis.

He uſed a foot-ſock or ſlipper, made of double quilted ticking, and left open at the toe; from the heel of which a ſtrap went up above the calf of the leg. A ſtrong piece of the ſame materials went round the calf, and was faſtened with a lace. On the back part of this was a buckle, through which the ſtrap of the foot-ſock was paſſed, by which the calf could be brought down, and the foot extended at pleaſure. Beſides there was a piece of tin applied to the fore part of the leg, to prevent the foot from getting into any improper poſture during ſleep. After propoſing to walk, he put on a ſhoe with a heel two inches deep; and it was not till the expiration of five months that he ventured to lay aſide the tin plate; and he continued the uſe of the high-heeled ſhoe for two years. The whole apparatus is repreſented in Pl. 27, fig. 102.

From this treatment a knowledge may be formed of the treatment neceſſary to be followed in the laceration of tendons of other parts of the body.

Wounds of the thorax.] Even though in wounds of the thorax none of the viſcera ſhould be wounded, we may yet reaſonably expect that a conſiderable quantity of blood will be extravaſated; and this, if very large, muſt be evacuated if poſſible. However, it ought to be particularly obſerved, that this extravaſated blood ſhould not be diſcharged before we are aſſured that the wounded veſſels have done bleeding. When the pulſe appears ſufficiently ſtrong and equal, the extremities are warm, no hickup or convulſion appears, and the patient's ſtrength continues, we may then know that the internal hæmorrhagy has ceaſed, and that the means for diſcharging the blood may now be ſafely uſed. Matter, water, blood, &c. have ſometimes vaniſhed from the cavities of the thorax, and been afterwards diſcharged by ſweat, urine, &c. Yet this but ſeldom happens; and if we were to truſt to nature only in theſe caſes, it is certain that many would periſh from a deſtruction of the vital viſcera by the extravaſated and putrid blood, who by an artificial extraction of the ſame blood might have been ſaved.

Wounds of the abdomen.] Theſe muſt be cloſed as ſoon as poſſible, and then treated as ſimple wounds; only they ought to be dreſſed as ſeldom and expeditiouſly as may be. A ſpare diet, with other parts of the antiphlogiſtic regimen, is here abſolutely neceſſary. It ſometimes happens, that, through a large wound of the abdominal integuments, the inteſtine comes out without being injured; yet, if it remains for any time expoſed to the air, the caſe is commonly very dangerous. The moſt certain method, in all ſuch caſes, is to return the protruded part as ſoon as poſſible; for although writers in general formerly recommended warm fomentations, &c. to be

previoufly applied, the lateft authors upon this fubject confider the moft natural and proper fomentation to be that which is produced by the heat and moifture of the patient's belly, and that therefore the inteftines, if no mortification has taken place, are to be cleared from extraneous matter, and immediately returned.

When the wound of the abdomen is large, the inteftines eafily prolapfe, but are as eafily returned. But when part of an inteftine has been forced through a narrow wound, the diforder is much more dangerous. For the prolapfed inteftine being diftended by flatus, or the ingefted aliments driven thither by the periftaltic motion, it will be inflamed, tumefied, and incapable of being returned through the ftricture of the wound; whence a ftoppage of the circulation and gangrene will foon follow. In this cafe the utmoft care it to be taken to reduce the inteftine to its natural fize. When this cannot be accomplifhed by other means, fome practitioners of great eminence have even advifed the puncturing of the inteftine in different places in order to difcharge the flatus. This practice has alfo been recommended in an incarcerated hernia, but is exceedingly difapproved of by Mr. Pott and later writers; and it feems to be very dubious whether any good can poffibly arife from it. To puncture any part that is already inflamed, muft undoubtedly add to the inflammation; and it is very improbable that the difchargeof flatus procured by the punctures would at all be a recompenfe for the bad confequences produced by the increafed inflammation. The method of Celfus is much more eligible: it is to dilate the wound fo as to reduce the inteftine with eafe. Sometimes part of the inteftine is loft either by fuppuration or gangrene. In this cafe, all that can be done is to ftrike a fingle ftitch through the wounded bowel, and to fix it to the external wound by paffing the future alfo through the fides of the wound. The ends of the inteftine may perhaps adhere; or at any rate the wound will continue to perform the office of an anus, out of which the fæces will continue to be difcharged during life. The directions given by fome furgeons about inferting the upper end of the gut into the lower, and ftitching them together, are perfectly impracticable, as Mr. John Bell has fhown in his Difcourfes on Wounds, Part II.; and even if they were practicable, would certainly produce new mortification, which could not but be fatal.

When the omentum appears prolapfed, the fame general treatment is to be obferved; only that, when it is dry and mortified, the dead part may fafely be extirpated.—We fhall conclude the article of abdominal wounds with a cafe from the Memoirs of the Academy of Sciences for the year 1705, which fhows that we ought not to defpair, even though the moft defperate fymptoms fhould take place, as long as any vis vitæ remains. A madman wounded himfelf in 18 different places of the abdomen. Eight of thefe penetrated the cavity, and injured the contained vifcera; he had a diarrhœa, naufea, and vomiting, tenfion of the abdomen, with difficult refpiration and violent fever, fo that his life was defpaired of. During the firft four days he was blooded feven times; and during the greateft part of the cure his diet confifted almoft entirely of flefh broths, with the addition of fome mild vegetables. By thefe means he was not only cured of his wounds, but reftored to his right fenfes. Seventeen months after, he went mad again, and threw himfelf over a precipice, by which he was inftantly killed: on opening the body, the wounds were found to have penetrated the middle lobe of the liver, the inteftinum jejunum, and the colon.

Such extraordinary cures are to be imputed, according to the fatisfactory explanation of Mr. J. Bell, to the abdomen being perfectly full, and conftantly fubjected to ftrong preffure between the diaphragm and abdominal mufcles; which, keeps the parts contiguous to a wound clofely applied to it, prevents the difcharge of fæces or even of blood in fome meafure, and gives an opportunity for a very fpeedy adhefion between the parts.

Wounds of the head.] In wounds of the head, where the cellular membrane only is affected, and the aponeurofis and pericranium untouched, phlebotomy, lenient purges, and the ufe of the common febrifuge medicines, particularly thofe of the neutral kind, generally remove all the threatening fymptoms. When the inflammation is gone off, it leaves on the fkin a yellowifh tint and a dry fcurf, which continue until perfpiration takes them away; and upon the removal of the difeafe, the wound immediately recovers a healthy afpect, and foon heals without further trouble. But in the worft kind of thefe wounds, that is, where a fmall wound paffes through the tela cellulofa and aponeurofis to the pericranium, the patient will admit of more free evacuations by phlebotomy than in the former. In both, the ufe of warm fomentations is required; but an emollient cataplafm, which is generally forbid in the eryfipelatous fwellings, may in this latter cafe be ufed to great advantage. Where the fymptoms are not very preffing, nor the habit very inflammable, this method will prove fufficient; but it fometimes happens that the fcalp is fo tenfe, the pain fo great, and the fymptomatic fever fo high, that by waiting for the flow effect of fuch means the patient runs a rifk from the continuance of the fever; or elfe the injured aponeurofis and pericranium, becoming floughy, produce an abfcefs, and render the cafe both tedious and troublefome. A divifion of the wounded part, by a fimple incifion down to the bone, about half an inch or an inch in length, will moft commonly remove all the bad fymptoms; and if it be done in time, will render every thing elfe unneceffary.

The wounds penetrating into the cavities of the joints do not feem at firft alarming; yet, by expofure to the air, the lining membrane of fuch cavities acquire fuch a degree of fenfibility as to endanger life when they are large As foon therefore as any extraneous body, pufhed into the joint, is removed, the admiffion of the external air s to be guarded againft as much as poffible. If the wound be not too large, this may be done by pulling the fkin over the wound of the joint; and, to prevent its retraction, rather adhefive plafter, with proper bandaging, is to be ufed. But when inflammation is come on, repeated and copious blood-letting, together with fomentations, become neceffary; and as the pain, in thefe cafes, is apt to be violent, opiates muft be adminiftered; but fhould matter be formed in the cavity of the joint, free vent muft be give to it.

SECT. II. *Of contufed and lacerated Wounds.*

WHEN the fmall veffels are broken by a blow with any hard inftrument without penetrating the fkin, at the fame time that the folid fibres of the part are crufhed, the injury is termed a *contufion*: and when at, the fame time the fkin is broken, it is termed a *contufed and lacerated wound*; becaufe in this cafe the parts are not fairly divided as with a knife, but torn afunder, or violently ftretched.

Every contufion therefore, whether the fkin is broken or not, may properly be reckoned a wound; for where the injury is fo flight that none of the contents of the fmall veffels are extravafated, it fcarce deferves to be mentioned. The immediate confequence of a contufion, therefore. is a fwelling, by reafon of the extravafation juft mentioned; and the fkin becomes difcoloured by the blood ftagnating under it: but as this fluid, even though covered by the fkin, cannot long remain in its natural ftate, it thence happens, that the contufed part foon lofes its florid red colour, and becomes blue or black;

the thinner parts being in the mean time gradually taken up by the abſorbent veſſels, which at laſt happens to the blood itſelf; the blue diſappears, and is ſucceeded by a yellowiſh colour, ſhowing that the blood is now diſſolved; after which the part recovers its former appearance, and the ruptured veſſels appear to have united as though nothing had happened.

Theſe are the ſymptoms which attend the ſlighteſt kind of contuſions; but it is evident, that where the blow is ſo violent as to rupture or cruſh ſome of the large nerves, or blood-veſſels, all the bad conſequences which attend ſimple wounds of thoſe par will enſue, and they will not at all be alleviated by the circumſtance of the ſkin being whole. Hence it is eaſy to ſee how a contuſion may produce ulcers of the worſt kind, gangrene, ſphacelus, carious bones, &c.; and if it happens to be on a glandular part, a ſcirrhus or cancer is very frequently found to enſue. Even the viſcera themſelves, eſpecially of the abdomen, may be injured by contuſions to ſuch a degree as to produce an inflammation, gangrene, or ſcirrhus, nay inſtant death, without rupturing the ſkin.

Sect. III. *Of Gun-ſhot Wounds.*

Gun-shot wounds can be conſidered in no other light than contuſed wounds. In thoſe made by a muſket or piſtol ball, the moſt immediate conſiderations are, to extract the ball, or any other extraneous body which may have lodged in the wounded part; and to ſtop the hæmorrhagy, if there is an effuſion of blood from the rupture of ſome conſiderable artery.

It is frequently neceſſary to enlarge the wound in order to extract the ball: and if it has gone quite through (provided the ſituation of the part wounded will admit of its being done with ſafety), the wound is to be laid freely open through its whole length; by which means any extraneous body will be more readily removed, and the cure facilitated.

In order to get at the ball, or any other foreign matter, probing is to be uſed as ſparingly as poſſible: and this muſt evidently appear to any one who will only conſider the nature of the ſymptoms attendant on penetrating wounds of the breaſt or belly, either from a bullet or ſharp inſtrument; the thruſting in a probe to parts under ſuch circumſtances being unavoidably a freſh ſtab on every repetition of ſuch practice. Wherever probing is neceſſary, the finger is to be preferred as the beſt and trueſt probe, where it can be uſed.

If a ball, or any other foreign body, happens to be lodged near the orifice, or can be perceived by the finger to lie under the ſkin, though at ſome diſtance from the mouth of the wound, we ſhould cut upon it and take it out: but when it is ſunk deep, and lies abſolutely beyond the reach of the finger, it muſt appear evident, upon the leaſt reflection, that thruſting, firſt a long probe in queſt of the bullet, and then, as has been practiſed likewiſe, a longer pair of forceps, either with or without teeth, into a wound of that kind, though with a ſort of certainty to extract it, muſt either contuſe, or irritate and inflame, the parts to a great degree; and conſequently do as much, or more miſchief, than the ball did at firſt by forcing its paſſage ſuch a length of way. And ſhould they at the ſame time lay hold of any conſiderable artery or nerve along with the ball (which can ſcarce ever fail of being the caſe), what ſhocking conſequences would attend ſuch a proceeding! Nor would attempts of this ſort be leſs injurious in caſe a bullet ſhould happen to be lodged in the cavity of the belly or breaſt. Such attempts are the leſs neceſſary, becauſe a great number of inſtances have occurred, were balls have been quietly lodged in ſeveral parts of the body, till after many years they have worked themſelves a paſſage towards the ſurface, and were very eaſily extracted; and many where balls have been entirely left behind.

In caſe the wound be occaſioned by a muſket or piſtol ſhot, and of courſe but ſmall, it will be neceſſary to *dilate* it without delay, provided the nature of the part will admit of this with ſafety: for in wounds near a joint, or in very membranous or tendinous parts, the knife, as well as forceps, ſhould be put under ſome reſtraint; nor ſhould any more opening be made than what is abſolutely requiſite for the free diſcharge of the matter lodged within.

Where the wounded perſon has not ſuffered any great loſs of blood, and this is generally the caſe, it will be adviſable to open a vein immediately, and take from the arm a large quantity; and to repeat bleeding as circumſtances may require, the ſecond, and even the third day. Repeated bleedings in the beginning draw after them many advantages. They prevent a good deal of pain and inflammation, leſſen any feveriſh aſſaults, forward the digeſtion, and ſeldom fail to obviate impoſthumations, and a long train of complicated ſymptoms which are wont otherwiſe to interrupt the cure, miſerably haraſs the poor patient, and too often endanger his life; and even where the feveriſh ſymptoms run high, and there is almoſt a certainty that matter is forming, bleeding, in that ſtate, is very frequently of great advantage.

For the firſt 12 days it will be proper to obſerve a cooling regimen, both in reſpect of the medicines that may be preſcribed, and the diet requiſite for the ſupport of nature. It is abſolutely neceſſary likewiſe that the body be conſtantly kept open. Unleſs, therefore, nature does this office of herſelf, a ſtool ſhould be every day procured, either by emollient clyſters or ſome gentle laxative taken at the mouth; and whenever there is much pain in the wounded parts, immediate recourſe muſt be had to opium.

[*External applications.*] Whatever is of a hot ſpirituous nature is remarkably injurious on theſe occaſions, and what no wounded part can in any degree bear. The wound may be dreſſed with pledgits of any emollient ointment; the whole being covered with a common poultice, or, in ſome caſes, the preparations of lead may be uſed. An opiate ſhould now be adminiſtered; and the part affected being placed in the eaſieſt and moſt convenient poſture, the patient ſhould be laid to reſt. The formation of matter, in every contuſed wound, is an object of the firſt importance; for, till this takes place, there is often reaſon to ſuſpect that gangrene may happen. With a view to haſten ſuppuration, the warm poultices ſhould be frequently renewed, and they ſhould be continued till the tenſion and ſwelling, with which wounds of this kind are uſually attended, be removed, and till the ſore has required a red, healthy, granulating appearance, when it is to be treated like a common ulcer.

Gun-ſhot wounds are commonly covered from the beginning with deep ſloughs, and various remedies are recommended for removing them. Every appearance, however, of this kind with which they are attended proceeds entirely from contuſion; and, excepting the injury be extenſive, the ſlough is not often perceptible, or it is ſo thin as to come away along with the matter at the firſt or ſecond dreſſing. Although emollient poultices be extremely uſeful, they ought to be no longer continued than till the effects already mentioned are produced; otherwiſe they will not only relax the parts, but alſo produce too copious a diſcharge of matter, which is ſometimes attended with great danger. A too copious flow of matter may proceed from different cauſes; but in whatever way it may have been produced, the practice to be adopted muſt be nearly the ſame. Every collection which appears muſt have a free outlet, and the limb laid in that poſture which will moſt readily admit of its running off. In ſuch circumſtances, nouriſhing diet and Peruvian bark in conſiderable quantities are highly uſeful. When the diſcharge continues copious, in ſpite of every effort to check

it, detached pieces of bone or ſome extraneous matter are probably the cauſe. In ſuch a ſituation nothing will leſſen the quantity of matter till ſuch ſubſtances be removed. The wound ought therefore again to be examined, and looſe bodies removed. Pieces of cloth have been known to be removed by ſetons, when that method was practicable, after every other method had failed. Opium likewiſe is frequently uſeful in checking an exceſſive diſcharge, when it happens to be kept up by irritation.

Although no conſiderable hæmorrhagy may happen at firſt in gun-ſhot wounds; yet after the ſloughs commonly produced upon ſuch occaſions have come off, ſome conſiderable arteries may be expoſed, and then a dangerous hæmorrhagy may enſue. The hæmorrhagy is often preceded by a great heat in the injured parts, and with a throbbing pulſatory pain. At this period it may frequently be prevented by plentiful blood-letting, particularly local. But if the hæmorrhagy has fairly taken place, and from arteries of conſiderable ſize, nothing will do but the proper application of ligatures. As the diſcharge in theſe caſes would often prove dangerous before the ſurgeon could be procured, the attendants ſhould be furniſhed with a tourniquet, with directions to apply it, upon the firſt appearance of blood.

Till of late years the ſcarifying of gun-ſhot wounds was a practice which prevailed very univerſally among ſurgeons; and it was expected by this, that the ſloughs with which wounds are ſometimes covered would ſooner ſeparate, and that the cure would thereby be more readily performed. It is now however, known, that this practice, inſtead of being uſeful, very generally does harm by increaſing the inflammation. It ſhould therefore be laid entirely aſide. When a gun-ſhot wound cannot eaſily or ſafely be laid open from one end to the other, perhaps it may be proper to introduce a cord through the ſinus. This, however, ſhould not be attempted till the firſt or inflammatory ſtate of the wound is over; but when a cord cannot be properly introduced, on account of the ſituation or direction of the wound, compreſſion may prove equally uſeful here as in caſes of punctured wounds.

Mortification.] If a Mortification happen after a gun-ſhot wound, it is to be treated in the ſame manner as if it had ariſen from any other cauſe, only bark is not to be promiſcuouſly uſed; as, in plethoric habits, it may prove hurtful, though in debilitated relaxed habits it will be extremely uſeful; but even in ſuch it ſhould never be given while much pain and tenſion continue.

Sect. IV. *Of Poiſoned Wounds.*

Poison may be introduced into the ſyſtem various ways. The effects of the poiſon introduced by the ſtings of inſects may frequently be prevented by applying immediately vinegar or ardent ſpirits. After inflammation has come on, the moſt effectual remedy is the waſhing the parts with cold water. The bite of a viper is not always dangerous; but as we can never judge with certainty whether the wound be poiſoned or not, and as the poiſon of this animal acts very ſpeedily upon the ſyſtem, its bad effects ought to be prevented by every poſſible means. The injured part ought either to be cut out immediately, or deſtroyed with the actual or potential cautery.

Formerly ſuction was much employed, and frequently with ſucceſs: it ſhould not, however, prevent the removal of the part. After the part has been removed, we ſhould endeavour to produce a plentiful ſuppuration. When the poiſon appears to have entered the ſyſtem, the application of warm oil over the whole body has been extolled; and it has been ſaid that advantage has been derived from the internal uſe of it. From ſome late obſervations, however, the efficacy of this remedy is much to be doubted. Perhaps a plentiful ſweat, kept up for a conſiderable time, is the moſt certain method yet diſcovered. Small doſes of volatile alkali frequently repeated is more to be depended on for producing this effect than any other remedy.

The *bite of a mad animal* occaſions the moſt formidable poiſoned wound known in this country. In theſe wounds hydrophobia indeed does not always enſue; but when it does death is almoſt certainly the conſequence. A variety of noſtrums, for preventing and curing this diſeaſe have been held forth to the public; but there is ſcarcely any well-atteſted fact of any one of them proving uſeful. Nothing yet known can be depended upon but the immediate removal of the injured part, either with the ſcalpel or the actual or potential cautery; which, together with a plentiful ſuppuration, has, in different inſtances, appeared to anſwer the purpoſe effectually; at leaſt, patients treated in this manner have eſcaped, while others bit at the ſame time by the ſame animal have ſuffered. The ſooner the operation is performed, the more effectual it is likely to prove; but it ought not to be omitted, even though ſome time has elapſed from the time that the wound was inflicted; for there is reaſon to ſuppoſe that this poiſon does not enter the ſyſtem ſo quickly as ſeveral others are obſerved to do. Sea-bathing has been much recommended in all ages as a preventive; but there are few well-atteſted caſes of its being attended with advantage. Many practitioners depend much on mercury; and as it can be uſed along with any other plan of treatment, it ought not to be neglected.

When wounds are poiſoned by the application of matter from certain ſores, as thoſe of the venereal or cancerous kinds, or from any of the vegetable poiſons, it is better to remove the part affected immediately, then to undergo a courſe of medicines generally ſlow and often doubtful in their operations.

The metallic poiſons do not fall to be conſidered in this place; for however deleterious they may be when taken into the ſtomach, they ſeldom appear to be otherwiſe hurtful, when applied to wounds, than by irritating or corroding the parts with which they come in contact.

CHAP. II. Inflammation *and its Conſequences.*

Sect. I. *Of Inflammation and Suppuration.*

Inflammation of any part is accompanied with increaſed heat, redneſs, and painful tenſion. For the remote and proximate cauſes of inflammation, together with the treatment of inflammatory diſeaſes, ſee *Phlegmaſiæ*, article Medicine. Inflammation is commonly divided into two ſpecies, the *phlegmonic* and *erythematic*. The firſt is diſtinguiſhed by conſiderable ſwelling, throbbing pain, and circumſcribed bright red colour. The ſecond by ſuperficial ſwelling, burning pain, dull red colour, apt to ſpread, diſappearing when preſſed, and quickly returning; the part affected is frequently covered with ſmall veſicles. The conſequences of inflammation are ſuppuration and gangrene, unleſs the inflammation be checked and terminated by reſolution.—That an inflammation will terminate in ſuppuration, may be known from the length of time it has continued, from the remiſſion of the pain and hardneſs, the greater elevation of the ſkin in the middle part, a change of colour from red to bluiſh or livid, a ſlight fever with ſhivering, and from a fluctuation of matter perceived on handling the part.

During the firſt ſtage of the inflammation, however, we ought, for the moſt part, to endeavour to *reſolve it*, or prevent

the ſuppuration. Yet ſome caſes muſt be excepted. For inſtance, thoſe inflammatory ſwellings which ſometimes occur in fevers, or ſucceed to them, ought always to be brought to ſuppuration; and it might be very dangerous to attempt a reſolution of them. In ſwellings of a ſcrophulous nature, it is perhaps beſt to do nothing at all, either with a view to reſolve or ſuppurate. Thus it might be dangerous to make uſe of repellent applications, at the ſame time that it is by no means adviſable to promote their ſuppuration; the cure of ſuch ſwellings, when opened, proving always very troubleſome; while at the ſame time it is known, that ſuch ſwellings may remain for a very long time without any riſk to the patient. In the lues venerea, too, as we are poſſeſſed of a certain antidote for the diſorder, it is beſt not to attempt the ſuppuration of any buboes which may appear; as the cure of them, when opened, very often proves extremely troubleſome; and as their being opened cannot contribute any thing towards their cure.

Where the inflammation is but beginning, and the ſymptoms are not ſo violent as to affect the general ſyſtem, topical remedies, with a due attention to regimen, often anſwer in reſolving them. The firſt thing to be attended to in the caſe of every inflammation, is the removal of the exciting cauſes, which either have brought on the inflammation originally, or which may continue it after it is begun. Such are extraneous bodies in wounds, pieces of fractured bones, luxations, &c. Of all the various applications for an inflamed part, thoſe of a ſedative nature are chiefly to be depended upon; and, next to theſe, emollients. Of the former kind we may conſider all the different preparations of lead diſſolved in vinegar; together with vinegar itſelf, which generally acts alſo as a ſedative. Among the latter we may place the mild expreſſed oils, as alſo the ſoft ointments made with theſe oils and pure wax.

When we ſpeak of ſedative medicines, however, it muſt not be underſtood that all of that claſs are to be uſed indiſcriminately. Thus opium, though one of the moſt powerful of all ſedatives, yet as its application, externally, to the human body, is always attended with ſome degree of irritation, however uſeful it may at times be found in ſome particular ſpecies of inflammatory diſorders, will never, probably, as an external application, become of general uſe in theſe caſes. Warm emollient fomentations alſo, though powerful ſedatives, as tending more effectually to remove tenſion and pain than perhaps any other remedy, are conſtantly found to be improper where a reſolution is to be wiſhed for. Their conſtant effect is, either to bring the ſwelling to a ſuppuration, or to relax the parts in ſuch a manner as to render the removal of the diſorder always exceedingly tedious.

Mr. Bell recommends the preparations of lead as proper applications, in caſes of external inflammation, where we wiſh for a reſolution. The beſt method of applying it, he ſays, is in the form of a watery ſolution; and he gives the following formula: ℞. *Sacchar. ſaturn.* ℥ſs.; *ſolve in acet. pur.* ℥iv.; *et adde aq. fontan. diſtillat.* ℔ij. The addition of vinegar renders the ſolution much more complete than it otherwiſe would be; and without it indeed a very conſiderable proportion of the lead generally ſeparates and falls to the bottom.

In making uſe of this ſolution in caſes of inflammation, as it is of conſequence to have the parts affected kept conſtantly moiſt with it, cataplaſms prepared with it and crumb of bread in general anſwer that intention exceedingly well. But when the inflamed part is ſo tender and painful as not eaſily to bear the weight of a poultice, which is frequently the caſe, pieces of ſoft linen moiſtened with the ſolution, anſwer the purpoſe tolerably well. Both ſhould be applied cold, or at leaſt with no greater warmth than is merely neceſſary for preventing pain or uneaſineſs to the patient: they ſhould be kept almoſt conſtantly at the part, and renewed always before turning ſtiff or hard.

When the tenſion and irritation on the ſkin are conſiderable, emollients are often attended with very great advantage: the parts affected being, in ſuch a ſtate of the diſorder, gently rubbed over with any of the mild expreſſed oils two or three times a-day, the tenſion, irritation, and pain, are often very much relieved, and the diſcuſſion of the tumor thereby greatly promoted.

In every caſe of inflammation, indeed, emollient applications would afford ſome relief. But as the preparations of lead, already recommended, prove in all ſuch diſorders ſtill more advantageous; and as unguents of every kind tend conſiderably to blunt the action of lead; theſe two ſets of remedies ſhould as ſeldom as poſſible be allowed to interfere with one another; and emollients ſhould accordingly never be preſcribed, but when the circumſtances already mentioned, of irritation, tenſion, and pain, are ſo conſiderable as to render their application altogether neceſſary.

When the part affected with inflammation is not very tender, or lies deep, applications of vinegar are often had recourſe to with conſiderable advantage: the moſt effectual form of uſing it ſeems to be by way of cataplaſm, made with the ſtrongeſt vinegar and crumb of bread. In ſuch caſes, an alternate uſe of this remedy, with the ſaturnine ſolution, has produced more beneficial effects, than are commonly obſerved from a continued courſe of any one of them.

At the ſame time that theſe applications are continued, blooding with leeches, or cupping and ſcarifying, as near as poſſible to the part affected, is generally of very great ſervice; and in no caſe of local inflammation ſhould ever be omitted. In all ſuch caſes, the whole body, but more eſpecially the diſeaſed part, ſhould be preſerved as free as poſſible from every kind of motion; and, for the ſame reaſon, the neceſſity of a low cooling diet, in every inflammatory diſorder, appears obvious, as does alſo a total abſtinence from ſpirituous and fermented liquors.

In ſlight caſes of inflammation, a due perſeverance of the ſeveral articles taken notice of will, in general, be found ſufficient for every purpoſe. But when there is likewiſe a full, hard, or quick pulſe, with other ſymptoms of fever, general blood-letting becomes neceſſary; the quantity of blood taken away being always to be determined by the violence of the diſorder, and by the age and ſtrength of the patient. Evacuation, however, ſhould never be carried to a greater height, than what is merely neceſſary for moderating the febrile ſymptoms; for if ſuppuration ſhould take place after the ſyſtem is too much reduced, its progreſs is thereby rendered much more ſlow and uncertain, nor will the patient be ſo able to bear the diſcharge that muſt enſue upon opening the abſceſs. The uſe of gentle laxatives, together with cooling diaphoretic medicines, are alſo attended with very good effects.

Theſe different evacuations being premiſed, the next object of conſequence is to procure eaſe and quietneſs to the patient; which is often, in inflammatory caſes, of more real ſervice than any other circumſtance whatever. The moſt effectual remedy for this purpoſe is opium; which, when pain and irritation are conſiderable, as in extenſive inflammations very frequently happens, ſhould never be omitted. In large wounds, eſpecially after amputations and other capital operations, alſo in punctures of all kinds, large doſes of opium are always attended with remarkable good effects. In all ſuch caſes, however, opium, in order to have a proper influence, ſhould, as was obſerved, be adminiſtered in very large doſes; otherwiſe, inſtead of proving ſerviceable, it ſeems rather to have the con-

trary effect; a circumstance which is perhaps the chief reason for opiates in general having been very unjustly condemned in every case of inflammation.

By a proper attention to the different circumstances taken notice of, in the course of three or four days, and sometimes in a shorter space of time, resolution of the tumor will in general begin to take place; at least before the end of that period it may, for the most part, be known how the disorder is to terminate. If the heat, pain, and other attending symptoms abate, and especially if the tumor begins to decrease, without the occurrence of any gangrenous appearances, we may then be almost certain that by a continuance of the same plan, a total resolution will in time be effected.

But, on the contrary, if all the different symptoms rather increase; and especially if the tumor turns larger, and somewhat soft, with an increase of throbbing pain; we may then with tolerable certainty conclude, that suppuration will take place; and should therefore immediately desist from such applications as were judged proper while a cure was thought practicable by resolution, and endeavour to assist nature as much as possible in the formation of pus, or what is called *maturation* of the tumor. For this purpose there is nothing better than to preserve a proper degree of heat in the parts. This is commonly done by the means of warm fomentations and cataplasms; and when these are regularly and frequently renewed, nothing, it is probable, could more effectually answer the purpose. But in the ordinary manner in which they are applied, by the cataplasms being renewed only once, or at most twice a-day, they must always, it is imagined, do more harm than good. For so soon as the degree of heat they were at first possessed of is dissipated, the moisture kept up by them, with the consequent evaporation which ensues, must always render the part a great deal colder, than if it had been merely wrapped in flannel without the use of any such application.

In order to receive all the advantages of such remedies, the part affected should be well fomented with flannels pressed out of any warm emollient decoction, applied as warm as the patient can easily bear them, continued at least half an hour at once, and repeated four times a-day.

Immediately after the fomentation is over, a large emollient poultice should likewise be applied warm, and renewed every second or third hour at farthest. Of all the forms recommended for emollient cataplasms, a common milk-and-bread poultice, with a proportion of butter or oil, is perhaps the most eligible; as it not only possesses all the advantages of the others, but can at all times be more easily obtained.

Roasted onions, garlic, and other acrid substances, are frequently made use of as additions to maturating cataplasms. When there is not a due degree of inflammation in the tumor, and when it appears probable that the suppuration would be quickened by having the inflammatory symptoms somewhat increased, the addition of such substances may then be of service; but when stimulants are necessary in such cases, a small proportion of strained galbanum, or of any of the warm gums, dissolved in the yolk of an egg, and added to the poultices, is a more certain form of applying them. Whenever the inflammation, however, takes place to a proper degree, such stimulating substances never can be necessary; and in many cases, it is apprehended, they may even do mischief.

In such tumors as, from their being possessed of little or no inflammation, are commonly said to be of a cold nature, as they are generally indolent, and proceed very slowly to suppuration, plasters composed of the warm gums are often had recourse to with considerable advantage. In such cases, they are not only of use by the stimulus and irritation they occasion, but by the heat which they tend to preserve in the part. They become particularly necessary when the patient, by being obliged to go abroad, cannot have cataplasms frequently enough renewed, or so conveniently applied; but when some such objection does not occur, the latter, for very obvious reasons, should always be preferred.

Dry cupping, as it is termed, that is, cupping without the use of the scarificator, upon or as near as possible to the part affected, is frequently had recourse to with advantage in promoting the suppuration of tumors. It is only, however, in such as these last mentioned, where there seems to be a deficiency of inflammation, that it can ever either be necessary or useful; but in all tumors of a real indolent nature, and where there is still some probability of a suppuration, no remedy is more effectual.

These different applications, under the restrictions taken notice of, being continued for a longer or shorter time, according to the size of the tumor, its situation, and other circumstances, a thorough suppuration may in general at last be expected.

Matter being fully formed in a tumor, is known by a remission of all the symptoms taking place; the throbbing pain, which before was frequent, now goes off, and the patient complains of a more dull, constant, heavy pain: the tumor points at some particular part, generally near to its middle; where, if the matter is not encysted, or deep seated, a whitish yellow appearance is observed, instead of a deep red that formerly took place; and fluctuation of a fluid underneath is, upon pressure, very evidently discovered. Sometimes, indeed, when an abscess is thickly covered with muscular and other parts, though, from concurring circumstances, there can be little doubt of there being even a very considerable collection of matter, yet the fluctuation cannot be readily distinguished: it does not, however, often happen, that matter is so very deeply lodged, as not to be discovered upon proper examination.

This, however, is a circumstance of the greatest consequence in practice, and deserves more attention than is commonly given to it. In no part of the surgeon's employment is experience in former similar cases of greater use to him than in the present; and however simple it may appear, yet nothing, it is certain, more readily distinguishes a man of observation and extensive practice, than his being able easily to detect collections of deep-seated matter; whilst nothing, on the contrary, so materially affects the character of a surgeon, as his having, in such cases, given an inaccurate or unjust prognosis; as the event, in disorders of that nature, comes generally at last to be clearly demonstrated to all concerned.

Together with the several local symptoms of the presence of pus already enumerated, may be mentioned the frequent shiverings to which patients are liable on its first formation: these, however, seldom occur so as to be distinctly observed, unless the collection is considerable, or seated internally in some of the viscera.

After the matter is fully formed, and the abscess brought to maturity, the only remedy is to *open it*, and give vent to the pus it contains. In many cases, indeed, nature will do the work, and abscesses, when superficially seated, will certainly burst of themselves: but where the matter lies deep, we are by no means to wait for this spontaneous opening; as the pus will acquire an acrimony before it can break through the teguments, which may prove very prejudicial to health. However, it is a general rule not to open abscesses till a thorough suppuration has taken place; for, when laid open long before that period, and while any considerable hardness remains, they commonly prove more troublesome, and seldom heal so kindly.

In some cases, however, it is necessary to deviate from this general rule, and to open them a good deal sooner; particularly

in all ſuch critical abſceſſes as occur in malignant fevers. In like manner, in the plague, we are commonly adviſed to open ſuch tumors, ſo ſoon as they are at all tolerably advanced, and not to wait till they are fully maturated; as, from experience in theſe diſorders, it is found to be of more conſequence, for the removal of the original diſeaſe, to have a quick diſcharge of matter produced, than any harm the patient can ever ſuffer from having a ſwelling ſomewhat prematurely laid open.

In abſceſſes, alſo, ſituated on any of the joints, or upon either of the large cavities of the breaſt and abdomen, and more eſpecially when they ſeem to run deep, they ſhould always be opened as ſoon as the leaſt fluctuation of matter is diſcovered. For, when the reſiſtance is on every ſide equal, they juſt as readily point inwardly as outwardly: and the conſequence of a large abſceſs burſting into either of the large cavities, is well known moſt frequently to prove fatal: an inſtance of which, in the following caſe, with very little attention, might have been prevented. A ſurgeon of eminence, and of very extenſive practice, was applied to by a young healthy-looking man, with a large abſceſs upon the left ſide of his cheſt. A fluctuation of a fluid was, upon preſſure, very evidently diſcovered; and it was agreed, by other two practitioners who were preſent, that an opening ſhould be made to give vent to the matter. But the operator, being much engaged in buſineſs, could not fix on an earlier period for doing it than the third day from the patient's applying to him: unluckily, however, the patient died ſuddenly in his bed the night before the abſceſs was to have been opened. On examining the body, the tumor had diſappeared entirely, without any external opening being obſervable; and, on opening the thorax, it was found to have burſt inwardly upon the lungs, and produced immediate ſuffocation.

In every other circumſtance, however, except in the caſes alluded to, the rule in opening abſceſſes is, as was already remarked, to allow a thorough ſuppuration to take place, before any vent whatever be given to the matter; and it being then determined to lay the collection open, the next queſtion that occurs, is with reſpect to the manner of doing it. There are three ways of opening an abſceſs ſo as to give an outlet to the matter; by cauſtic, by inciſion, or by the introduction of a ſeton.

1. The firſt is more agreeable to timid patients, who are afraid of the pain of inciſion, but is attended with ſome inconveniences which render the method of inciſion much preferable. *Cauſtic* acts ſlowly, and produces a long continued pain; beſides, no kind of cauſtic has yet been invented, the effects of which can be confined to a certain determinate extent; hence the patient is liable to ſuffer much unneceſſary pain, as the cauſtics commonly employed are either the lapis infernalis or lunar cauſtic. The abſceſs is to have a ſlip of adheſive plaſter applied to it, with a ſlit cut in it of a ſize ſomewhat leſs than the opening is intended to be. This ſlit is to be filled with cauſtic reduced into a powder, and wetted to make it act more quickly. It is then to be covered over with a plaſter, and the whole is ſecured with a firm compreſs and bandage. The time neceſſary for the cauſtic to make a ſufficient opening, will depend upon the thickneſs of the ſkin and ſtrength of the cauſtic; but generally it requires ſeveral hours. When we find that an eſchar is made, it is to be ſoftened with any emollient ointment until it can be readily ſeparated; after which, the matter is to be diſcharged, and the abſceſs treated as one opened by inciſion.

2. The method of opening abſceſſes by the *knife* is, to make an inciſion of ſuch a ſize as to give free vent to the matter. The opening is to be made in the under part of the tumor, that the matter may paſs readily out. It has been a practice among ſurgeons either to open a large abſceſs from end to end, or at leaſt through two-thirds of its length; but from the bad conſequences which often attend this method, the lateſt practitioners have thought it better merely to give a free diſcharge to the matter, without expoſing the part to the action of the air.

3. The third method, viz. that by the *ſeton*, is now frequently employed. It has the advantage of being attended with little pain, emptying the abſceſs in a gradual manner, and completely preventing the acceſs of the air, which, in the other two methods, is often attended with bad conſequences; and it frequently performs a cure in a much ſhorter time.

There are various inſtruments for introducing the ſeton: it may even frequently be done by a lancet and common probe; but the inſtruments repreſented in Plate 24. fig. 1. and 2. are more frequently employed. One of theſe being threaded with glover's ſoft ſilk, is to be introduced through the upper part of the tumor; but if the blunt one (fig. 2.) be employed, it will be neceſſary to have the aſſiſtance of a lancet; the inſtrument is then to be brought out at the under part of the tumor, and in this way the matter will be allowed to run gradually off.

The uſual mode of *dreſſing an abſceſs* the firſt time, is with dry lint. In the courſe of dreſſing, it will be proper to have regard to the ſituation of the abſceſs, and as much as poſſible to make the patient favour the diſcharge by his ordinary poſture: and to this end alſo, the diſcharge muſt be aſſiſted by compreſs and bandage: the compreſs may be made of ſoft old linen, applied according to the nature of the part and the ſeaſon of the year. The frequency of dreſſing will depend on the quantity of diſcharge: once in twenty-four hours is ordinarily ſufficient; but ſometimes twice, or perhaps three times, is neceſſary.

SECT. II. *Of Gangrene.*

THE other conſequence of inflammation is *gangrene,* which may terminate in mortification. When the colour of an inflamed part changes to a dark red, when bliſters ariſe on it containing an ichorous fluid, we know that it has become gangrenous. When it becomes black, flaccid, and inſenſible, when it loſes heat, and acquires a putrid ſmell, it has proceeded to complete mortification. A gangrene ſeldom affects thoſe who enjoy a good habit of body, though, even in them, it may be brought on accidentally by whatever deſtroys the texture of *a part*; as contuſion, long continued preſſure, or whatever deprives *a part* of its nouriſhment. In like manner, cold, by putting a ſtop to the circulation, may produce gangrene, and frequently does ſo in cold climates. This comes on ſuddenly, without any pain or previous inflammation; and the patient himſelf is frequently inſenſible of it, till he is informed of his ſituation by ſome other perſon.

A defect in the circulation, in extreme old age, frequently occaſions mortification in the extremities.

There are ſome inſtances of what is called *dry gangrene,* in which the parts continue totally mortified for a great length of time, without either turning very flaccid, or running into diſſolution. But ſuch caſes never occur from inflammation; they happen commonly from the flow of blood to ſuch parts being put a ſtop to by compreſſion of one kind or another, as tumors, ligatures, or other ſimilar cauſes, obſtructing the principal arteries which uſed to ſupply them; which, when the ſtoppage of the circulation is complete, always occaſions a very ſlow, tedious, mortification; and as the parts in ſuch inſtances are no longer ſupplied with freſh quantities of fluids, while a conſiderable evaporation muſt ſtill be going on, ſuch a degree of humidity cannot therefore poſſibly occur, as does in

other cafes of gangrene. So that fpecies of the diforder has, perhaps, with propriety enough, been termed the *dry gangrene*.

There is another variety of the difeafe termed *white gangrene*; in which the parts fuppofed mortified do not turn black, but retain nearly their former colour, &c. Whether fuch a complaint, however, can with propriety be denominated *gangrene* or not, may properly be doubted: but as it is chiefly that fpecies of the diforder which fucceeds inflammation that is here particularly treated of, and in which no fuch varieties are ever obferved, it is not neceffary to carry the inquiry farther.

The *prognofis* in every cafe of gangrene is doubtful at firft, as, even in the flighteft cafes, the patient may fuffer from the fpreading of the difeafe; but flight cafes, from external injuries, are more favourable than thofe which arife from internal caufes, though no perfon can be confidered fafe till the difeafed parts are feparated, and even entirely caft off. When inflammation happens round a mortified part, more efpecially if pus be formed, we may pretty certainly pronounce that the mortified part will be thrown off.

When there is reafon to fufpect from the violence of the fever and great heat of the inflamed part, that it will terminate in gangrene, blood-letting, and whatever may have a tendency to moderate the inflammation, may check its progrefs. But as the patient, in fuch cafes, is fometimes apt to fink afterwards, nothing more ought to be done than is merely neceffary to moderate the prefent fymptoms. If an inflamed furface put on a gangrenous appearance when the patient is weak, and the pulfe low, we muft have recourfe to whatever may invigorate the fyftem, viz. a nourifhing diet, with the free ufe of wine. Peruvian bark likewife is to be given in as great quantities as the ftomach of the patient will permit. When the ftomach cannot bear enough in fubftance, which is the beft form of exhibiting it, it may be given either in form of tincture or joined with aromatics. External applications, fuch as are of a ftimulating nature, may likewife be ufeful.

In the cafe of gangrene *arifing from cold*, the part muft be immerfed in very cold water, or rubbed with fnow; for if any thing warm be applied, or the patient brought near a fire, it certainly mortifies. If the whole body has become torpid with cold, the fame practice muft be followed; the very cold water fhould be afterwards changed for fome that is a little warmer, and the patient gradually brought to a proper degree of heat. Rubbing with falt is fometimes found ufeful. If the whole body be benumbed, cordials are not to be adminiftered too fuddenly. A glafs of cold wine fhould firft be given, afterwards warm wine by itfelf, or with fpices. If ftronger cordials be required, ardent fpirits may be employed. Notwithftanding the greateft attention, however, a mortification fometimes takes place, and in fome inftances very fuddenly; as in the cafe of carbuncle, where, after an inflammation has continued for fcarcely twenty-four hours, the parts become black, and end in real mortification.

In the *treatment of mortified parts*, a variety of external applications have been pointed out, and particularly thofe of the antifeptic kind; fuch as all the warm gums and balfams, ardent fpirits, and even alcohol: and to admit of their nearer application to the found parts, with a view to the prefervation of thefe from putrefaction, deep fcarifications through the difeafed, and into the found parts, have been generally recommended. But although fuch articles may be of ufe in preferving dead animal-fubftances from corruption; yet that they will always prove ferviceable in the fame manner in living bodies, is probably very much to be doubted. And it is even apprehended, by the ftrong irritation they always occafion when applied to a living fibre, that, in fuch cafes as the prefent, they may rather do mifchief; it being only a very flight degree of inflammation that is required to bring on a fuppuration. The incifions, when carried into the found parts, with a view to facilitate the operation of fuch remedies, may likewife do harm; not only from the rifk of wounding the bloodveffels, nerves, and tendons, that lie in the way, but alfo by allowing a free and farther entrance of the putrefcent fluids into the parts not yet affected: and unlefs they are carried fo deep as freely to reach the found parts, applications of the antifeptic kind can never have any effect in anfwering the purpofe for which they were intended.

All the advantages commonly obferved from the great variety of applications recommended for gangrene, are obtained with more eafe, and generally with more certainty, from the ufe of any gentle ftimulating embrocation; which, by exciting a flight irritation upon the furface, and efpecially when affifted by a free ufe of the bark, at laft commonly produces fuch a degree of inflammation as is wifhed for. With this view, a weak folution of fal ammoniac in vinegar and water has been known to anfwer exceedingly well: a dram of the falt to two ounces of vinegar and fix of water, forms a mixture of a very proper ftrength for every purpofe of this kind; but the degree of ftimulus can be eafily either increafed or diminifhed, according to circumftances, by ufing a larger or fmaller proportion of the falt.

Although, for the reafons formerly advanced, incifions may not in general be proper; yet in fuch cafes where the mortifition runs very deep, it is fometimes of fervice to make fcarifications into the difeafed parts, fo as to remove part of them; which, by taking off a confiderable load perhaps of putrid flefh, not only leffens the fetor, which in fuch cafes is always confiderable, but often renders it more eafy for the found parts to free themfelves from the remainder. When with this view, however, incifions are had recourfe to, care fhould always be taken that they be not carried the length of the found parts.

When by the ufe of external or internal remedies, a feparation of the mortified part has been effected, and a difcharge of pus produced, the remaining fore is then to be confidered merely as a fimple purulent ulcer, and may be treated in the fame manner.

CHAP. IV. OF ULCERS, WHITE SWELLINGS, CANCERS, AND BURNS.

SECT. I. *Of Ulcers.*

A SOLUTION of continuity in any of the fofter parts of the body, difcharging either pus, fanies, or any other vitiated matter, is termed *ulcer*; and when the fame circumftances happen to the bones, the term *caries* or *carious ulcer* is adopted.

Ulcers are diftinguifhed by their particular diforders, though it feldom happens that the affections are not complicated; and when we lay down rules for the management of one fpecies of ulcer, it is generally requifite to apply them to almoft all others. However, the characters of moft eminence are, the callous ulcer, the finuous ulcer, and the ulcer with caries of the adjacent bone: befides this there is the putrid, the corrofive, the varicofe ulcers, &c.; but as they have acquired their names from fome particular affection, we fhall fpeak of the treatment of them under the general head of ulcers.

It will be often in vain to purfue the beft means of cure by topical application, unlefs we are affifted by internal remedies; for as many ulcers are the effects of a particular indifpofition of body, it will be difficult to bring them into order while the

cauſe of them remains. Thoſe which are cancerous and ſcrophulous ſeem to gain the leaſt advantage from phyſic; for if in their beginnings they have ſometimes been very much relieved, or cured, by ſalivation, or any other evacuation, they are alſo often irritated and made worſe by them.

When an ulcer becomes foul, and diſcharges a naſty thin ichor, the edges of it, in proceſs of time, tuck in, and, growing ſkinned and hard, give it the name of a *callous ulcer*; which, as long as the edges continue in that ſtate, muſt neceſſarily be prevented from healing. But we are not immediately to deſtroy the lips of it, in expectation of a ſudden cure; for while the malignity of the ulcer remains, which was the occaſion of the calloſity, the new lips will be ſubject to a relapſe of the ſame kind, however often the external ſurface of them be deſtroyed: we are to endeavour to bring the body of the ulcer into a diſpoſition to recover by other methods. It ſometimes happens to poor laborious people, who have not been able to afford themſelves reſt, that lying a-bed will in a ſhort time give a diverſion to the humours of the part, and the callous edges, ſoftening, will without any great aſſiſtance ſhoot out a cicatrix, when the ulcer is grown clean and filled with good fleſh. The effect of a ſalivation is generally the ſame; and even an iſſue ſometimes diſpoſes a neighbouring ulcer to heal. But though calloſities be frequently ſoftened by theſe means, yet when the ſurface of the ulcer begins to yield thick matter and little granulations of red fleſh ſhoot up, it will be proper to quicken nature by deſtroying the edges of it, if they remain hard. The manner of doing this, is by touching them a few days with the lunar cauſtic, or *lapis infernalis*. Some chooſe to cut them off with a knife: but this is very painful, and not more efficacious. When the lips do not tuck down cloſe to the ulcer, but hang looſe over it, as in ſome venereal buboes, the eaſieſt method is to cut them off with the ſciſſars.

To digeſt the ulcer, or to procure good matter from it when in a putrid ſtate, there are an infinity of ointments invented; but the baſilico flavum, alone, or ſoftened down ſometimes with turpentines, and ſometimes mixed up with different proportions of red precipitate, ſeems to ſerve the purpoſe of bringing an ulcer to cicatrization as well as any of the others. When the ulcer is incarned, the cure may be finiſhed as in other wounds: or if it do not cicatriſe kindly, it may be waſhed with aq. calcis, or aq. phag. or dreſſed with a pledgit dipt in tinct. myrrhæ: and if excoriations are ſpread round the ulcer, they may be anointed with ſperm. cet. ointment, or any other ſoft ointment.

The red precipitate has of late years acquired the credit it deſerves for the cure of ulcers; but, by falling into general uſe, is very often unſkilfully applied: when mixed with the baſilicon, or, what is nearer, a cerate of wax and oil, it is moſt certainly a digeſtive, ſince it hardly ever fails to make the ulcer yield a thick matter in twenty-four hours, which diſcharged a thin one before the application of it.

If the ulcer produces a *ſpongy fleſh*, ſprouting very high above the ſurface, it will be neceſſary to deſtroy it by ſome of the eſcharotics, or the knife. This fungus differs very much from that belonging to healing wounds, being more eminent and lax, and generally in one maſs; whereas the other is in little diſtinct protuberances. It approaches often towards a cancerous complexion, and when it riſes upon ſome glands, ſometimes actually degenerates into a cancer. When theſe excreſcences have ariſen in venereal ulcers, eſcharotics ſhould be applied. Thoſe in uſe, are the vitriol, the lunar cauſtic, the lapis infernalis, and more generally the red precipitate powder.

It is but ſeldom that theſe inveterate funguſes appear on an ulcer; but it is very uſual for thoſe of a milder kind to riſe, which may often be made to ſubſide by preſſure and the uſe of mild eſcharotics: however, if the aſpect of the ſore be white and ſmooth, as happens in ulcers accompanied with a dropſy, and often in young women with obſtructions, it will anſwer no purpoſe to waſte the excreſcences until the conſtitution is repaired, when moſt probably they will ſink without any aſſiſtance. In ulcers alſo, where the ſubjacent bone is carious, great quantities of looſe flabby fleſh will grow up above the level of the ſkin: but as the caries is the cauſe of the diſorder, it will be in vain to expect a cure of the excreſcence until the rotten part of the bone be removed; and every attempt with eſcharotics will be only a repetition of pain to the patient, without any advantage.

When the pain and inflammation are exceſſive, bleeding and other evacuations will often be ſerviceable; and above all things, reſt and a horizontal poſition; which laſt circumſtance is of ſo great importance to the cure of ulcers of the legs, that unleſs the patient will conform to it ſtrictly, the ſkill of the ſurgeon will often avail nothing: for as the indiſpoſition of theſe ſores is in ſome meaſure owing to the gravitation of the humours downwards, it will be much more beneficial to lie along than ſit upright, though the leg be laid on a chair; ſince even in this poſture they will deſcend with more force than if the body was reclined.

In ulcers of the legs, accompanied with *varices* or dilatations of the veins, the method of treatment will depend upon the other circumſtances of the ſore; for the varix can only be aſſiſted by the application of bandage, which muſt be continued a conſiderable time after the cure. The neateſt bandage is the laced ſtocking, which is particularly ſerviceable in this caſe; though alſo, if the legs be œdematous, or if, after the healing of the ulcers, they ſwell when the patient quits his bed, it may be worn with ſafety and advantage. There are inſtances of one vein only being varicous; which, when it happens, may be deſtroyed by tying it above and below the dilatation, as in an aneuriſm; but this operation ſhould only be practiſed where the varix is large and painful.

Ulcers *of many years ſtanding* are very difficult of cure; and in old people the cure is often dangerous, frequently exciting an aſthma, a diarrhœa, or a fever, which deſtroys the patient, unleſs the ſore break out again: ſo that it is not altogether adviſeable to attempt the abſolute cure in ſuch caſes: but only the reduction of them into better order, and leſs compaſs, which, if they be not malignant, is generally done with reſt and proper care. The cure of thoſe in young people may be undertaken with more ſafety; and in all caſes of ſtubborn ulcers, the bark very copiouſly given, will be found of the utmoſt ſervice.

When an ulcer or abſceſs has any ſinuſes or channels opening and diſcharging themſelves into the ſore, they are called *ſinuous ulcers*. Theſe ſinuſes, if they continue to drain a great while, grow hard in the ſurface of their cavity, and then are termed *fiſtulæ*, and the ulcer a *fiſtulous ulcer*; alſo, if matter be diſcharged from any cavity, as thoſe of the joints, abdomen, &c. the opening is called a *ſinuous ulcer* or a *fiſtula*.

The *treatment* of theſe ulcers depends upon a variety of circumſtances. If the matter of the ſinus be thick, ſtrict bandage and compreſs will ſometimes bring the oppoſite ſides of the ſinus to a reunion; if the ſinus grow turgid in any part, and the ſkin thinner, ſhowing a diſpoſition to break, the matter muſt be made to puſh more againſt that part, by plugging it up with a tent: and then a counter opening muſt be made, which proves often ſufficient for the whole abſceſs, if it be not afterwards too much tented, which locks up the matter and prevents the healing; or too little, which will have the ſame effect: for dreſſing quite ſuperficially does ſometimes prove as

mischievous as tents, and for nearly the same reason; since suffering the external wound to contract into a narrow orifice before the internal one be incarned, does almost as effectually lock up the matter as a tent. To preserve, then, a medium in these cases, a hollow tent of lead or silver may be kept in the orifice, which at the same time that it keeps it open, gives vent to the matter. The abscesses where the counter opening is made most frequently are those of compound fractures, and the breast; but the latter do oftener well without dilatation than the former; though it must be performed in both, if practicable, the whole length of the abscess, when after some trial the matter does not lessen in quantity, and the sides of it grow thinner; and if the sinuses be fistulous, no cure need be expected without dilatation.

When an ulcer with loose rotten flesh discharges more than the size of it should yield, and the discharge is oily and stinking, in all probability the bone is carious; which may easily be distinguished by running the probe through the flesh: and if so, it is called a *carious ulcer*. The cure of these ulcers depends principally upon the removal of the rotten part of the bone, without which it cannot heal. Those caries which happen from the matter of abscesses lying too long upon the bone, are most likely to recover: those of lues venerea very often do well, because that distemper fixes ordinarily upon the middle and outside of the densest bones, which admit of exfoliation; but those produced by scrophula, where the whole extremities of the spongy parts of the bone are affected, are exceedingly dangerous. All enlarged bones are not necessarily carious; and there are ulcers sometimes on the skin which covers them, which do not communicate with the bone, and consequently do well without exfoliation: nay, it sometimes happens, though the case be rare, that, in young subjects particularly, the bones will be carious to such a degree, as to admit a probe almost through the whole substance of them; and yet afterwards admit of a cure, without any notable exfoliation.

The method of *treating an ulcer with caries*, is by applying a caustic of the size of the scale of the bone which is to be exfoliated; and after having laid it bare, to wait till the carious part can without violence be separated, and then heal the wound. In order to quicken the exfoliation, there have been several applications devised; but that which has been most used in all ages, is the actual cautery, with which surgeons burn the naked bone every day, or every other day, to dry up, as they say, the moisture, and by that means procure the separation: but as this practice is never of great service, and always cruel and painful, it is now pretty much exploded. Indeed, from considering the appearance of a wound, when a scale of bone is taken out of it, there is little doubt that burning retards rather than hastens the separation; for as every scale of a carious bone is flung off by new flesh generated between it and the sound bone, whatever would prevent the growth of these granulations would also in a degree prevent the exfoliation; which must certainly be the effect of a red-hot iron applied so close to it.

Some caries of the bones are so very shallow, that they crumble insensibly away, and the wound fills up; but when the bone will neither exfoliate nor admit of granulations; it will be proper to scrape it with a rugine, or perforate it in many points with a convenient instrument down to the quick. In scrophulous cases, the bones of the carpus and tarsus are often affected; and from their sponginess they are seldom cured; so that when these, or indeed the extremities of any of the bones, are carious through their substance, it is advisable to amputate; though there are instances in the scrophula, but more especially in critical abscesses, where, after long dressing down, the splinters, and sometimes the whole substance, of the small bones, have worked away, and a healthy habit of body coming on, the ulcer has healed; but these are so rare, that no great dependence is to be laid on such an event. The dressings of carious bones, if they are stinking, may be dossils dipped in the tincture of myrrh; otherwise those of dry lint are easiest, and keep down the edges of the ulcer better than any other gentle applications.

Sect. II. *Of White Swellings.*

There are two species of white swellings, Mr. Benjamin Bell observes; the one of a mild nature, and frequently admitting of a cure; which the other never does. The former, named by our author the *rheumatic species of white swelling*, begins with an acute pain, seemingly diffused over the whole joint, and frequently extending along the tendinous aponeuroses of the muscles which communicate with it. There is, from the beginning, an uniform swelling of the whole surrounding integuments. Great tension generally prevails; but at first there is seldom any external change of colour. From the commencement of the disease the motion of the joint is attended with exquisite pain, and the patient keeps it constantly in a relaxed posture, finding that the easiest. Hence the tendons become extremely stiff and rigid, till at last the joints have the appearance of complete and real anchyloses. The swelling now begins to augment, till the joint has acquired three or four times its natural size; the cuticular veins become turgid and varicose; at the same time that the muscular substance of the limb below decays, though it frequently acquires an equality in size by becoming œdematous; the pain becomes intolerable, especially when the person is warm in bed or otherwise heated; abscesses form in different parts, which, either breaking of themselves, or by being laid open, discharge considerable quantities of matter, but without any remarkable effect in reducing the size of the swelling. The pus discharged from these is at first of a tolerably good consistence, but soon degenerates into a thin ill-conditioned sanies. However, the orifices from whence it flows soon heal up, unless they are kept open by art; and new collections breaking out, they burst and heal up as before; so that in long-continued disorders of this kind, the surrounding integuments are often entirely covered with cicatrices.

In the mean time, the health of the patient gradually declines, from the violence of the pain, and the absorption of matter into the system, which takes place in some degree from its first formation in the different abscesses; but which never appears so evidently till the different abscesses have been laid open; after which a quick pulse, night-sweats, and a weakening diarrhœa, are sure to occur, which generally carry off the patient, if the member is not either amputated, or the disease cured some other way.

On *dissecting limbs* which have been amputated for white swellings, the original disease appears to have been a morbid thickening of the surrounding ligaments, without any other affection of the joint whatever; the bones and cartilages always remaining perfectly sound, as likewise the synovia both in quantity and consistence. In the more advanced stages of the disorder, the thickness of the ligaments is more considerable, and is generally attended with an effusion, into the surrounding cellular substance, of a thick glairy matter, which gives to swellings of this kind an elastic springy feel, independent of the collections of matter the fluctuation of which may also be perceived. Through this glairy matter the collections of pus run in various directions, without seeming, however, to mix with it. In some instances also a great many small hydatides are observed; all which form a confused mass, incapable of further dissection.

All the abovementioned appearances have been obſerved without any affection of the bones or cartilages But when, by a very long continuance of the diſorder, the ligaments come to be corroded by the different collections of matter, the cartilages, and in conſequence thereof the bones, ſoon begin to ſuffer. The tendons of the flexor muſcles, though very ſtiff and contracted, do not, upon diſſection, ſhow any ſigns of diſeaſe.

The above is an hiſtory of the mildeſt ſpecies of white ſwelling; the more inveterate kind our author names the *ſcrophulous white ſwelling*. In this the pain is commonly very violent; more acute than in the former; and, inſtead of being diffuſed, is confined to a particular ſpot, commonly the very middle of the joint. The ſwelling is commonly inconſiderable at firſt; inſomuch that, on ſome occaſions, even when the pain has been very violent, little difference in point of ſize could be obſerved between the diſeaſed and the ſound joint. The motion of the joint is attended with very great pain, and the tendons become ſtiff. As the diſorder advances, the pain becomes more violent, and the ſwelling increaſes, with an evident enlargement of the ends of the bones. The ſame elaſtic feel, together with ſimilar abſceſſes, occur in this as in the laſt: but upon opening them they commonly diſcharge a thin fetid ſtuff; the bones are found to be carious, and pieces of them are frequently diſcharged at the openings.

By the continuance of the diſorder, the conſtitution ſuffers, as in the firſt ſpecies of the diſeaſe; and a diarrhœa with night-ſweats commencing, the patient is ſoon reduced to little more than ſkin and bone.

Upon ſuch joints being *diſſected* in the firſt ſtages of the diſorder, the ſoft parts ſeem very little affected: but there is conſtantly obſerved an enlargement either of the whole ends of the bones, or of their epiphyſes; frequently of thoſe on one ſide of the joint only; in others, again, the bones on both ſides have been affected.

This enlargement ſometimes occurs without any other evident diſeaſe: but in general, and always in a more advanced ſtate of the complaint, the ſoft ſpongy parts of ſuch bones appear diſſolved into a thin, fluid, fetid matter; and that too, in ſome caſes, without the cartilages which ſurround them ſeeming much affected. In proceſs of time the cartilages are likewiſe diſſolved; and then the matter of the bones and ſofter parts mixing together, ſuch ſwellings exhibit in that ſtate a ſtill more confuſed collection than is generally obſerved even in the worſt ſtages of the other ſpecies of the diſorder.

In the farther progreſs of this diſeaſe the ſurrounding ſoft parts likewiſe ſuffer: The ligaments become thickened, and the contiguous cellular membrane is ſtuffed with the viſcid glairy matter obſerved in the other ſpecies of the diſorder.

We come now to the conſideration of the different cauſes which tend to produce this diſeaſe. That the ligaments of the joints only are firſt affected in this diſorder is rendered evident by diſſection. The thick glairy effuſions into the cellular membrane are probably occaſioned by an exudation from the veſſels of thoſe ligaments that have been originally inflamed, as ſuch parts never furniſh a proper fluid for the formation of purulent matter: In the courſe of the diſeaſe, indeed, abſceſſes containing real pus always appear; but never till inflammation has been communicated to the ſurrounding parts. We may conclude, therefore, that the firſt ſpecies of white ſwelling is always occaſioned by an *inflammatory* or *rheumatic affection* of the ligaments of ſuch joints as it attacks, from whatever cauſe ſuch inflammation may originally have proceeded.

The other ſpecies of the diſorder ſeems to be originally an affection of the bones; the ſurrounding ſoft parts coming only to ſuffer in the progreſs of the diſeaſe from their connection with and vicinity to theſe. This laſt ſpecies of white ſwelling generally begins without the patient being in the leaſt able to account for it: and from the effects which it produces on the bones attacked, appears to be a ſpecies of *ſpina ventoſa*; a diſeaſe of the bones probably of the ſame nature as ſcrophula is of the ſoft parts. Indeed, the appearances of the two diſorders, after making allowance for their different ſituations, are exceedingly ſimilar: they both begin with conſiderable enlargements or ſwellings of the parts, which generally end in ulcerations; they both likewiſe frequently occur in the ſame perſon at the ſame time. This ſpecies of white ſwelling is generally either attended with other evident ſymptoms of ſcrophula; or the patient, in an early period of life, has been ſubject to that diſeaſe; or, which is nearly the ſame, he is deſcended from ſcrophulous parents, and probably has the ſeeds of that diſeaſe lurking in his conſtitution. From all theſe circumſtances, it may with probability be concluded, that this ſpecies of white ſwelling is of a ſcrophulous nature: and ſince the other ſpecies of the diſorder is to be conſidered as an inflammatory affection, a thorough diſtinction between them is of very great importance; it will not be improper therefore to give a ſhort enumeration of the ſeveral diagnoſtic or moſt characteriſtic ſymptoms of each.

The pain in the firſt ſpecies is always, from the beginning, diffuſed over the whole joint, and ſometimes extends a conſiderable way along the muſcles that are attached to it: in the other ſpecies it is always at firſt, and ſometimes even when the complaint has been of conſiderable ſtanding, confined to a very ſmall circumſcribed ſpace. In the former, the ſwelling is always confined to the ſoft parts, and is from the beginning exceedingly evident: but in the latter, it is generally for ſome time hardly perceptible; and when it appears, the bones are the parts chiefly affected, the ſurrounding teguments coming only to ſuffer on a farther progreſs of the diſeaſe. Theſe are the chief local differences of the two ſpecies of this diſorder; but ſome aſſiſtance in the diſtinction may likewiſe be obtained from the general habit of the patient, and from the manner in which the complaint may ſeem to have been produced. Thus, when ſuch ſwellings occur in young, ſtrong, plethoric, people, eſpecially in ſuch as have formerly been ſubject to rheumatiſm, they moſt probably will always prove of the mildeſt or rheumatic ſpecies of the diſorder: But when they appear in patients of ſcrophulous diſpoſitions, we need be under very little doubt in concluding them to be of a ſcrophulous nature.

The great utility of properly diſtinguiſhing the two different ſpecies of white ſwellings appears in no circumſtance ſo evident as in the treatment. In the one, there being ſome chance, by proper remedies, of being ſerviceable to the patient; whereas in the other, viz. the ſcrophulous, it is not probable that art will ever be able to afford much aſſiſtance.

Rheumatic white ſwelling.] As it is always at firſt evidently of an inflammatory nature, conſiderable advantages are commonly obtained by a due attention to a proper cooling courſe. The firſt remedy which, with this view, ſhould be put in practice, is blood-letting immediately from the part affected. Cupping and ſcarifying is here a principal remedy. The inſtrument ſhould be applied to each ſide of the diſeaſed joint; on each ſide of the rotula, for inſtance, when the knee is the part affected, and at leaſt eight or ten ounces of blood diſcharged; and this to be repeated at proper intervals, once, twice, or oftener, according to the violence of the ſymptoms and ſtate of the patient's ſtrength at the time.

Cupping is, in theſe caſes, much ſuperior to leeches, becauſe it is more expeditious, and becauſe of the ſwelling occaſioned

by the application of any confiderable number of thefe animals proves frequently very troublefome, and fometimes interrupts for a time the ufe of other remedies.

Upon the anterior part of the joint, where the cupping-glaffes have not been placed, a fmall blifter fhould be directly applied, and the part kept open with iffue ointment, till the wounds from the fcarificator are fo far healed that a veficatory may likewife be laid on one fide of the joint; and fo foon as that is nearly healed, the other fide fhould be alfo bliftered. By thus alternately applying them, firft to the one fide and then to the other, almoft a conftant ftimulus is kept up; which, in deep-feated inflammations, feems to have fully a greater influence than all the difcharge occafioned by blifters. Gentle cooling laxatives at proper intervals are alfo of ufe; and the patient fhould, in every refpect, be kept upon a ftrict antiphlogiftic courfe, both as to diet and every other circumftance.

It is in the firft ftages only of the difeafe that fuch a courfe can be of much fervice; and in fuch it has frequently been a means of curing diforders which otherwife might have proceeded to the laft ftages of white fwellings.

The original inflammatory affection being once over, thefe fort of drains feem to have little or no influence, and ought not then to be long perfifted in, as they prevent the ufe of other remedies, which, in an advanced ftate of the difeafe, are commonly more efficacious.

The inflammation being moftly gone, and while there are yet no appearances of the formation of matter, mercury has fometimes been known of ufe; not given fo as to falivate, but merely to affect the mouth gently, and to keep it fomewhat fore for a few weeks.

The beft form of ufing it is by way of unction, as it allows, at the fame time, the application of friction; which, in all fuch fwellings, may of itfelf be in fome meafure confidered as a remedy. For this purpofe, an ointment of quickfilver and hog's-lard fhould be prepared; but with fo fmall a proportion of the former, that the patient may admit of two drams of the ointment being rubbed in three times a-day. In order to rub that quantity of the medicine in with gentle friction, an hour each time is at leaft neceffary; for in the ordinary way of continuing friction for a few minutes only, it can feldom have much influence.

By Le Dran, and other French writers, falls of warm water on fwellings of this nature are much recommended; and there is no doubt, that a long-continued and reiterated application of that remedy may, in the firft ftages of fuch complaints, be often attended with very good effects. By a proper ufe of thefe different applications, viz. of the feveral topical remedies in the firft or inflammatory ftate of the difeafe, and afterwards (ftill, however, before the formation of matter) of mercurials, friction, &c. many affections of this nature have been entirely removed.

It frequently happens, by the bent pofition the limb has been for a long time kept in, that the ufe of the joint comes to be entirely loft, having often acquired fuch a degree of ftiffnefs, that any attempts to move it are commonly attended with very great pain. This has been conftantly attributed to one or other of two different caufes, which are both in their nature incurable, viz. either to the ends of fuch bones as compofe the joints having run into one another, fo as to become firmly conjoined in confequence of the furrounding cartilages being abraded; or to the infpiffation, as it is termed, of the fynovia of the joints, whereby their cavities are entirely filled up, and no fpace left for the future motion of the bones.

Both thefe opinions, however, are in general very ill founded: as the ftiffnefs almoft always proceeds from a contraction of the mufcles and tendons. It may often be cured by a long-continued ufe of emollients.

The beft emollient that can be ufed is pure olive oil applied warm; as much of it as can be eafily rubbed in by an hour's gentle friction fhould be regularly done at leaft three times a-day; and inftead of confining the friction altogether to the rigid tendons, it fhould be extended over the whole mufcles, even to the infertions of their other extremities; but more efpecially on their flefhy mufcular parts, where the principal caufe of the continuance of fuch complaints is probably feated.

The web or omentum of a new-killed fheep, or of any other animal, applied over all the difeafed parts directly on being cut out of the animal, is fometimes attended with advantage. The application fhould be renewed as frequently as poffible, once a-day at leaft, or oftener when it can be done; for on being more than four or five hours applied it becomes difagreeable; and after that time, indeed, as it commonly turns ftiff, it cannot then probably be of much fervice.

The diforder has hitherto been fuppofed not to be fo far advanced as to have occafioned the formation of matter; for when come that length, Mr. Bell afferts, no confiderable advantages can be expected from any of the remedies as yet recommended: but even in that ftate of the complaint, if the patient's health does not abfolutely require it, amputation of the member fhould not be immediately had recourfe to. For by opening the different abfceffes foon after their formation, the matter may be prevented from deftroying the capfular ligaments of the joints, which, if once effected, would no doubt render that operation neceffary. Even in point of fuccefs from the operation, it ought never to be advifed till the complaint is pretty far advanced. For in this diforder, efpecially, a greater proportion of patients have recovered after amputation, who have previoufly been confiderably reduced by diarrhœas and other weakening fymptoms, than of fuch as have ftill remained in a full plethoric habit of body.

All the different obfervations hitherto made upon the treatment, relate particularly to the rheumatic fpecies of the diforder; and when had recourfe to in time, and duly perfifted in, they will frequently be found of fervice: but when the difeafe is fo far advanced as to have deftroyed the capfular ligaments of the joint, and perhaps even the cartilages and bones themfelves, amputation of the member is then no doubt the only refource.

In the fcrophulous white fwellings, when the difeafed parts of the bone begin to caft off, a cure may in that way, by affifting the efforts of nature, be fometimes obtained in the fmall joints; but in all the large joints, as the knee, ankle, &c. it is not probable that any other refource than amputation will ever afford much relief. And even the effects of that operation can feldom be depended on as lafting; for when the general fcrophulous taint ftill fubfifts in the conftitution, the diforder will moft probably appear again in fome other part; which, however, in the advanced ftages of the difeafe, it is fometimes neceffary to run the rifk of, the pain being often fo tormenting as to make it more eligible to fubmit to any hazard rather than to bear it longer.

When, however, for fome reafon or other, amputation is determined againft, as there being almoft a certainty of the complaint foon returning, from the fcrophulous difpofition appearing very ftrong in the fyftem, it then becomes neceffary to have recourfe to palliatives, fo as to render the complaint as tolerable as poffible: and with this view, opiates in large dofes, by moderating the pain and procuring reft to the patient, will in general be found the principal remedy. In other refpects, all fuch medicines and articles of regimen as are found beneficial in fcrophula, may be had recourfe to.

Sect. III. *Of* Cancers.

Cancers moſt commonly ariſe in the glandular parts of the body, where they are occaſioned by any bruiſe or contuſion, ſometimes a very ſlight one: and hence they are more common in the lips, and in the breaſts of women, than in any other parts of the body. Cancers have been generally diſtinguiſhed into *occult* and *open*. By the former are meant ſuch hard ſcirrhous ſwellings as are attended with frequent ſhooting pains, and which at laſt generally terminate in the latter.

By the *open cancerous ulcer*, is underſtood that ſpecies of ſore which commonly ſucceeds to hard ſwellings of the glands; although in ſome inſtances it occurs without any previous hardneſs. The edges of the ulcer are hard, ragged, and unequal, very painful, and reverſe in different ways, being ſometimes turned upwards and backwards, and on other occaſions inwards. The whole ſurface of the ſore is commonly very unequal, there being in ſome parts conſiderable riſings, and in others deep excavations. The diſcharge, for the moſt part, is a thin dark-coloured fetid ichor; and is often poſſeſſed of ſuch a degree of acrimony as to excoriate, and even deſtroy, the neighbouring parts. In the more advanced ſtages of the diſeaſe, by the eroſion of blood-veſſels which occurs, conſiderable quantities of pure blood are ſometimes alſo diſcharged.

Patients labouring under real cancerous affections univerſally complain of a *burning* heat over the whole ulcerated ſurface; which, in general, is the moſt tormenting ſymptom that attends the diſorder: and thoſe ſhooting lancinating pains, which were troubleſome in the more occult ſtate of the complaint, become now a great deal more ſo.

Theſe are the moſt frequent ſymptoms which attend an ulcerated cancer; but the appearances of ſuch ſores are ſo various, that it is almoſt impoſſible in any deſcription to comprehend every one. When two, three, or more, however, of thoſe enumerated, concur together in the ſame ulcer, we may always be pretty certain of its being of the cancerous kind.

Concerning the *cauſes of cancers*, there have been a great many conjectures, but without any ſolid foundation. It is of ſome moment, however, to determine whether they ariſe from ſome general diſorder in the ſyſtem, or whether they are only to be accounted local diſeaſes. Many of the moſt eminent practitioners have been of opinion that they ariſe from a general diſorder of the ſyſtem; and hence conſider them as totally incurable even by extirpation, as the latent ſeeds of the diſeaſe, in their opinion, will not fail to bring on a return of it ſomewhere or other. Of this opinion the late Dr. Monro appears to have been; and in a paper on this ſubject in the Edinburgh Medical Eſſays, declares, that "of near ſixty cancers which he had been preſent at the extirpation of, only four patients remained free of the diſeaſe at the end of two years." From this bad ſucceſs, and the violent progreſs of the diſeaſe, he finally concludes againſt the extirpation of cancers, and propoſes only the palliative method of cure. But later practitioners have been a great deal more ſucceſsful; and a late publication by Mr. Hill, ſurgeon at Dumfries, has put the uſefulneſs of extirpation beyond a doubt, when the operation is performed in time: though, after the diſeaſe has continued long, and the virus been abſorbed, the whole ſyſtem acquires a cancerous diſpoſition, and the diſeaſe almoſt certainly recurs in ſome other part. From internal medicines we can expect little or nothing in the cure of cancers; and external applications can do no more than palliate. Great expectations were formed from the powder and extract of cicuta; but it has ſo univerſally failed, that few put much confidence in it at preſent. However, it has ſometimes been of ſervice in caſes of a ſimple indurated gland: and even where the diſeaſe has been farther advanced, it has produced a better diſcharge, and diminiſhed the fetor of the ſore; but as it cannot be depended upon for a radical cure, a delay of the operation is never to be recommended.

No part of the body is more ſubject to cancer than the breaſts of women. Cancer of the *mamma* may ariſe at any period of life, though it ſeldom appears till about the time the menſes uſually diſappear. Tumors ariſing in the breaſt previous to this period have been conſidered by ſome practitioners as being only of a ſcrophulous nature; and it is probably owing to that circumſtance that ſeveral cures have been of late years made on tumors of the breaſt by mercurial frictions and other remedies.

Scirrhus and cancer of the breaſts are diſtinguiſhed by the following marks: when the tumor is firſt obſerved, it is commonly in form of a ſmall hard knot in the glandular part of the mamma, while the ſkin at the ſame time is free from inflammation. It frequently continues in this ſtate for ſeveral months: by degrees, however, it increaſes conſiderably in ſize, and at laſt a ſharp pain is felt ſhooting towards the axilla. The lymphatic glands at the under edge of the pectoral muſcle and in the axilla are often enlarged, and an occult cancer is now formed. By degrees the integuments over this part of the tumor in the mamma become diſcoloured, and at laſt an ulceration or open cancer breaks out. Violent hæmorrhagies now frequently enſue; the pain becomes ſtill more excruciating; and, unleſs proper aſſiſtance be given, the patient is generally cut off in not many months after the breaking out of the cancer.

In early ſtages, the diſeaſe in general may be conſidered as entirely a local affection, and a radical cure may be of courſe expected; but in proportion as the ſkin ſhall afterwards be found diſeaſed and adhering to the gland, and that to the pectoral muſcle, and the lymphatic glands near the mamma and in the arm-pit ſwelled, the chance of a cure becomes more doubtful, as the cancerous matter may have been abſorbed, and part of it carried into the ſyſtem. The moſt unfavourable ſtate for an operation is when there are ulcerations in the breaſt, large, deep, and of long ſtanding; and particularly if theſe are attended with great pain, when the arm of the affected ſide has become œdematous, and the health of the patient is much impaired. In this laſt ſtate very little is to be expected from a ſurgical operation.

In *extirpating the mamma*, which we ſhall firſt ſuppoſe is to be done where the ſkin is ſound, and where the tumor has no uncommon adheſion to the pectoral muſcle, the patient ought to be placed horizontally in a bed, or upon a table covered with a mattreſs, &c. The operator is to be ſeated, and to have proper aſſiſtants. A longitudinal inciſion is then to be made with a common ſcalpel through the ſkin and cellular ſubſtance along the whole extent of the tumor, and at a little diſtance of the nipple, which is to be ſaved. When the longeſt diameter of the tumor is acroſs the body, inſtead of a longitudinal inciſion, a tranſverſe one is to be made. The integuments being diſſected from the mamma on both ſides of the inciſion, the patient's arm is to be extended to ſave the pectoral muſcle; and the whole glandular part is to be detached from the muſcle, though a ſmall portion only ſhould be diſeaſed, beginning at the upper ſide, and ſeparating downwards. If there be any indurated glands, they are to be carefully removed. If the patient be faint, a glaſs of wine, or ſome other cordial, is to be given. After the diſeaſed parts are removed, the wound is to be cleaned with a ſponge wrung out of warm water, which will generally render the ſmall bleeding

vessels more conspicuous. The integuments are next to be closely applied to the parts underneath, and retained there by the twisted suture, and likewise by a few adhesive straps. A large pledgit of simple ointment is now to be laid over the whole; and this is to be covered with a thick compress of lint, tow, or soft linen; and the dressings to be kept in their place, and moderate pressure made by the napkin and scapulary bandage.

By this method the integuments will generally soon adhere, and a cure will be performed by the first intention. But it does not often happen that the operation is performed while this favourable mode of practising it will answer.

In general, before extirpation of a breast is recommended by the surgeon, or submitted to by the patient, a considerable portion of the external integuments are so much diseased as to render it necessary to separate them along with the glandular part of the mamma. It sometimes happens likewise that the tumor adheres to the pectoral muscle, and that again to the ribs. In either of these cases it becomes necessary to remove all the diseased parts. For this purpose, two incisions of an oval form, with sharp extremities, of a sufficient size to include the whole of the affected parts, become necessary. If again it be found, that besides the disease of the breast, the lymphatic glands in the neighbourhood are indurated, or otherwise diseased, the first incision ought to extend at once over these; and after the other parts have been removed, and the vessels secured, the whole of the diseased glands are to be extirpated; and in performing this part of the operation, considerable assistance may be given by supporting them with a hook, or a ligature passed through them, till they are entirely removed. When they lie deep in the axilla, the points of the fingers, or the end of the handle, will sometimes be safer than the edge of the knife. After having removed all the glands which are in the smallest degree affected, the cut edges of the skin are to be brought as near to each other as the nature of the case will allow, so as to heal as much as possible by the first intention. After the wound is nearly, or perhaps entirely healed, an issue, inserted into the arm of the opposite side, will be the best means of preventing a relapse.

Sect. IV. Burns.

The immediate consequence of burns is a greater or less degree of inflammation; and the danger attending such accidents is in proportion to the extent of the injury. Burns which irritate the skin only, without destroying the cuticle, act nearly in the way of a common blistering plaster. When the cuticle is destroyed, no blister takes place: a mortified slough is observed: and when this separates, an ulcer is left. Where the cuticle is not destroyed, relief may be procured by holding the part affected a considerable time in very cold water, or sometimes by plunging it two or three times into water a little below the boiling point. Solutions of saccharum saturni, and other preparations of lead, have been recommended, as in the case of other inflammations. Vinegar is found a very effectual application, whether the skin be sound or blistered. The part may be entirely immersed in it, or linen rags dipt in the vinegar may be applied, and the parts kept constantly moist, till the pain be removed. The same application is useful where the skin is rubbed off, or otherwise destroyed. In this case, indeed, the vinegar is apt to give additional pain on its first application; but this soon ceases, and the part becomes much cooler and easier. If the patient will not suffer the vinegar to be applied immediately to the surface of the sore, a linen rag soaked in olive-oil may be previously laid on the part, covering the whole with the cloths dipped in vinegar; and these applications are to be occasionally repeated till the pain and inflammation be entirely removed; after which the parts are to be dressed in the same manner as in the case of a common blister In extensive burns, where the irritation is great, along with external applications, opium should be prescribed, in doses adequate to the degree of pain. Even that stupor with which patients in this situation are sometimes attacked, is found to be more readily removed by opium than by any other remedy. With respect to the blisters which arise upon burns, it has been disputed whether they ought to be opened, or allowed to remain till they dry up of themselves. But, according to the opinions of the latest authors, they ought to be opened as soon as any considerable quantity of fluid is found in them. After the serum is discharged, a thin liniment of wax and oil, with a little saccharum saturni, should be applied to the part.

In cases of very severe burns, where, notwithstanding the above treatment, there is danger of a violent inflammation being induced, blood-letting, cooling purgatives, and other remedies adapted to the peculiar symptoms, must be used. When, again, burns are from the first attended with the loss of substance, as commonly happens after the application of hot metallic bodies, we ought to have recourse to the vinegar, as already mentioned, or to a liniment which is now in very common use for such purposes, made of equal parts of lint-seed oil and lime-water, which, when shaken together, forms a thick white substance, which often gives speedy relief; and it may be readily applied by daubing the parts frequently over with a soft pencil well soaked in it. Though this has been considered as one of the best applications in burns, yet in some cases, more immediate relief has been procured from the application of Goulard's cerate, or the unguentum nutritum; and a weak solution of saccharum saturni has sometimes been of service.

When burns are occasioned by the *explosion of gun-powder*, some of the grains of the powder are apt to be forced into the skin. At first they produce much irritation; and if they are not removed, they commonly leave marks which remain during life. They should, therefore, be picked out as soon as possible after the accident; and to prevent inflammation, as well as to dissolve any power which may remain, the parts afflicted should be covered, for a day or two, with emollient poultices. In other respects, injuries of this sort are to be treated like any other kind of burns.—When burnt parts are contiguous to each other, they are apt to adhere. To prevent this, pledgits covered with any proper dressing ought to be inserted between them during the course of the cure. Ulcers arising from burns are apt to become soft and fungous, and to rise above their natural level. When this is observed, the emollient ointments, which may have been previously used, should be laid aside, and those of a moderately astringent nature applied. Gentle compression with a roller is also of particular service. Advantage is likewise derived from saturnine washes, &c. One of the best ointments, in such cases, is the common calamine cerate. These will commonly answer the purpose: but when they prove insufficient, burnt alum, blue vitriol, or even lunar caustic, may be necessary.

CHAP. V. Of INFLAMMATORY TUMORS.

Inflammatory Tumors are such as are quick in their progress when compared with those of the indolent kind, and are attended with considerable pain and other symptoms of

inflammation. We have here mentioned ſuch only whoſe treatment more properly belongs to the province of the ſurgeon, and which are placed according to their ſituations in the different parts of the body.

Sect. I. *Inflammation and Abſceſs of the* Breasts *of Women.*

This diſorder occurs moſt frequently in nurſes by the ſtoppage of the milk, which is always occaſioned by ſudden or imprudent expoſure to cold.

In the early ſtages of the affection, reſolution is always to be attempted, unleſs the ſwelling appears to have an evident tendency towards ſuppuration. The remedies uſed in inflammation, in general, ſeem uſeful in every caſe of inflammation of the breaſts. When the patient happens to be nurſing, a ſudden evacuation of blood is apt to diminiſh the quantity of milk: in ſuch caſes, therefore, blood is to be extracted in ſmall quantities at a time. The application of cooling ſaturnine poultices is adviſable. When ſuppuration has taken place, the matter is to be diſcharged by making an inciſion in the moſt depending part of the tumor.

Sect. II. *Inflammation of the* Testicles.

This diſeaſe is often owing to expoſure to cold, violent exerciſe, &c.; but moſt frequently to gonorrhœa virulenta, and never to matter falling down upon the teſtes, as was ſuppoſed by thoſe who gave it the name of *hernia humoralis*. Inflammation here rarely terminates in ſuppuration.

The beſt method for diſcuſſing the inflammation is by the application of leeches; after which the penis ought to be kept conſtantly moiſtened with a ſolution of ſaccharum ſaturni, and the ſcrotum and teſtes ſupported by a proper bandage. The bowels ſhould be kept moderately open; the patient ſhould uſe a low diet, and keep as much as poſſible in an horizontal poſture. If lues venerea be preſent, a cure cannot be expected without mercury. If the diſeaſe is owing to a ſudden ſtoppage of the diſcharge in gonorrhœa, the running ought to be reſtored, and promoted by bathing the penis in warm water, injecting warm oil, and the uſe of bougies. Theſe means will generally diſcuſs the inflammation. If matter form, it muſt be diſcharged.

Sect. III. *Of* Venereal Buboes.

A swelling of any of the lymphatic glands of the body is called a *bubo*; and when ſuch a ſwelling proceeds from venereal poiſon, it is termed *venereal bubo*. They ſeldom or never appear except in the lymphatic glands of the groin, arm-pit, or extremities, and much more frequently in the groin than any-where elſe.

In the treatment of buboes, a ſtrict antiphlogiſtic regimen is to be uſed to promote a reſolution; the application of leeches to the hardened gland is particularly proper. In diſcuſſing venereal buboes, the application of mercurial ointment has a conſiderable effect. After ſuppuration is completely formed, the application of cauſtic to open the bubo is dangerous, leſt it ſhould corrode ſome of the conſiderable blood-veſſels, which generally lie contiguous to the bubo. Buboes, when opened by the knife, are ſaid to heal with more difficulty, and generally to leave a ſcar behind them. To allow them to burſt of themſelves, is therefore for the moſt part proper, except when the collection is ſo conſiderable as to preſs upon the neighbouring blood-veſſels. In ſuch a caſe, a ſmall inciſion may be made by the lancet, taking as much care as poſſible to prevent the admiſſion of the external air into the wound. When the edges of the opening grow callous, the application of lunar cauſtic to them becomes neceſſary. During the remaining part of the cure, mercury joined with opium is to be uſed.

Sect. IV. Lumbar Abscess.

The term *lumbar* may be applied to every abſceſs ſeated in the loins; but that which is here meant is ſuch as begins about the top of the os ſacrum, and is ſeated in the vicinity of the great pſoas muſcle.

The ſymptoms begin with pain and tenſion about the loins, ſhooting upwards to the ſpine and downwards to the thigh. The diſeaſe has ſometimes a ſtrong reſemblance to nephritic affections, and is ſometimes miſtaken for lumbago. After ſuppuration takes place, ſhivering fits come on; and the pain now becoming dull, the patient imagines himſelf better, till matter points at the ſide of the anus, or in the groin. The firſt caſe is rare; and when it does occur, the tumor burſts, or is opened as a common abſceſs. In the other caſe, the matter is ſeated behind the faſcia of the groin, and ſometimes deſcends as far as the knee. The teguments commonly retain their natural appearance. Fluctuation is evident, eſpecially when the patient is in an upright poſture. It is often miſtaken for crural hernia; but may be eaſily diſtinguiſhed from it, by its ſlow progreſs, by pain in the lumbar region at the commencement of the diſeaſe, by the patient allowing the tumor to be handled freely, by fluctuation being evident, by the tumor becoming flaccid when the patient is in an horizontal ſituation, and by the abſence of all the ſymptoms by which hernia is diſtinguiſhed. Both diſeaſes may occur at once: but this is very rare, and a diſtinction is ſtill to be made.

It is diſcovered that this diſeaſe has, in general, been induced by conſiderable injury being done to the ſmall of the back or loins, either by twiſts, or ſevere bruiſes, or by ſudden expoſure to cold after the heat occaſioned by ſevere exerciſe, particularly in ſcrophulous habits. Were accidents of this nature immediately treated with that attention which their importance deſerves, the diſeaſe might frequently be prevented.

In the treatment the ſtricteſt antiphlogiſtic regimen ought to be obſerved. Blood-letting ought immediately to be performed, by ſcarifying deeply and leeching the injured part: neither are bliſters, opiates, gentle purgatives, and other remedies uſeful in inflammations, to be neglected.

Authors have an idea that little advantage can be derived from laying open the abſceſs, on account of the great danger which may enſue from the admiſſion of air. Mr. Benjamin Bell, however, is of an oppoſite opinion, and has always given vent to matter here as elſewhere, and no bad conſequences have been obſerved. The matter, when long lodged, has been found to deſtroy the ſoft parts and bones, and ſometimes to make its way into the cavity of the abdomen; all of which might be prevented by an early evacuation. For this purpoſe a trocar ſhould be uſed, which was tried by Mr. Bell in one caſe with complete ſucceſs.

Some other caſes are lately narrated by authors, where, by the introduction of a ſeton, and drawing off the matter by ſlow degrees, and then by uſing compreſs, and ſometimes injections of gently irritating fluids, a cure has been performed in the courſe of a few months. If the caſe is doubtful, an opening ſhould be made with the knife in the ſame manner as in hernia. If the flow of matter continue conſiderable for the ſpace of two or three weeks, injections of a weak ſolution of ſaccharum ſaturni, lime-water, or other gentle aſtringents, may be employed.

Sect. V. Paronychia *or* Whitloe, *and* Chilblains.

Whitloe is a painful and inflammatory ſwelling at the extremities of the fingers under the nails, terminating in an effuſion of clear ſerum below the ſkin, which is ſometimes ſo acrid as to corrode the perioſteum, and render the bones carious. At other times the inflammation runs ſo high that the whole of the arm ſwells, particularly the lymphatics, and ſometimes even the glands in the axilla.

When this affection ariſes from external violence, the remedies employed for inflammation, in general, will be of ſervice. When it ariſes from unknown cauſes, ardent ſpirits and aſtringents have been found uſeful, particularly when topical and general bleedings have been previouſly uſed. When an effuſion of a ſerous matter takes place, it is immediately to be diſcharged, as it is almoſt impoſſible to convert it into proper pus. When this ſerum has continued ſo long as to render the bone carious, a removal of the whole bone, or of the carious portion, becomes neceſſary, in order to effect a complete cure.

Chilblains are inflammatory ſwellings, of a purple colour, chiefly affecting the heels, and ſometimes alſo the fingers, toes, arms, hands, or feet, or even the tips of the noſe and ears, attended with a ſtinging pain, and a degree of itching. The ſwelling ſometimes cracks, and diſcharges an acrid ſerum: ſometimes a mortification takes place, and an ulcer follows very difficult to heal.

This diſorder is owing to the weaker action of the ſmall veſſels moſt remote from the heart, occaſioned by cold or dampneſs, and occurs moſt frequently in people of a delicate conſtitution.

When the patient has been for ſome time expoſed to the cold, and the parts are froſt bitten, they ought to be plunged into the coldeſt water and rubbed with ſalt; when they are only benumbed, rubbing them with camphorated ſpirit of wine will anſwer equally well: but when cracks take place, and an oozing of acrid matter enſues, poultices may be applied, but not long, as they are apt to give riſe to fungous excreſcences.

Sect. VI. *Of* Contusions *and* Sprains.

Contusions of the integuments and muſcles produce pain, ſwelling, and inflammation, and theſe, in ſome caſes, may extend to a conſiderable degree; but in general they are leſs violent than what take place in caſes of ſprains of ligaments or tendons; for in theſe there is frequently a total loſs of motion for many weeks, and ſometimes for years, if proper attention be not paid. An effuſion of fluids always ſucceeds the injury, which ſeems to be, for the moſt part, of a ſerous nature, as the ſkin uſually retains its natural colour; ſometimes the tumefied parts are of a deep red, or leaden colour, owing to a rupture of ſome veſſels conveying red blood.

In *the treatment* of contuſions and ſprains, two circumſtances require attention. 1. To endeavour to prevent the ſwelling as far as is practicable; 2. To employ thoſe remedies afterwards which are known to be moſt powerful in preventing or removing inflammation. In contuſions of the cellular ſubſtance, and even of the muſcles, the effuſed fluids are commonly ſoon abſorbed; but in ſprains of the tendons or ligaments, a very troubleſome, painful thickneſs of the injured parts is apt to continue for a great length of time, and in ſome inſtances even for life.

It is neceſſary, therefore, to obviate theſe ſymptoms as ſoon as poſſible; and for this purpoſe, cold aſtringent applications, as water, vinegar, &c. are moſt commonly uſed. Others again, with a view to relax the parts fully, make uſe of water as hot as the patient can bear it. By immerſing the injured part in theſe immediately after the injury is received, the effuſion will at leaſt be ſomewhat obviated. When the pain is exceſſive, opiates become neceſſary.

After blood has been freely diſcharged, a repetition of the remedies already mentioned will be found to give great relief; care ſhould be taken, at the ſame time, that the injured parts be kept in a relaxed and eaſy poſture.

CHAP. VI. Of INDOLENT TUMORS.

These are ſuch as are ſlow in their progreſs, and may continue for a long time without being attended with either pain or inflammation; though occaſionally almoſt all of them may be inflamed, and ſome of them, in that ſtate, attended with conſiderable pain. They are of different kinds according to the nature of their contents, and appear in various parts of the body. They are ſeated in the adipoſe and cellular membrane; whence it often happens that they take place in the viſcera themſelves, where they are frequently mortal. Sometimes they are filled with a ſubſtance of the conſiſtence of honey, and are thence called *meliceratous* tumors; ſometimes they are filled with an harder ſubſtance, and are then called *atheromatous* tumors; at other times they are filled with a ſubſtance of the conſiſtence of fat, and are then called *ſteatomatous*. Sometimes, however, they are found to be repleniſhed with a fluid lymph coagulable by heat, and are then called *hydatids*. One ſet are filled with matter like the ſynovia of the joints, and get the name of *ganglions*.

Tumors of this kind are eaſily *diſtinguiſhed* from all others, as having neither heat, pain, nor pulſation, as is to be obſerved in thoſe which incline to ſuppurate; and they are diſtinguiſhed from each other, before they are laid open, by fluctuation being readily perceived in the meliceris: the atheroma is ſoft and compreſſible, but has no fluctuation; while the ſteatoma is commonly firm and rolls under the ſkin. But theſe rules are liable to conſiderable exceptions. The meliceris and atheroma are moſt commonly found upon the head, and the ſteatoma upon the other parts of the body; while ganglions are ſituated over the tendons of the muſcles. Theſe tumors muſt be either extirpated entirely, or laid open ſo as to diſpoſe the cyſt to ſlough off or granulate. If the matter be fluid, we may evacuate it by an opening made with a lancet, or by means of a ſeton; but as the matter is apt to collect again, it is better to remove the ſac entirely. If large veſſels or nerves prevent this from being done, then it is to be laid freely open and expoſed to the air, ſo that the bag may granulate, or be thrown off. When the tumor is to be extirpated, a longitudinal inciſion is to be made through the integuments; after which the tumor may be frequently removed by the point of the finger, or by the end of a ſpatula, replacing the integuments with a view to heal by the firſt intention. In every pendulous tumor of this kind, with a narrow neck, we ought to divide the teguments near the bottom of the tumor, in an oval form, ſo that the wound may be afterwards properly covered with the remaining integuments. After the tumor is removed, the ſkin is to be replaced over the wound, and fixed with adheſive ſtraps, covering it with a pledgit of cerate, a ſmall compreſs of linen, with a bandage above all, to make a gentle preſſure on the parts.

Sect. I. *Of* Steatomatous *and* Sarcomatous Tumors.

Steatomatous tumors have been ranked by authors among thoſe of the encyſted kind; but they have no other

cyſt containing them than the common cellular ſubſtance, ſomewhat condenſed; and the particles of fat compoſing them are found of the ſame ſize with thoſe in a ſound part of the body.

Authors formerly adviſed the diſcuſſion of ſteatoms, or the prevention of their growth, by the application of preſſure; but by ſuch means the growth is rather promoted than retarded, nor have internal remedies been of any advantage, They can be removed therefore by an operation which is the ſame with that for the extirpation of encyſted tumors.

Sarcomatous tumors have nearly the ſame external appearance with thoſe of the ſteatomatous kind. The term has been applied, in a general way, to ſcirrhi of the glands: but ſarcomatous tumors are likewiſe found in various other parts of the body, and are diſtinguiſhed from ſteatoms by being firmer to the touch; internally they are found of a redder colour, or approaching that of muſcles, in conſequence of the greater number of veſſels entering into their ſubſtance. Theſe are to be treated in the ſame manner as ſteatoms; but the operation ought to be performed early, as they are more apt to degenerate into cancer.

Sect. II. *Of* Ganglions, *or Swellings of the Burſæ Mucoſæ.*

Ganglions of the tendons are likewiſe tumors of the encyſted kind, ſeated in the burſæ mucoſæ, or ſheaths of the tendons which belong to the extremities. They are moſt frequently met with over the tendons upon the back of the wriſt, and often likewiſe about thoſe of the ankle and other parts of the extremities. When preſſed, they are found to poſſeſs a conſiderable degree of elaſticity, from which, and from their ſituation, they may generally be diſtinguiſhed from other encyſted tumors. They ſeldom arrive at any great bulk, are not often attended with pain, and commonly the ſkin retains its natural appearance. On being laid open, they are found to contain a tough, viſcid, tranſparent fluid, reſembling the glaire of an egg.

They are generally *produced by ſprains,* or contuſions of the joints, or by rheumatiſm. In many inſtances, they go off inſenſibly, without any aſſiſtance from art; but as this is often not the caſe, means ought to be uſed for removing them. For this purpoſe, moderate friction frequently repeated, or gentle compreſſion applied to them by means of thin plates of lead, &c. ſometimes remove them. In ſome inſtances they have been removed by the application of bliſters; but the moſt certain method is, to make a ſmall puncture into the ſac, and to draw a cord through it; or, after the puncture is made, to preſs out the contents, and then inject ſome gently ſtimulating fluid, as port-wine and water heated blood-warm. Sometimes, in tumors of this kind, bodies of a cartilaginous nature, and of different ſhapes and ſizes, are found; ſome quite ſmooth, others with peduncles; by which they are ſuppoſed by Dr. Monro, in his work upon the burſæ mucoſæ, to have been attached to the burſæ. As theſe cannot be removed by any remedy with which we are yet acquainted, it is found neceſſary to diſcharge them. But as the parts may ſometimes ſuffer from inflammation when the tumor is laid fully open, it may be punctured at each end; and, after preſſing out the contents, a ſmall cord may be introduced; after which gentle preſſure may be applied with a compreſs and bandage over the courſe of the tumor. The cord, however, ſhould not be continued ſo long as to induce any great degree of inflammation, for it is found that a ſlight degree of this ſufficiently anſwers the purpoſe.

Sect. III. *Of* Collections *within the* Capsular Ligaments *of* Joints, *and of Cartilaginous Bodies contained there.*

Collections here may conſiſt of ſerum, blood, or pus and ſynovia combined. They are moſt frequently met with in the joint of the knee, and may be produced either by internal or external cauſes. Theſe kinds of collections may in general be diſtinguiſhed from each other.

Watery effuſions, commonly called *dropſical ſwellings* of the joints, ariſe chiefly in conſequence of ſevere rheumatic complaints; and when the tumor is not very large, the fluctuation of the fluid may be felt by preſſure. When a large effuſion appears immediately after a violent bruiſe, it is probable that it conſiſts chiefly of blood; but when it ſucceeds a violent ſprain, attended with great pain, inflammation, and ſwelling, terminating in an effuſion, there is every reaſon to think that the contained fluid conſiſts of pus mixed with ſynovia.

Swellings of the joints are moſt apt to be confounded with collections in the burſæ mucoſæ, or with matter effuſed in the adjacent cellular ſubſtance. From the firſt of theſe they are generally diſtinguiſhed by the contained fluid paſſing readily from one ſide of the joint to the other, and from its being diffuſed over the whole of it; whereas, when it is contained in the burſæ, the tumor is confined to a particular part, and is ſeldom attended with much pain.

When ſuch collections can ſafely be allowed to remain, the capſular ligament ought never to be opened, as they can often be removed by diſcutients. Even conſiderable collections ariſing from rheumatiſm may commonly be diſcuſſed by friction, fomenting the parts with warm vapour, keeping them conſtantly moiſt with ſaturnine ſolutions, covering them properly with flannel, and applying bliſters. When theſe fail, ſupporting the part with a laced ſtocking, or with a roller, has frequently been of ſervice. But whether a rheumatic tumor can be diſcuſſed or not, it ought not to be opened; for the inconvenience attending it is more intolerable than the pain and inflammation which may enſue. But when the matter would do miſchief by lodging, it ſhould be diſcharged. Effuſed blood and matter which ſucceed high degrees of inflammation are of this kind. Blood is frequently extravaſated among ſoft parts without much detriment; but when in contact with cartilage or bone, it ſoon hurts them materially. The matter *ought to be diſcharged* ſo as moſt effectually to prevent the admiſſion of air into the cavity of the joint. For this purpoſe the opening ſhould be made with a trocar; and the ſkin, previouſly drawn tight to the upper part of the tumor, ſhould be pulled down immediately on withdrawing the canula. A piece of adheſive plaſter ſhould be directly laid over the opening, and the whole joint ſhould be firmly ſupported by a flannel roller properly applied. If the patient be plethoric, he ſhould be blooded to ſuch an extent as his ſtrength will bear; he ſhould be put upon a ſtrict antiphlogiſtic regimen, and in every reſpect ſhould be managed with caution; for inflammation being very apt to enſue, we cannot too much guard againſt it.

Joints are ſometimes rendered painful and ſtiff by the formation of different *ſubſtances within the capſular ligaments.* Theſe are ſometimes looſe, and as firm as cartilage; and ſometimes of a ſoft membraneous nature, ſimilar to thoſe already obſerved in treating of ſwellings of the burſæ mucoſæ.

In ſome caſes theſe ſubſtances, eſpecially the laſt ſpecies, retain nearly the ſame ſituation, without being much affected either by preſſure or by the motion of the joint: in that

caſe the pain is conſtant but ſeldom ſevere. The firſt ſpecies, however, is commonly very moveable; and on being touched, they ſlip with ſuch facility, that it is difficult to fix them even with the fingers. Theſe are only painful in particular ſituations.

Where theſe concretions appear, upon examination, to be perfectly looſe and detached, if the pain which they excite is very ſevere, we ſhould venture in a cautious manner to take them out, by making an inciſion into the joint. But if there is reaſon to ſuſpect that they are connected with any part of the joint, the patient ought to be adviſed to ſubmit to the pain they induce, which in general will be rendered moderate by ſhunning exerciſe; but if, notwithſtanding this, it becomes inſupportable, amputation is the only reſource.

The limb being firmly ſecured by aſſiſtants, in that poſture which admits of the body to be taken out being felt moſt diſtinctly, the ſurgeon ſhould endeavour to fix it with his fingers towards the upper part of the joint, after an aſſiſtant has drawn the ſkin as much as poſſible upwards from the part where the inciſion is to be made. The operator with a ſcalpel is now to make an inciſion through the teguments and capſular ligament, directly upon the ſubſtance itſelf, of ſuch a ſize as will admit of its being eaſily taken out: which may be done either with the finger or with the end of a blunt probe. If it is found to be connected by any ſmall filaments either to the capſular ligament or to the cartilages of the joint, they ſhould be cautiouſly divided, either with a probe-pointed biſtoury, or probe-pointed ſciſſars, after drawing the ſubſtance itſelf as far out as it can be got. When more concretions than one are found, they ſhould all be taken out at the ſame opening, when this can be done; but when it cannot, it will be better to allow the firſt inciſion to heal before attempting the ſecond, ſo as to avoid as much as poſſible the exciting of inflammation.

After the concretion is removed, the ſkin ſhould be immediately drawn over the wound in the capſular ligament; and the lips of the opening in the ſkin being laid together, they ſhould be ſecured in this ſituation by pieces of adheſive plaſter, ſo as to prevent the air from finding acceſs to the cavity of the joint. Till the wound be completely healed, the patient ſhould not only be confined to bed, but the limb ſhould be kept as much as poſſible in one poſture, and a ſtrict antiphlogiſtic regimen ſhould be preſerved.

Sect. IV. *Of* Spina Bifida.

Spina bifida is a tumor which ſometimes appears upon the lower part of the ſpine in new-born children. A fluctuation is diſtinctly perceived in it, and the fluid it contains can in ſome meaſure be preſſed in at an opening between the vertebræ. In ſome caſes this opening is owing to a natural deficiency of bone; in others, to the ſeparation of the ſpinous proceſſes of the vertebræ.

The diſeaſe proceeds from ſerum collected within the coverings of the ſpinal marrow. It is always fatal. Children labouring under it have been known to live for two or three years; but, in general, they linger and die in a few weeks. All that art has been able to do is to ſupport the tumor by gentle preſſure with a proper bandage. When a tumor of this kind is laid open or burſts, the child dies in a few hours. A tumor nearly of the ſame nature with this is ſometimes met with upon different parts of the head in new-born children; it is formed by a fluid lodged beneath the membranes of the brain, which have been forced out at ſome unoſſified part of the ſkull. What we have ſaid with reſpect to the former is exactly applicable to this.

Sect. V. *Of* Scrophulous Tumors.

We ſhall here only mention the ſurgical treatment of ſcrophulous tumors, having ſpoken of ſcrophula in general under the article Medicine. Some practitioners have recommended poultices, &c. to bring ſcrophulous tumors to ſuppuration; but the beſt practitioners have laid them aſide, becauſe they increaſe the ſoft and ſpongy ſtate of the parts, by which they are prevented from healing.

As external applications are ineffectual, it is better to allow ſcrophulous tumors to be as much expoſed as poſſible, as this frequently renders the ſubſequent ulcer more eaſily cured. The other methods recommended for diſcuſſing theſe tumors are, the internal uſe of cicuta, burnt ſponge, muriated barytes, a long-continued uſe of the cold bath, particularly of ſea-bathing, and drinking mineral or ſea water. Theſe, to produce any effect, ſhould be begun early, while the tumors are ſmall, and long perſiſted in. When the tumors come to a ſtate of ſuppuration, if they are ſeated upon the thorax or abdomen, or any of the large joints, free vent ought always to be given to the matter to prevent its burſting into theſe cavities; and when the abſceſs is large, this ſhould be done with a trocar, or by paſſing a cord through it, in order to exclude the external air. When the tumors are not ſituated upon great cavities, it is better to allow them to break of themſelves, as the ſores commonly heal more readily, and the ſcar is pretty ſimilar in both. The moſt proper applications to ſcrophulous ſores ſeem to be thoſe of the ſaturnine kind, as they diminiſh inflammation, and in ſome meaſure prevent the ſore from ſpreading. When the bones become carious, they are to be treated like carious bones from other cauſes; but amputation cannot here be attended with advantage, as the diſeaſe proceeds from a fault in the conſtitution. After the ſores are healed up, the introduction of an iſſue may aſſiſt in preventing their return.

Tumors of a ſcrophulous nature are ſometimes apt to be miſtaken for thoſe of the ſcirrhous kind, and thus may be improperly extirpated. Scrophulous tumors deeply ſeated commonly have a degree of firmneſs, which, if they happen to be ſeated near a ſuſpicious part, as cloſe by the ſide of a woman's breaſt, may give occaſion to ſuch a miſtake. But they may generally be diſtinguiſhed by the ſoftneſs even of the firmeſt kind of them, when compared with ſcirrhus. They have always a ſmooth equal ſurface; whereas ſcirrhus is ſomewhat unequal or knotty, and ſeated in the real ſubſtance of the gland; and a ſhooting pain is commonly felt in it from time to time, even from its firſt appearance. They are generally accompanied, too, with other ſymptoms of ſcrophula, which is not neceſſarily the caſe with ſcirrhus.

Sect. VI. *Of* Bronchocele.

This is a tumor on the fore-part of the neck, ſeated between the trachea and ſkin, termed in French *goitre*. In this country it is very rare; but it is frequent among the inhabitants of the Alps, and other montainous countries, and is ſuppoſed to be owing to the uſe of ſnow-water. It is ſeated moſt frequently in the thyroid gland; though in two caſes examined by Mr. Benjamin Bell this gland was diminiſhed from the compreſſion of the tumor, which was chiefly formed of condenſed cellular ſubſtance, with effuſions in different parts of it of a viſcid brown matter. Dr. Proſſer conſiders bronchocele

as a dropfical affection of the thyroid gland; and in confirmation of this, he gives an account of a diffection of a difeafed gland of this kind by Dr. Hunter, who found in it a great number of capfules filled with water. The fwelling is at firft foft, without pain or any evident fluctuation, and the fkin retains its natural appearance; but as the tumor advances in fize, it becomes unequally hard; the fkin acquires a copper colour, and the veins of the neck become varicole; the face becomes flufhed, and the patient complains of frequent headachs, as well as of flinging pains through the body of the tumor.

Frequent frictions are found ufeful, efpecially when employed early; faponaceous and mercurial plafters, too, have in fome cafes proved ferviceable; and repeated bliiters have been known to retard its progrefs. In the enlarged ftate of the tumor no remedy yet known is powerful enough to difcufs it. When the difeafe is far advanced, the removal of the tumor by an operation muft be attended with great danger, on account of the enlarged ftate of the arteries, as well as its vicinity to the common carotids. It is therefore thought by fome of the moft experienced practitioners, that in fuch a fituation it would not be advifable to attempt extirpation, and that the patient fhould rather truft to the common palliative treatment. When the tumor, however, is not much increafed, if other remedies have failed, and the difeafe is advancing, a furgeon might be warranted in attempting its extirpation

Sect. VII. *Of* Nævi Materni, Corns, *and* Warts.

Nævi materni are thofe marks which frequently appear upon the bodies of children at birth, and which are fuppofed to originate from impreffions made on the mind of the mother during pregnancy. They are of various forms; their colour is likewife various; though moft frequently refembling that of claret or red port-wine. Many of thefe marks are perfectly flat, and never rife above the level of the fkin: thefe do not require the affiftance of furgery; but in fome cafes they appear in the form of fmall protuberances, which frequently increafe to a great fize in the courfe of a few months. They appear to be firm and flefhy. They fometimes hang by flender attachments to the contiguous parts, but more generally they are fixed by broad bafes. They may be removed with as little danger as any other tumor of the farcomatous kind. They are fupplied indeed more plentifully with blood than moft other tumors are; and even fometimes they appear to be entirely formed by a congeries of fmall blood-veffels; but the arteries which fupply them may, for the moft part, eafily be fecured by ligature. The operation fhould never be long delayed; for as the fize of the veffels correfponds with that of the tumor, they fometimes are fo large as to throw out a good deal of blood before they can be fecured In performing it, the tumor is to be cut out, the arteries taken up, and the remaining fkin brought as well together as the nature of the part will allow, and kept fo by adhefive plafter or future. When the tumor is pendulous, and connected only by a narrow neck, it fhould be extirpated by ligature.

Corns are fmall hard tubercles, commonly fituated on the toes or other parts of the feet, and fometimes on the hands. They are of a horny nature. They proceed from a difeafed ftate of the cuticle, occafioned by preffure. The part becomes hard and thickened, with a fmall white fubftance in the centre, which has a difpofition to become prominent It likewife forms a depreffion in the fubjacent cutis vera, and fometimes is faid to penetrate it. When corns are fituated on parts much expofed to preffure, they irritate the fkin, and produce an increafed fenfibility of the part, and thus occafion much pain. The beft preventive of corns is the wearing of wide fhoes, and avoiding every kind of preffure; and unlefs this be attended to, it will be found difficult to keep free from them. Various remedies are recommended for the cure or removal of corns. One is to bathe the part about half an hour in warm water, then to pare as much off them as poffible without giving pain, and to apply over them any emollient ointment. If this treatment be frequently repeated, while preffure from fhoes is prevented, they generally fall off, and do not return if preffure be afterwards avoided. Another method is to allow them to grow to fome length through pieces of perforated leather, properly fecured by plafter or by any other means, and afterwards to cut round their root, by which they may for the moft part be eafily turned out. Or if fuch irritating fubftances be applied to them as will raife a blifter by feparating the cuticle from the cutis, the corn will be raifed along with the cuticle, and may then be readily removed by a fcalpel or fciffars. The furface of the cutis being now expofed, is to be healed like any other part that has been bliftered.

Warts are fmall, hard, indolent tumors, with a rough furface, appearing on different parts of the body, chiefly the hands and face, and more commonly in young people. When they appear in advanced life they are apt to degenerate into cancer, efpecially when of a livid colour and with a fmooth furface. If they do not prove troublefome, nothing fhould be done to them, as they generally either fall off, or wafte gradually away. When from their fize or fituation they require to be removed, this, if they are pendulous or have narrow necks, is eafily done by ligature; but if their bafes be broad, the fcalpel or efcharotic applications will be neceffary. As few, however, will fubmit to the former, the latter are generally employed. Efcharotics of a mild nature give leaft pain, and are leaft apt to excite inflammation, which in thefe cafes it is difficult to remove, and are found to be quite fufficient for the purpofe. One of the beft of thefe is crude fal ammoniac: it fhould firft be moiftened in water, and then well rubbed upon the warts two or three times a-day. Liquid falt of tartar, and fometimes fpirit of hartfhorn, has anfwered the fame purpofe: fome recommend alfo the juice of onions.

Warts appearing on the penis as a fymptom of venereal infection, are of the fame nature, and to be cured by the fame means. Mercury is of no advantage here, and commonly indeed does harm. When every other part of the difeafe is eradicated, the warts may generally be removed by wafhing them morning and evening in lime water, or in a weak folution of faccharum faturni. They may be removed alfo by the knife, and the parts from whence they are cut afterwards touched with lunar cauftic, to prevent them from returning: but when this method is practifed, the operator ought to be certain that he has removed the wart entirely, for where part has been left the moft formidable fymptoms have fometimes enfued.

Sect. VIII. *Of* Polypi.

Polypi are pendulous, flefhy, indolent tumors, fo called from their fuppofed refemblance to the animal of that name. They may be found in different cavities of the body, and originate from the lining membrane; but thofe which come under furgical treatment are found in the nofe, mouth, throat, and outer paffage of the ear, and in the vagina and rectum. They are divided into two claffes; the one foft and compreffible, the other extremely firm. Both of them bleed on being fretted or roughly handled. The foft kind fhrivels and contracts in a dry atmofphere (this is particularly the cafe

with those of the nose); but the firm are not affected by the influence of the weather. Their colour is commonly pale and transparent, and sometimes a deep red.

The pain at the commencement of the disorder is always inconsiderable; but increases in those of a hard nature as they increase in size. Sometimes polypi of this kind become unequal, and form ulcers over the whole surface, discharging fetid matter in considerable quantity. They are apt at this time, unless extirpated, to degenerate into cancer.

Most frequently they arise from local injury, or whatever tends to produce and support an inflamed state of the part. Scrophula and lues venerea, though considered by some authors as frequently giving rise to them, seem only to be exciting causes; for in lues venerea in particular, polypi when present remain after the disease is cured.

The *prognosis* must depend much upon their situation and their consistence. The soft kind being seldom painful, may be removed at any period with little danger; but the hard kind are generally not only painful, but more apt to degenerate into cancer, or to return after being removed. The soft kind therefore may be removed in general with success; but when polypi of a harder nature exist, the prognosis will be much more unsavourable.

With respect to the treatment.—As long as they remain stationary, they are not to be touched; but when they continue to grow, we ought to use astringent remedies, especially a strong solution of alum, a decoction of oak bark, vinegar, ardent spirits, &c. The softer kinds of polypi may frequently be prevented for a long time from increasing in size, and sometimes they even become considerably smaller. Mercury has been found rather to make them worse; caustic and other corroding applications have been of use in the softer kind, though they have not produced a cure. Setons have likewise been used with little advantage. It is therefore found necessary to have recourse to a more effectual practice; and with this view the knife, scissars, forceps, or ligature, are more generally recommended. The knife and scissars may be used when the roots of the tumor can be readily come at; but polypi are seldom so situated as to render excision practicable; and even when they are, the hæmorrhagy may be attended with considerable danger. The removal of a polypus by tearing or twisting it with the forceps, Plate 1. fig. 3. is occasionally practised; but as ligatures are less painful, and fully as effectual, they are now more generally employed. The ligatures consist of wire, catgut, silk cord, &c. Different methods have been employed for passing these over polypi, according to their different situations.

When the *ligature* is to be applied, it is to be passed double over the tumor, and conducted to the root of it by means of the fingers or by slit probes, as in Plate 24. fig. 4. or rings, fig. 5. as may be best suited to the shape and size of the passage. The ends of the ligature are then to be introduced into a single or double canula, fig. 6. which is to be pushed along the opposite side of the polypus till the end of the canula reach the root of it, when the ligature is to be drawn somewhat tight, and fastened to the canula which is to be left in the passage. The ligature is to be daily tightened till the tumor drop off. In this manner the largest polypus may be removed equally well with those of a smaller size. Should any part of it remain, it may be destroyed by caustic, and different instruments are contrived for conducting this to the root of the tumor.

What has been said of the treatment of polypi in general, readily applies to those seated in the nose, outer passage of the ear, the rectum, and the vagina. It likewise applies to those in the throat; only that instead of passing the ligature through the mouth, it is to be passed through one of the nostrils. The operator is then to introduce one or two of his fingers into the mouth, and open the doubling of the ligature, which he is to pass over the polypus, and having pressed it down to the root of it, to proceed as before directed.

Chap. IX. *Of Diseases of the* Bones.

The bones, as well as the softer parts, are liable to be swelled, either throughout their whole length, or to have tumors formed on particular parts of them.

Exostosis is one species of tumor of the bone. According to Mr. Bromefield, no swelling should be called so, but an excrescence continued from a bone, like a branch from the trunk of a tree. Under this head therefore is ranked the *benign node*, which may be produced by external injury, such as contusions and fractures: it can hardly be called a disease, as pain seldom succeeds, but rather a deformity.

There are risings or tumors observable on the bones which are often the consequents of venereal virus, and are termed *tophi*, *gummi*, or *nodes*.—Tophus is a soft tumor in the bone; and seems to be formed of a chalky substance, that is intermediate between the osseous fibres. These cretaceous extravasations are sometimes found on the ligaments and tendons, as well as on the bone; and may sometimes be taken out by the knife. We have many instances where chalk stones in gouty people make their way out through the skin of the fingers and toes.

Gummi is a soft tumor on the surface of the bone, between it and the periosteum; and its contents resemble gum softened, from when it has taken its name. Possibly, by obstruction in the nutrient vessels of the bone, a rupture of some of them occasions the serous liquor to escape, which, by making its way between the fibres of the bone, arrives at its surface; and being detained by the resistance of the periosteum, its most liquid parts being evaporated, and the remainder condensed by the inflammation, and consequently this inelastic covering being stretched, it becomes inspissated, and forms this species of *exostosis*, as it is generally called. When this is the cause, and the indisposition of the habit in general got the better of, pressure by a steel instrument, adapted to the part affected, is the proper cure.

The confirmed *venereal node* has the appearance of a divarication of the osseous fibres, probably from some inspissated humour obstructing the nutrient vessels, but not extravasated; this occasioning an extension of the periosteum, produces a violent pain, which, when noctural, is the characteristic of a venereal cause. When the periosteum is thickened but the bone not affected, a course of mercury, by attenuating the obstructed humour, and fitting it to be carried out of the body by the proper outlets, will often produce a perfect cure: but when the bone itself is diseased, this method will fail. But here the division of the extended periosteum has been known to give perfect ease.

The usual method, formerly, was to apply a caustic equal to the extent of the node, which being laid bare, required exfoliation before it could be cicatrized. If the incision is made early, that is, before matter be formed under the investing membrane, it seldom requires exfoliation; and, as we often find that the bone itself is not affected, but only the periosteum thickened, we may be deceived even after a careful examination: it is therefore proper that the patient should be pretty far advanced in a course of mercurial unction before even the incision is made; for, should the tumor decrease, and the pain abate during the course, chirurgical assistance, with the knife, most likely may become unnecessary.

A bone may become carious first in its internal parts; and that from external injury, as well as from a vitiated state of

the animal fluids. Authors feem not to agree as to the technical term for this kind of difeafe of the bones; fome calling it *cancer* or *gangræna offis*; others, *fpina ventofa*, from the pointed extuberances ufually attendant on this diforder of the bone; and fome again *teredo*, from the appearance of the carious bone, like wood that is worm-eaten.

It is univerfally allowed, that this difeafe takes its rife from matter being formed either in the diploe, or in the marrow: whenever obftruction is begun in the veffels expanded on, or terminating in, the medullary cyfts, the confequence will be inflammation, and, if not early removed, matter will form; for this reafon this cafe may be called *abfceffus in medulla*. Whenever, then, a patient complains of dull heavy pain, deeply fituated in the bone, poffibly confequent to a violent blow received on the part fome time before, though the integuments appear perfectly found, and the bone itfelf not in the leaft injured, we have great reafon to fufpect an abfceffus in the medulla. Children of a bad habit of body, though they have not fuffered any external injury, will often become lame, and complain of the limb being remarkably heavy; and though not attended with acute pain, yet the dull throbbing uneafinefs is conftant. If rigors happen during the time the patient labours under this indifpofition, it generally implies that matter will be formed within the fubftance of the bone. If the extremities of the bone complained of begin, or if it becomes enlarged throughout its whole extent, it may be known to be an abfceffus in medulla, or true fpina ventofa, as it is called: if neither of thefe fymptoms take place, the great infenfibility of the bone in fome fubjects will prevent that acutenefs of pain ufual in other parts where matter is formed, though the acrid matter is eroding the bone during the whole time it is contained within it. This matter at length having made it way through, arrives at the periofteum, where it creates moft violent pain, as well from its fharpnefs as from its increafed quantity, occafioning an extenfion of the periofteum. The integuments then become fwelled and inflamed, and have a fort of emphyfematous feel. On being examined by preffure, the tumor will fometimes be leffened, from part of the matter retiring into the bone: from this appearance to the touch, moft likely the name of *ventofa* was added to the term *fpina*. When we are affured of matter being under the periofteum, we cannot be too early in letting it out, as it will fave a confiderable deal of pain to the patient, though probably it may not be of any confiderable advantage in refpect to the carious bone; for, where the fluids in general are vitiated, no chance of cure can be expected from topical remedies; but where the conftitution is mended, Nature will fometimes aftonifh us in her part, as the carious bone will be thrown off from the epiphyfes, or the teredines will be filled up by the offific matter that flows from the parts of the bone where fome of the fpinæ have come away.

If proper medicines are given, the children well fupported, and the parts kept clean and dry, patience and perfeverance will frequently give great credit to the furgeon. In cafe it fhould have been thought advifable to apply a trephine, to give free difcharge to the matter, the wafhing it away, as well as the fmall crumblings of the carious bone, by means of deterfive and drying injections, has been known to contribute greatly to the curing this kind of caries, after the habit of body in general had been mended.

Befides thofe above mentioned, the bones are liable to two oppofite difeafes; the one termed *friabilitas*, the other *mollities*; the former peculiar to adults, the latter more frequent in infants, though fometimes feen in adults, from a vitiated ftate of their juices.

The bones, when deprived of their cementing liquor, by paffing through fire, become friable. From repeated falivations, and in old people, they have been rendered extremely brittle; infomuch that in many fubjects they have been fractured merely from their weight and the action of the mufcles: but in fuch cafes, this is not owing to the friability of the bones, but to the lofs of fubftance, from the erofion of the bone by an acrimonious humour thrown on it: to which caufe perhaps may be attributed the difeafe called *rickets* in children. The effects of fcorbutic humour in rendering the bones foft, in many inftances, have often been remarked.

By proper diet, gentle friction with coarfe cloths, exercife, and cold bathing, rickety children will frequently get their conftitution fo much changed, as that, by the time they arrive at the age of twenty years, there fhall not remain the leaft veftige of their former difeafe. The epiphyfes are generally moft affected in this fpecies of the diforder. For want of early attention to invalids of this fort, we find that their bones not only become foft, and yield to the powers of the mufcles, but remain diftorted the reft of their lives, though they have acquired a perfect degree of folidity. In fuch cafes, correcting the vitiated juices only will not reftore the bones to their natural ftate; therefore the affiftance of a fkilful mechanic is neceffary both to fupport the parts improperly acted on, and to alter the line of direction of the diftorted offeous fibres.

Though the *curvature of the extremities*, or thicknefs of the ends of the bones near their articulations, may give the firft alarm to thofe who are conftantly with children, yet there are other fymptoms that give earlier notice than thefe; and had they been timely difcovered by proper judges, it is highly probable that the curvature of the limbs in many children might not have happened. The belly generally becomes larger in this difeafe, from the increafed fize of the contained bowels, as it is not unlikely but that the mefenteric glands are the firft parts obftructed; obftructions of the liver, fpleen, and pancreas, foon follow; the head then becomes enlarged; then a difficulty of breathing, which is generally fuppofed to be the effects of taking cold, fucceeds; the fternum is elevated and fharp, and the thorax becomes contracted; the fpine is protruded in feveral parts; the pelvis altered, according to the preffure of the parts within, and habitual inclination of the patient, at times, to obtain that line of direction in which the perpendicular from the centre of gravity may fall within the common bafe of the body, the extremities of the cylindrical bones, and the ends of the ribs next the fternum, become enlarged; foon after this the bones in general become foft and flexible, yielding in fuch directions as the ftrongeft mufcles determine by their actions.

The bones of children who die of this diforder, we obferve, are not only rendered foft, but the veffels within their fubftance are replete with blood of a texture totally broken, and having more the appearance of thin chocolate than blood: the periofteum in many places is feparated, and the intermediate fpace between it and the bone filled with extravafated fluid; and caries is almoft as frequent as the feparation of the periofteum. The mufcles in fuch bodies generally appear pale and flabby.

Where the affection of the mefenteric glands is evident, Mr. Bromefield afferts, that after a dofe or two of the pulvis bafilicus to empty the inteftines thoroughly, the purified crude quickfilver is by much the moft efficacious medicine to remove obftructions in thofe glands. When the belly begins to foften and fubfide, the chyle paffes without interruption, and the child begins to get flefh; then the cold bath becomes truly fervicable, and the decoction or cold infufion of the Peruvian

bark is a proper reſtorative; but the cold bath uſed too early, or the bark given before there is a free circulation of chyle through the lacteals, would be very injurious.

The *mollities oſſium*, in ſome caſes, may be produced from a redundancy of the oleaginous parts of the blood, or from a laxity of the ſolids, by which the fluids are not ſufficiently attenuated, nor properly blended and mixed: the conſequence of which will be obſtructed perſpiration, the habit in general loaded with groſs, phlegmatic, and ſerous humours, and the oſſific matter not united or condenſed as in an healthy ſtate. The method of cure confirms us in the cauſe of theſe ſymptoms; for, by ſtrengthening the fibrous ſyſtem, by uſing gentle exerciſe, a dry diet, good air, aromatics, and cold bathing, this kind of invalids are generally reſtored to health.

Among the diſeaſes of the bones we may likewiſe take notice of that *palſy of the lower extremities* which takes place, as is generally ſuppoſed, in conſequence of a curvature in ſome part of the ſpine. To this diſtemper both ſexes and all ages are equally liable. When it attacks an infant of only a year or two old or under, the true cauſe of it is ſeldom diſcovered until ſome time after the effect has taken place. The child is ſaid to be uncommonly backward in the uſe of his legs, or it is thought to have received ſome hurt in the birth. When the child is of an age ſufficient to have already walked, and who has been able to walk, the loſs of the uſe of his legs is gradual, though in general not very ſlow. He at firſt complains of being very ſoon tired, is languid, liſtleſs, and unwilling to move much or at all briſkly. Soon after this he may be obſerved frequently to trip and ſtumble, though there be no impediment in his way; and whenever he attempts to move briſkly, he finds that his legs involuntarily croſs each other, by which he is frequently thrown down without ſtumbling; and when he endeavours to ſtand ſtill in an erect poſture without ſupport, even for a few minutes, his knees give way and bend forward. As the diſeaſe advances, it will be found that he cannot, without much difficulty and deliberation, direct either of his feet exactly to any one point; and very ſoon after this, both legs and thighs loſe a good deal of their natural ſenſibility, and become quite uſeleſs. In adults, the progreſs of the diſeaſe is much quicker, but the ſymptoms nearly the ſame.

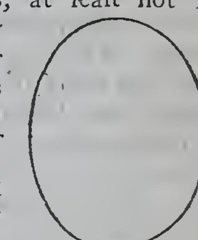
Until the curvature of the ſpine is diſcovered, the complaint generally paſſes for a nervous one; but when the ſtate of the back-bone is adverted to, recourſe is almoſt always had to ſome previous violence to account for it. That this might have been the caſe in ſome few inſtances might be admitted; but in by far the greateſt number ſome prediſpoſing cauſe muſt be looked for.

Mr. Pott, who has written a treatiſe upon this diſeaſe, recommends it to our obſervation, that though the lower limbs are rendered almoſt uſeleſs, or even entirely ſo, yet there are ſome circumſtances in which it differs from a common nervous palſy. The legs and thighs, though ſo much affected, have neither the flabby feel of a truly paralytic limb; nor have they that ſeeming looſeneſs at the joints, nor the total incapacity of reſiſtance which allows the latter to be twiſted almoſt in all directions: on the contrary, the joints have frequently a conſiderable degree of ſtiffneſs, particularly the ankles; by which ſtiffneſs the feet of children are generally pointed downward, and they are prevented from ſetting them flat upon the ground.

At firſt the general health of the patient ſeems not to be at all, or at leaſt not materially affected; but when the diſeaſe has continued for ſome time, and the curvature is thereby increaſed, many inconveniences and complaints come on; ſuch as difficulty in reſpiration, indigeſtion, pain, and what they call *tightneſs at the ſtomach*, obſtinate conſtipations, purgings, involuntary flux of urine and fæces, &c. with the addition of ſome nervous complaints, which are partly cauſed by the alterations made in the form of the cavity of the thorax, and partly by impreſſions made on the abdominal viſcera.

Mr. Pott was led to a knowledge of the true cauſe and cure of this diſeaſe, from obſerving the caſe of a youth of fourteen, who was reſtored to the uſe of his limbs immediately after a ſeemingly accidental abſceſs near the part. From this he was inclined to think, that the curvature of the ſpine was not the original cauſe of the diſorder, but that the ſurrounding parts were prediſpoſed towards it by ſome affection of the ſolids and fluids there; and he was confirmed in theſe ſuſpicions by a variety of appearances, which he obſerved both in the living body and upon diſſection of the ſubject after death; all of which are narrated at full length in his treatiſe upon this ſubject.

"The remedy (ſays he) for this moſt dreadful diſeaſe conſiſts merely in procuring a large diſcharge of matter, by ſuppuration, from underneath the membrana adipoſa on each ſide of the curvature, and in maintaining ſuch diſcharge until the patient ſhall have perfectly recovered the uſe of his legs. To accompliſh this purpoſe, I have made uſe of different means, ſuch as ſetons, iſſues made by inciſion, and iſſues made by cauſtic; and although there be no very material difference, I do upon the whole prefer the laſt. A ſeton is a painful and a naſty thing; beſide which it frequently wears through the ſkin before the end for which it was made can be accompliſhed. Iſſues made by inciſion, if they be large enough for the intended purpoſe, are apt to become inflamed, and to be very troubleſome before they come to ſuppuration; but openings made by cauſtic are not in general liable to any of theſe inconveniences, at leaſt not ſo frequently nor in the ſame degree: they are neither ſo troubleſome to make or maintain. I make the eſchars about this ſize and ſhape



on each ſide the curve, taking care to leave a ſufficient portion of ſkin between them. In a few days, when the eſchar begins to looſen and ſeparate, I cut out all the middle, and put into each a large kidney-bean: when the bottoms of the ſores are become clean by ſuppuration, I ſprinkle, every third or fourth day, a ſmall quantity of finely powdered cantharides on them, by which the ſores are prevented from contracting, the diſcharge increaſed, and poſſibly other benefit obtained. The iſſues I keep open until the cure is complete; that is, until the patient recovers perfectly the uſe of his legs, or even for ſome time longer: and I ſhould think that it would be more prudent to heal only one of them firſt, keeping the other open for ſome time; that is, not only until the patient can walk, but until he can walk firmly, briſkly, and without the aſſiſtance of a ſtick: until he can ſtand quite upright, and has recovered all the height which the habit or rather the neceſſity of ſtooping, occaſioned by the diſtemper, had made him loſe."

Chap. VIII. Of BLOOD-LETTING.

Sect. I. *Of* Blood-letting *in general:*

Blood-letting is performed either to leſſen the quantity of circulating fluid, or to relieve a particular part: hence we have the terms of *general* and *local* blood-letting.

General blood-letting is either performed upon a vein or an artery; and from this circumſtance ariſe the appellations of *phlebotomy* and *arteriotomy*.

Local or topical blood-letting is performed by ſcarificators and cupping-glaſſes, by leeches, or by punctures made with a lancet, as may be moſt ſuitable to the nature of the diſeaſe it is intended to remedy.

There are ſome general rules and obſervations which relate equally to this operation in whatever part of the body it is practiſed: theſe we ſhall in the firſt place enumerate, and ſhall afterwards proceed to treat particularly of blood-letting in the arm and other parts.

I. In this, as in every other operation, the ſituation of the patient, and of the operator likewiſe, ought to be preciſely fixed. The ſituation of a patient, during the operation of blood-letting, has a conſiderable influence on the effects produced, and therefore merits particular attention. In ſome diſorders, it is the object of this remedy to evacuate a conſiderable quantity of blood without inducing fainting: when this is the caſe, and when from former experience it is known that the patient is liable during the evacuation to fall into a faintiſh ſtate, a horizontal poſture ought to be preferred to every other; for fainting is not near ſo ready to occur in a horizontal as in an erect poſture. It now and then happens, however, that one material advantage expected from the operation of blood-letting, is the production of a ſtate of deliquium; as, for inſtance, in caſes of ſtrangulated hernia, where a general relaxation of the ſyſtem is ſometimes deſirable. In all ſuch circumſtances, inſtead of a horizontal poſture, the more erect the patient is kept, the more readily will a ſtate of fainting be induced. The patient ought to be ſo placed, that the principal light of the apartment ſhall fall directly upon the part to be operated upon, that the vein to be opened may be made as apparent as poſſible.

II. The patient being properly ſeated, the next ſtep is, by means of a proper bandage of ſilk, linen, or woollen cloth, which has more elaſticity, ſo to compreſs the vein intended to be opened, as to prevent the blood from returning to the heart. An equal degree of preſſure ought to be applied to all the other veins of the part: for if this be not attended to, the communication preſerved by the collateral correſponding branches would render the preſſure upon any one particular vein of very little importance. This preſſure upon the veins, by inducing an accumulation of their contents, tends to bring them more evidently into view, and conſequently renders it eaſier for the operator to effect a proper opening than he would otherwiſe find it. The preſſure, however, ought never to be carried ſo far as to obſtruct the circulation in the correſponding arteries, otherwiſe no diſcharge of blood can take place. When we ſee that it has the effect of raiſing the veins, while at the ſame time the pulſation of the artery is diſtinctly felt in that part of the member which lies on the ſide of the ligature moſt diſtant from the heart, we may be certain that it is to a very proper degree, and that it ought not to be carried farther; for by the ſwelling of the veins we are ſure that they are ſufficiently compreſſed; and by the arteries continuing to beat, it is evident that a continued flow of blood may be expected.

III. The reflux of blood to the heart being in this manner prevented, the next queſtion to be determined is, the beſt method of making an opening into the vein. Different inſtruments have been invented for this purpoſe; but there are two only which have been retained in uſe, and which are all therefore that here require to be mentioned. Theſe are the lancet and the phlegm. This laſt, on being placed immediately on the part to be cut, is, by means of a ſpring, puſhed ſuddenly into the vein, and produces an opening of the exact ſize of the inſtrument employed.

When it is determined to employ the lancet, which is by far the ſafeſt, the form of that inſtrument is next the object of attention. The broad-ſhouldered lancet ought to be laid entirely aſide; becauſe the broadneſs of its ſhoulders produces always a wound in the external teguments of perhaps three times the ſize of the opening made in the vein; a circumſtance which adds no advantage whatever to the operation; on the contrary, it produces much unneceſſary pain; renders it frequently a very difficult matter to command a ſtoppage of the blood; and the wounds produced by it are commonly ſo extenſive as to be liable to terminate in partial ſuppurations.

The ſpear-pointed lancet, on the contrary, is in every reſpect well calculated for the purpoſe of veneſection. From the acuteneſs of its point, it enters the teguments and vein with very little pain; which is with many patients a circumſtance of no ſmall importance. We are ſure of making the opening in the vein equal, or nearly ſo, to the orifice in the external teguments; and the diſcharge of blood produced by an opening made with one of theſe lancets, is commonly put a ſtop to with great eaſe immediately on removing the ligature upon the vein.

IV. The form of lancet being thus fixed upon, we come now to ſpeak of the method of uſing it. The ſurgeon and patient being both properly ſeated, and the ligature having been applied for a ſhort ſpace of time in order to produce ſome degree of ſwelling in the veins, that vein is to be made choice of which, at the ſame time that it appears conſpicuouſly enough, is found to roll leſs than the others on being preſſed upon by the fingers. It is ſcarcely thought neceſſary to obſerve here, that when a vein appears to be ſo immediately connected with a contiguous artery or tendon, as evidently to produce ſome riſk of wounding theſe parts in the operation, another vein not liable to ſuch hazard, if it can be procured, ought undoubtedly to be preferred. Veins may lie directly above both arteries and tendons, and yet no manner of riſk be incurred by opening them, provided the operator is ſufficiently ſteady and attentive; but it does now and then happen, that veins are ſo nearly and intimately connected with theſe parts, as to render it hazardous even for the moſt dexterous ſurgeon to attempt this operation.

The vein being at laſt made choice of, the ſurgeon, if he is to uſe his right hand in the operation, takes a firm hold of the member from whence the blood is to be drawn with his left, and with the thumb of the ſame hand he is now to make ſuch a degree of preſſure upon the vein, about an inch and a half below the part where the orifice is to be made, as not only to render the ſkin and teguments ſomewhat tenſe; but at the ſame time to interrupt for a little all communication between the under part of the vein and that portion of it lying between the ligature and the thumb placed as thus directed.

The lancet being drawn out ſo as to form nearly a right angle with the ſcales, the operator now takes it between the finger and thumb of his right hand; and leaving at leaſt one half of the blade uncovered, he reſts his hand on the middle-finger, ring-finger, and little-finger, all placed as conveniently as poſſible in the neighbourhood of the vein from whence the blood is to be taken; and having puſhed the point of the inſtrument freely through the ſkin and teguments into the vein, he now carries it forward in an oblique direction, till the orifice is of the ſize he inclines to have it; taking care, during the time of puſhing on the lancet, that its point be kept in as ſtraight a direction as poſſible, for fear of dipping into the parts below.

The inſtrument is now to be withdrawn; and the ſurgeon, removing the thumb of his left hand, is to allow the vein to empty itſelf freely into the different cups previouſly provided for the purpoſe.

It is of importance to obſerve, that during the time the blood is diſcharging, the member ought to be kept in exactly the ſame poſture it was in when the lancet was firſt introduced: otherwiſe the orifice in the ſkin is apt to ſlip over the opening in the vein; a circumſtance which always proves inconvenient, and on ſome occaſions produces a good deal of trouble by the blood from the vein inſinuating itſelf into the ſurrounding cellular ſubſtance.

V. When the vein is properly cut, and the orifice is made ſufficiently large, it rarely occurs that any difficulty is experienced in procuring all the blood that is wanted. But when this laſt circumſtance occurs, from the patient becoming faintiſh, a ſtream of freſh air ought to be admitted to the apartment, wine or ſome other cordial ſhould be adminiſtered, and the patient ought to be laid in a horizontal poſture. By theſe means the faintiſhneſs will in general be ſoon removed: but if ſtill the blood ſhould not flow freely, the member ought to be put into all the variety of poſitions that can probably aſſiſt in bringing the openings of the ſkin and other teguments to correſpond with that of the vein; which will ſoon be known to have happened by the blood beginning inſtantly to flow. Throwing the muſcles of the part into conſtant action, by giving the patient a cane or any other firm ſubſtance to turn frequently round in his hand when the operation is done in the arm, will often anſwer in producing a conſtant flow of blood from a vein when every other means has failed: and, laſtly, when the pulſe in the inferior part of the member is felt very feeble, or eſpecially if it cannot be diſtinguiſhed at all, we may be thereby rendered certain that the ligature is too tight, and may in general have it in our power to produce an immediate flow of blood, by removing the compreſſion thus improperly made upon the arteries of the part.

VI. A quantity of blood proportioned to the nature of the diſorder being thus diſcharged, the preſſure upon the ſuperior part of the vein ſhould be immediately removed; and this being done, if the ſpear-pointed lancet has been uſed, all farther loſs of blood will in general ſtop immediately. The contrary of this, however, ſometimes occurs, and blood continues to flow freely even after the ligature is removed. When this is the caſe, the operator ought to compreſs the vein both above and below the orifice, by means of the finger and thumb of one hand, ſo as to prevent any farther loſs of blood. This being done, and the orifice being cleared of every particle of blood, the ſides of it ſhould be laid as exactly together as poſſible; and a piece of court or any other adheſive plaſter being ſo applied as to retain them, it will ſeldom happen that any kind of bandage is neceſſary: but when the blood has iſſued with uncommon violence during the operation, and has been difficult to command after the removal of the ligature, in ſuch inſtances it will be prudent to apply a ſmall compreſs of linen over the plaſter, and to ſecure the whole with a linen roller properly applied round the member.

Sect. II. *Of* Venesection *in* different Parts *of the* Body.

When veneſection is to be performed *in the arm*, the ligature for ſtopping the circulation ought to be placed about an inch or an inch and a half above the joint of the elbow, and brought twice round: in order to prevent the ends of it from interfering with the lancet, the knot ſhould be made on the outſide of the arm. In general, one knot might anſwer; but a ſlip-knot being made above the firſt, renders it more ſecure, and it is very eaſily done.

In forming the choice of a vein from whence blood is to be taken, the general rules we have already laid down upon this point muſt be here particularly attended to. In general the artery lies ſo low in this place, that the median baſilic vein, under which it commonly runs, may be opened with perfect ſafety; and as this vein in general appears more conſpicuous than any of the others, probably from the continued pulſation of the artery below obſtructing in ſome meaſure the paſſage of its contents, it is in this reſpect therefore more properly calculated for this operation than any of the others. Other circumſtances occur too which render the median baſilic preferable to the cephalic or median cephalic veins, for the operation of blood-letting. The former, viz. the median baſilic, is leſs deeply covered with cellular ſubſtance; and by lying towards the inner part of the arm, it is more thinly covered with the tendinous expanſion of the biceps muſcle than either of the others. From theſe circumſtances, the operation is always attended with leſs pain when done in this vein than in any of the others.

In very corpulent people, it ſometimes happens that all the larger veins lie ſo deep as not to be diſcovered by the eye; but when they are ſenſibly felt by the fingers, even although they cannot be ſeen, they may be always opened with freedom. In a few inſtances, however, they can neither be diſtinguiſhed by the eye nor by the finger: in ſuch a ſituation, as they may in general be met with about the wriſt or on the back-part of the hand, the ligature ſhould be removed from the upper part of the arm; and being applied about half way between the elbow and wriſt, the veins below will thereby be brought into view; and wherever a vein can be evidently obſerved, there can be no danger in having recourſe to the operation.

There is only one vein of *the neck*, viz. the poſterior external jugular, which can eaſily be brought ſo much into view as to be with propriety opened; and even this lies deeply covered with parts, not only with the ſkin and cellular ſubſtance, but with the fibres of the platiſma myoides muſcle; ſo that a conſiderable degree of preſſure becomes neceſſary in order to raiſe it to any height. With a view to produce this, the operator's thumb is commonly adviſed to be placed upon the vein, ſo as to compreſs it effectually about an inch or an inch and a half below where the opening is to be made. This, however, ſeldom proves ſufficient for the purpoſe, as the blood, on being ſtopped in its progreſs through this branch, eaſily finds a paſſage to the other veins; ſo that unleſs the principal vein on the other ſide of the neck is alſo compreſſed, the vein to be opened can never be fully diſtended. In order to effect this, a firm compreſs of linen ſhould be applied on the largeſt vein on the oppoſite ſide of the neck; and an ordinary garter, or any other proper ligature, being laid directly over it, ſhould be tied with a firm knot below the oppoſite arm-pit; taking care to make ſuch a degree of preſſure, as to put an entire ſtop to the circulation in the vein, which in this way may be eaſily effected without producing any obſtruction to the patient's breathing.

This being done, and the patient's head properly ſupported, the operator, with the thumb of his left hand, is now to make a ſufficient preſſure upon the vein to be opened; and with the lancet in his right hand is to penetrate at once into the vein; and before withdrawing the inſtrument, an orifice ſhould be made large enough for the intended evacuation. It may be proper to obſerve, that a more extenſive opening ought always to be made here than is neceſſary in the arm, otherwiſe the quantity of blood is generally procured with difficulty: and beſides, there is not the ſame neceſſity for caution on this

point here that there is in the arm; for it feldom or never happens that any difficulty occurs in this fituation, in putting a ftop to the blood after the preffure is removed from the veins; all that is commonly neceffary for this purpofe being a flip of adhefive plafter without any bandage whatever.

In order to bring the vein more clearly into view, fo as afterwards to be able to open it with more exactnefs, it has been recommended, that the fkin, cellular fubftance, and mufcular fibres covering the vein, fhould be previoufly divided with a fcalpel before attempting to pufh the lancet into it. There is not, however, any neceffity for this precaution, as it rarely happens that any difficulty is experienced in procuring a free difcharge of blood by opening the vein and teguments at once in the manner directed. And it is here, as in every inftance where it is neceffary to take blood by a lancet, if it is not done at once, the patient is much difappointed, and is fure to attribute the failure entirely to a fault in the operator.

When blood is to be difcharged from the veins of the *ankle* or *feet*, the ligature being applied a little above the ankle-joint, all the branches of the vena faphena, both in the infide and outfide of the foot, come at once into view; and as this vein lies every-where very fuperficial, being in general covered with fkin only, wherever a proper vein appears confpicuoufly, it may with fafety be opened.

With a view to encourage the difcharge of blood, it has been a conftant practice in blood-letting, in thefe veins, to dip the feet into warm water immediately on the orifice being made. But this is a very inaccurate method of proceeding, as the quantity of blood taken in this manner can never be afcertained with precifion; for the blood being all mixed with the water, the operator can never be in any degree certain as to this point: and befides, there does not appear to be any neceffity for this affiftance; for when the compreffion of the fuperior part of the veins is made effectual, and the orifice is of a proper fize, there is feldom more difficulty in obtaining a full difcharge of blood from the veins of thefe parts than from any other veins of the body.

On removing the ligature, the difcharge is generally ftopped at once; fo that a piece of adhefive plafter applied over the orifice anfwers all the purpofe of a bandage. The arm, neck, and ankles, are the parts from whence blood is ufually taken by venefection; but on fome occafions, where the contiguous parts have been particularly affected, it has been thought advifable to perform venefection in other places.

When venefection is to be performed in the veins called *ranulæ* under the *tongue*, the apex of the tongue is to be elevated, and the vein on each fide opened, becaufe the opening of one only will hardly ever difcharge blood enough. After a fufficient quantity has been difcharged, fome cold aftringent fluid taken into the mouth will generally ftop the hemorrhagy.

The *vena dorfalis penis*, which runs along the back or upper fide of this member, being generally pretty much diftended, and confpicuous in an inflammation of this part, may be opened about the middle or back part of the penis; and a fufficient quantity of blood be difcharged proportionable to the urgency of the fymptoms. This being done, apply a comprefs and bandage proper for the penis. The arteries and nerves which lie on each fide of the vein are to be avoided: nor ought the bandage to be too tight, otherwife the inflammation and other fymptoms may turn out worfe than before.

When it is found neceffary to difcharge blood in this manner from the penis, the veins can be eafily brought into view, by producing an accumulation of their contents in the fame manner as in other parts of the body, through the intervention of a ligature: but in the tongue, in the hæmorrhoidal veins about the anus, and other parts where compreffion cannot be applied, all that the furgeon can do, is to make an orifice of a proper fize in that part of the vein which fhows itfelf moft evidently; and if a fufficient difcharge of blood is not thus produced, as there is no other method of effecting it, immerfing the parts in warm water may in fuch circumftances be a very neceffary meafure.

There are feveral ways of performing the operation of blood-letting in the *eyes*. We fhall here only relate the chief: firft, the patient is to be feated conveniently on the bed-fide or on a chair, with his head held in a proper pofture by an affiftant; which done, the furgeon makes a tranfverfe incifion with a lancet upon the turgid fmall veffels in the corners of the eye, fo as to open them or cut them quite acrofs. Some ufe a fmall pair of fciffars, inftead of a lancet, to divide the veffels; but in ufing either of them, the eye-lids muft be feparated from each other by the fingers of one hand, while the veffels are cut by inftruments held in the other. Some, again, elevate the fmall turgid veffels with a crooked needle before they divide them, the eye-lids being in the mean time held afunder by an affiftant. The fmall veffels being thus opened or divided, their difcharge of blood fhould be promoted by fomentations of warm water frequently applied to the eye by means of a fponge or foft linen rags.

Among other methods that have been propofed for fcarifying the blood-veffels of the eye, the beards of rough barley were at one period much extolled, and are ftill employed by fome individuals. By drawing them over the furface of the eye, in a direction contrary to the fharp fpiculæ with which they are furnifhed, a confiderable difcharge of blood is thereby produced: but the pain attending this operation is exquifite; and as it does not poffefs any fuperior advantage to the method with the lancet, it is now falling into general difufe.

Sect. III. *Of* Arteriotomy.

Whatever particular advantages may in theory have been expected from arteriotomy, and however fome of its fupporters may have recommended it, not only as being in many inftances preferable to venefection, but as an operation perfectly fafe even in veffels of confiderable fize; yet the moft ftrenuous friends to the practice have fhrunk from any real attempt of this kind on the larger arteries. Inftances have no doubt occurred of large arteries having been opened without any danger enfuing; but thefe are fo exceedingly rare, that no practitioner of experience will, from that confideration, be induced coolly to proceed to open any artery of importance. The fmaller branches of arteries may indeed be opened with great fafety, when they are not deeply covered, and efpecially when they lie contiguous to bones; but in any of the larger arteries, the attempt muft be always attended with fo much hazard, and the advantages to be expected from it, in preference to venefection, are apparently fo trifling, as muft in all probability prevent it from ever being carried into execution.

There are very few arteries, therefore, which, with any propriety, can be opened: the different branches of the temporal are the only arteries indeed from whence blood, in ordinary practice, is ever taken; for although the opening of fome other branches of arteries has by fome been propofed, yet they are fituated in fuch a manner that they either cannot be readily come at, or being in the neighbourhood of fo large nerves, the opening of them might be attended with bad confequences. In performing this operation on any of the temporal branches, if the artery lies fuperficial, it may be done with one pufh of the lancet, in the fame manner as was directed for venefection; but when the artery lies deeply covered

with cellular ſubſtance, it is always neceſſary to lay it fairly open to view, before making the orifice with the lancet: for in all the ſmaller arteries, when they are cut entirely acroſs, there is little chance of being able to procure any conſiderable quantity of blood from them; as when divided in this manner, they are ſure to retract conſiderably within the ſurrounding parts, which commonly puts a ſtop to all farther evacuation.

Some degree of nicety is alſo neceſſary in making the opening into the artery of a proper oblique direction, neither quite acroſs nor directly longitudinal; for a longitudinal opening never bleeds ſo freely, either in an artery or in a vein, as when its direction is ſomewhat oblique.

If the opening has been properly made, and if the artery is of any tolerable ſize, it will at once diſcharge very freely without any compreſſion; but when the evacuation does not go on ſo well as could be wiſhed, the diſcharge may be always aſſiſted by compreſſing the artery immediately above the orifice, between it and the correſponding veins. The quantity of blood being thus diſcharged, it will commonly happen, that a very ſlight compreſſion on theſe ſmaller arteries will ſuffice for putting a ſtop to the evacuation: and whatever preſſure is found neceſſary, may be here applied in the ſame manner as was directed in veneſection.

It happens, however, in ſome inſtances, that this does not ſucceed, the orifice continuing to burſt out from time to time, ſo as to be productive of much diſtreſs and inconvenience.

In this ſituation there are three different methods by which we may with tolerable certainty put a ſtop to the farther diſcharge of blood. 1ſt, If the artery is ſmall, as all the branches of the temporal arteries commonly are, the cutting it entirely acroſs, exactly at the orifice made with the lancet, by allowing it to retract within the ſurrounding parts, generally puts an immediate ſtop to the diſcharge. 2d, When that is not conſented to, we have it always in our power to ſecure the bleeding veſſel with a ligature, as we would do an artery accidentally divided in any part of the body. And, laſtly, if neither of theſe methods is agreed to by the patient, we can, by means of a conſtant regular preſſure, obliterate the cavity of the artery at the place where the operation has been performed, by producing the accretion of its ſides. Different bandages have been contrived for compreſſing the temporal artery; but none of them anſwer the purpoſe ſo eaſily and ſo effectually as the one figured in Plate 24. fig. 7. This method is more tedious; but to timid patients it generally proves more acceptable than either of the other two.

Sect. IV. *Of* Topical Bleeding.

When, either from the ſeverity of a local fixed pain, or from any other cauſe, it is wiſhed to evacuate blood directly from the ſmall veſſels of the part affected, inſtead of opening any of the larger arteries or veins, the following are the different modes propoſed for effecting it, viz. by means of leeches; by ſlight ſcarifications with the ſhoulder or edge of a lancet; and, laſtly, by means of a well-known inſtrument termed a *ſcarificator*, in which ſixteen or twenty lancets are commonly placed in ſuch a manner, that, when the inſtrument is applied to the part affected, the whole number of lancets contained in it are, by means of a ſtrong ſpring, puſhed ſuddenly into it, to the depth at which the inſtrument has been previouſly regulated. This being done, as the ſmaller blood-veſſels only by this operation are ever intended to be cut, and as theſe do not commonly diſcharge freely, ſome means or other become neceſſary for promoting the evacuation.

Various methods have been propoſed for this purpoſe. *Glaſſes* fitted to the form of the affected parts, with a ſmall hole in the bottom of each, were long ago contrived; and theſe being placed upon the ſcarified parts, a degree of ſuction was produced by a perſon's mouth ſufficient for nearly exhauſting the air contained in the glaſs: and this accordingly was a ſure enough method of increaſing the evacuation of blood to a certain extent. But as this was attended with a good deal of trouble, and beſides did not on every occaſion prove altogether effectual, an exhauſting ſyringe was at laſt adapted to the glaſs: which did indeed anſwer as a very certain method of extracting the air contained in it; but the application of this inſtrument for any length of time is very troubleſome, and it is difficult to preſerve the ſyringe always airtight.

The application of heat to the *cupping-glaſſes*, has been found to rarefy the air contained in them to a degree ſufficient for producing a very conſiderable ſuction. And as the inſtrument in this ſimple form anſwers the purpoſe in view with very little trouble to the operator, and as it is at all times eaſily obtained, the uſe of the ſyringe has therefore been laid aſide.

There are different methods adopted for thus applying heat to the cavity of the glaſs. By ſupporting the mouth of it for a few ſeconds above the flame of a taper, the air may be ſufficiently rarefied; but if the flame is not kept exactly in the middle, but is allowed to touch either the ſides or bottom of the glaſs, it is very apt to make it crack. A more certain, as well as an eaſier, method of applying the heat, is to dip a piece of ſoft bibulous paper in ſpirit of wine; and having ſet it on fire, to put it into the bottom of the glaſs, and, on its being nearly extinguiſhed, to apply the mouth of the inſtrument directly upon the ſcarified part. This degree of heat, which may be always regulated by the ſize of the piece of paper, and which it is evident ought to be always in proportion to the ſize of the glaſs, if long enough applied, proves always ſufficient for rarefying the air very effectually, and at the ſame time, if done with any manner of caution, never injures the glaſs in the leaſt.

The glaſs having been thus applied, if the ſcarifications have been properly made, they inſtantly begin to diſcharge freely: and ſo ſoon as the inſtrument is nearly full of blood, it ſhould be taken away; which may be always eaſily done by raiſing one ſide of it, ſo as to give acceſs to the external air. When more blood is wiſhed to be taken, the parts ſhould be bathed with warm water; and being made perfectly dry, another glaſs, exactly the ſize of the former, ſhould be inſtantly applied in the very ſame manner: and thus, if the ſcarificator has been made to puſh to a ſufficient depth, ſo as to have cut all the cutaneous veſſels of the part, almoſt any neceſſary quantity of blood may be obtained. It ſometimes happens, however, that the full quantity intended to be diſcharged cannot be got at one place. In ſuch a caſe, the ſcarificator muſt be again applied on a part as contiguous to the other as poſſible; and this being done, the application of the glaſſes muſt alſo be renewed as before.

When it is wiſhed to diſcharge the quantity of blood as quickly as poſſible, two or more glaſſes may be applied at once on contiguous parts previouſly ſcarified; and, on ſome occaſions, the quantity of blood is more quickly obtained by the cupping-glaſſes being applied for a few ſeconds upon the parts to be afterwards ſcarified. The ſuction produced by the glaſſes may poſſibly have ſome influence in bringing the more deep-ſeated veſſels into nearer contact with the ſkin, ſo that more of them will be cut by the ſcarificator.

A ſufficient quantity of blood being procured, the wounds made by the different lancets ſhould be all perfectly cleared of

blood, and a bit of soft linen or charpie, dipped in a little milk or cream, applied over the whole, is the only dressing that is necessary. When dry linen is applied, it not only creates more uneasiness to the patient, but renders the wounds more apt to fester than when it has been previously wetted in the manner directed.

Dry cupping consists in the application of the cupping-glasses directly to the parts affected, without the use of the scarificator. By this means a tumor is produced upon the part; and where any advantage is to be expected from a determination of blood to a particular spot, it may probably be more easily accomplished by this means than by any other.

When the part from which it is intended to produce a local evacuation of this kind is so situated, that a scarificator and cupping-glasses can be applied, this method is greatly preferable to every other; but in inflammatory affections of the eye, of the nose, and of other parts of the face, &c. the scarificator cannot be properly applied directly to the parts affected. In such instances, *leeches* are commonly had recourse to, as they can be placed upon almost any spot from whence we would wish to discharge blood.

In the application of these animals, the most effectual method of making them fix upon a particular spot, is to confine them to the part by means of a small wine-glass. Allowing them to creep upon a dry cloth, or upon a dry board, for a few minutes before application, makes them fix more readily; and moistening and cooling the parts on which they are intended to fix, either with milk, cream, or blood, tends also to cause them to adhere much more speedily than they otherwise would do. So soon as the leeches have separated, the ordinary method of promoting the discharge of blood is to cover the parts with linen cloths wet in warm water. In some situations, this may probably be as effectual a method as any other; but wherever the cupping-glasses can be applied over the wounds, they answer the purpose much more effectually.

CHAP. IX. Of ISSUES.

Issues are a kind of artificial ulcers formed in different parts of the body with a view to procure a discharge of purulent matter, which is frequently of advantage in different disorders.

Practitioners were formerly of opinion that *issues* served as drains to carry off the noxious humours from the blood, and therefore they placed them as near the affected part as possible. But as it is now known that they prove useful merely by the quantity of matter which they afford, they are generally placed where they will occasion the least inconvenience. The most proper parts for them are, the nape of the neck; the middle, outer, and fore-part of the humerus; the hollow above the inner side of the knee; or either side of the spine of the back; or between two of the ribs; or wherever there is a sufficiency of cellular substance for the protection of the parts beneath: they ought never to be placed over the belly of a muscle; nor over a tendon, or thinly covered bone; nor near any large blood-vessel.

The issues commonly used are, the blister-issue, the pea-issue, and the seton or cord.

When a *blister-issue* is to be used, after the blister is removed, a discharge of matter may be kept up by dressing the part daily with an ointment mixed with the powder of cantharides. If the discharge be too little, more of the powder may be used; if too great, or if the part be much inflamed, the issue ointment may be laid aside, and the part dressed with basilicon, or with Turner's cerate, till the discharge be diminished and the inflammation abated. It is most proper sometimes to use the issue ointment and a mild one alternately.

A *pea-issue* is formed either by making an incision with a lancet, or by caustic, large enough to admit one or more peas; though sometimes instead of peas, kidney-beans, gentian root, or orange-peas, are used. When the opening is made by an incision, the skin should be pinched up and cut through, of a size sufficient to receive the substance to be put into it. But when it is to be done by caustic, the common caustic or lapis infernalis of the shops answers best: it ought to be reduced to a paste with a little water or soft soap, to prevent it from spreading; and adhesive plaster, with a small hole cut in the centre of it, should be previously placed, and the caustic paste spread upon the hole in the centre. Over the whole an adhesive plaster should be placed to prevent any caustic from escaping. In ten or twelve hours, the whole may be removed, and in three or four days the eschar will separate, when the opening may be filled with peas, or any of the other substances already mentioned.

The *seton* is used where a large quantity of matter is wanted, and especially where it is wished for from deep-seated parts. It is frequently used in the back of the neck for diseases of the head or eyes, or between two of the ribs in affections of the breast.

When the *cord*, which is to be made of threads of cotton or silk, is to be introduced, the parts at which it is to enter and pass out should be previously marked with ink, and a small part of the cord being besmeared with some mild ointment, and passed through the eye of the seton-needle, Plate 24. fig. 8. the part is to be supported by an assistant, and the needle passed fairly through, leaving a few inches of the cord hanging out. The needle is now to be removed and the part dressed. By this method matter is produced in quantity proportioned to the degree of irritation applied; and this can be increased or diminished by covering the cord daily before it is drawn with an irritating or mild ointment.

CHAP. X. Of SUTURES and LIGATURES of ARTERIES.

Sect. I. *Of* Sutures.

The intention of *sutures* is to unite parts which have been divided, and where the retraction of the lips of the wound has been considerable. The sutures in ordinary use at present, among surgeons, are the interrupted, the quilled, and the twisted. Besides these sutures, adhesive plasters are used for uniting the lips of wounds, which have been termed the *false* or *dry* suture, in opposition to the others which have obtained the name of *true* or *bloody*. The true suture is used in cases of deep wounds, while the false is employed in those of a superficial nature.

The interrupted suture is made as follows. The wound being emptied of the grumous blood, and the assistant taking care that the lips of it lie quite even, the surgeon is carefully to carry the needles from the bottom outwards; using the caution of making them come out far enough from the edge of the wound, which will not only facilitate the passing the ligature, but will also prevent it from cutting through the skin and flesh; as many more stitches as may be required will be only repetitions of the same process. The threads being all passed, let those be first tied which are in the middle of the wound; though, if the lips are held carefully together all the while, as they should be, it will be of no great consequence

which is done firft. The moft ufeful kind of knot is a fingle one firft, and then a flip-knot, which may be loofened upon any confiderable inflammation taking place. If a violent inflammation fhould fucceed, loofening the ligature only will not fuffice: it muft be cut through and drawn away, and the wound be treated afterwards without any future. When the wound is fmall, the lefs it is difturbed by dreffing the better; but in large ones, there will fometimes be a confiderable difcharge; and if the threads be not cautioufly carried through the bottom of it, abfceffes will frequently enfue from the matter being pent up underneath, and not finding iffue. If no accident happen, after the lips are firmly agglutinated, the ligatures are to be removed, and the orifices which they leave dreffed.

It will readily be underftood, that the ftrength of the ligature and fize of the needle ought always to be proportionable to the depth of the fore and retraction of the parts. The crooked needles ufed in fuch cafes are known to every one.

It muft likewife be remembered, that during the cure the future muft be always affifted by the application of bandage, if poffible, which is frequently of the greateft importance; and that fort of bandage with two heads, and a flit in the middle, which is by much the beft, will in moft cafes be found practicable.

In deep wounds, attended with much retraction, it is always a neceffary precaution, to affift the operation of the ligatures by means of bandages, fo applied as to afford as much fupport as poffible to the divided parts: but even with every affiftance of this nature, it now and then happens, that the divided parts cannot be kept together, retraction occurs to a greater or leffer degree, and the ligatures of courfe cut afunder the foft parts they were at firft made to furround.

With a view to prevent this receding of the teguments and other parts, it was long ago propofed to add to the interrupted future what was fuppofed would afford an additional fupport, viz. quills, or pieces of plafter rolled up into the form of quills; one of which being placed on each fide of the wound, the double of the ligature is made to include the one, and the knot to prefs directly upon the other, inftead of being made immediately on the edges of the fore, as was directed for interrupted futures.

It is at once evident, however, that the ligatures muft here make the fame degree of preffure on the parts through which they pafs as they do in the interrupted future: and this being the cafe, it is equally obvious, that the interpofition of thefe fubftances cannot be of any ufe. This future is accordingly now very rarely practifed, and it is probable that it will be foon laid entirely afide.

By the term *twifted future*, is meant that fpecies of ligature by which parts, either naturally or artificially feparated, are united together, by means of ftrong threads properly twifted round pins or needles pufhed through the edges of the divided parts.

This future is commonly employed for the purpofe of uniting the parts in cafes of *hare-lip*; and this indeed is almoft the only ufe to which it has been hitherto applied: but it may with great advantage be put in practice in a variety of other cafes, particularly in all artificial or accidental divifions either of the lips or cheeks; and in every wound in other parts that does not run deep, and in which futures are neceffary, this future is preferable to the interrupted or any other. The pins made ufe of for twifting the threads upon ought to be made of a flat form, fo as not to cut the parts through which they pafs fo readily as the ligatures employed in the interrupted future. And thus one great objection to the latter is very effectually obviated: for every practitioner muft be fenfible of this being the moft faulty part of the interrupted future, that when mufcular parts are divided fo as to produce much retraction, the ligatures employed for retaining them almoft conftantly cut them through before a reunion is accomplifhed; whereas the flatnefs of the pins ufed in the twifted future, and upon which the whole preffure produced by the ligatures is made to reft, proves in general a very effectual preventive againft all fuch occurrences.

The pins ufed in this operation are reprefented in Plate 24. fig. 9. The are commonly made of gold or filver; and in order to make them pafs with greater eafe, fteel points are added to them. They are fometimes ufed, however, of gold or filver alone.

The *manner of performing this operation* is as follows. The divided parts intended to be reunited, muft, by the hands of an affiftant, be brought nearly into contact; leaving juft as much fpace between the edges of the fore as to allow the furgeon to fee that the pins are carried to a proper depth. This being done, one of the pins muft be introduced through both fides of the wound, by entering it on one fide externally, pufhing it forwards and inwards to within a little of the bottom of the wound, and afterwards carrying it outwardly through the oppofite fide, to the fame diftance from the edge of the fore that it was made to enter at on the other.

The diftance at which the needle ought to enter from the edge of the fore muft be determined by the depth of the wound, and by the degree of retraction produced in the divided parts. In general, however, it is a proper regulation, in deep wounds, to carry the pins nearly to the fame diftance from the fide of the fore as they are made to penetrate in depth: and whatever the deepnefs of the wound may be, the pins ought to pafs within a very little of its bottom: otherwife the parts which lie deep will run a rifk of not being united; a circumftance which muft always give rife to troublefome collections of matter.

The firft pin being paffed in this manner very near to one end of the fore, and the parts being ftill fupported by an affiftant, the furgeon, by means of a firm waxed ligature, paffed three or four times round and acrofs the pin, fo as nearly to defcribe the figure of 8, is to draw the parts through which it has paffed into immediate and clofe contact: and the thread being now fecured with a loofe knot, another pin muft be introduced in the fame manner at a proper diftance from the former; and the thread with which the other was fixed being loofed, and in the fame manner carried round this pin, others muft be introduced at proper diftances along the whole courfe of the wound; and the fame ligature ought to be of a fufficient length for fecuring the whole.

The *number of pins* to be ufed muft be determined entirely by the extent of the wound. Whenever this future is practifed, a pin ought to be introduced very near each end of the wound, otherwife the extremities of the fore are apt to feparate fo as not to be afterwards eafily reunited. In large wounds, if the pins are introduced at the diftance of three quarters of an inch from one another, it will in general be found fufficient; but in cuts of fmaller extent a greater number of pins become neceffary in proportion to the dimenfions of the fores.

Thus in a wound of an inch and a half in length, three pins are abfolutely requifite; one near to each end, and another in the middle of the fore: whereas five pins will always be found fully fufficient for a wound of three inches and a half in extent, allowing one to be within a quarter of an inch of each extremity of the wound, and the others to be placed along the courfe of the fore at the diftance of three quarters of an inch from one another.

The pins being all introduced and fecured in the manner directed, nothing remains to be done, but to apply a piece of

lint wet with mucilage all along the courfe of the wound, with a view to exclude, as effectually as poffible, every accefs to the external air.

When the pins remain long, they generally do harm, by the unneceffary irritation and confequent retraction of parts with which they are always attended; and if they are not continued for a fufficient length of time, that degree of adhefion is not produced between the divided parts which is neceffary for their future retention; fo that the effect of the operation comes to be in a great meafure, if not entirely, loft.

In wounds of no great depth, for inftance of three quarters of an inch or fo, a fufficient degree of adhefion always takes place in the fpace of five days; and fix, or at moft feven days, will generally be found fufficient for wounds of the greateft depth. But with refpect to this circumftance, it muft always be underftood, that the patient's ftate of health muft have a confiderable influence on the time neceffary for producing adhefion between divided parts.

When the pins are withdrawn, the uniting bandage may be applied with great advantage; but as flips of leather fpread with ordinary glue, when applied to each fide of the cicatrix, may, by means of ligatures properly connected with them, be made to anfwer the purpofe more effectually, this mode of fupporting the parts ought of courfe to be preferred.

Sect. II. *Of the Ligature of* Arteries.

When a furgeon is called immediately to a wound of any great artery of a limb, he fhould clap the point of his finger upon the wounded artery, or make his affiftant hold it; cut the wound fo far open as to fee the artery fairly; draw it out if it be cut acrofs, and have fhrunk among the flefh; or tie it like the artery of the arm in aneurifm by paffing ligatures under it. When, however, the wound happens in fuch fituations that we cannot command the blood, it is better to clofe the lips of the wound, and try to make them adhere by means of a very fteady comprefs and bandage. Thus an aneurifm will form; the operation for the cure of which fhall be afterwards defcribed.

When accidents of this nature occur in any of the extremities, and where preffure can be made with eafe on the fuperior part of the artery, we are poffeffed of an inftrument which never fails to put a ftop to all further lofs of blood: we mean the tourniquet. See Plate 24. fig 10.

The *tourniquet* has undergone many improvements; but the one here reprefented is confidered as the beft. By means of it the blood in any limb is very eafily and effectually commanded; and as it grafps the whole member equally, all the collateral branches, as well as the principal arteries, are equally compreffed by it. It has this material advantage too over every other inftrument of this kind, that, when properly applied, a fingle turn, or even half a turn, of the fcrew, is fufficient for producing either a flow of blood, or for putting a total ftop to it.

The manner of ufing it is as follows. Let a cufhion of three inches in length by one inch and half in diameter be prepared of a linen roller, tolerably firm, but not fo hard as to render preffure produced by it very painful. This being placed upon the courfe of the principal artery of the limb, is to be firmly fecured in that fituation by one or two turns of a circular roller, of the fame breadth with the cufhion itfelf.

The inftrument, with the ftrap connected with it, being now placed upon the limb, with the handle of the fcrew on the oppofite fide of the member to the cufhion upon the artery, the ftrap is to be carried round the limb directly over the cufhion, and to be firmly connected on the other fide of the buckle. In thus connecting the ftrap and buckle together, particular attention is neceffary in doing it with great firmnefs, fo as that the fcrew may afterwards operate with as much advantage as poffible in producing a fufficient degree of preffure. When proper attention is paid to this circumftance, a fingle turn of the fcrew proves fufficient for putting an entire ftop to the circulation of blood in the limb: but when the ftrap has not originally been made very tight, feveral turns of the fcrew become neceffary; an occurrence which may be always very eafily prevented, and which, when not attended to, frequently proves very embarraffing in the courfe of an operation.

Various methods have been invented for fecuring arteries by means of ligatures. The practice till lately in ordinary ufe was, by means of a curved needle, to pafs a ligature of fufficient ftrength round the mouth of the bleeding veffel, including a quarter of an inch all round of the furrounding parts, and afterwards to form a knot of a proper tightnefs upon the veffel and other parts comprehended in the noofe. But this method was found to give fo much pain, and in fome cafes to be attended with fuch violent convulfions, not only in the part chiefly affected, but of the whole body, that the beft practitioners have thought proper to reject it, and to tie up the blood-veffels by themfelves; for it is now well known that even very fmall arteries are poffeffed of much firmnefs; and that even in the largeft arteries a flight degree of compreffion is fufficient not only for reftraining hæmorrhagy, but for fecuring the ligature on the very fpot to which it is firft applied.

In order to detect the arteries to be tied, the tourniquet, with which they are fecured, muft be flackened a little by a turn or two of the fcrew; and the moment the largeft artery of the fore is difcovered, the furgeon fixes his eye upon it, and immediately reftrains the blood again by means of the tourniquet. An affiftant now forms a noofe on the ligature to be made ufe of; and this noofe being put over the point of the tenaculum, fig. 11. the operator pufhes the fharp point of the inftrument through the fides of the veffel, and at the fame time pulls fo much of it out, over the furface of the furrounding parts, as he thinks is fufficient to be included in the knot which the affiftant is now to make upon the artery. In forming this ligature a fingle knot moderately drawn, and over it another fingle knot, is perfectly fufficient.

When from the deepnefs of a wound, or from any other caufe, fome particular artery cannot be properly fecured by the tenaculum: in this cafe there is a neceffity of employing the crooked needle, and the following is the method of ufing it.

A needle of the common fhape armed with a ligature of a fize proportioned to itfelf and to the veffel to be taken up, is to be introduced at the diftance of a fixth or eighth part of an inch from the artery, and pufhed to a depth fufficient for retaining it, at the fame time that it is carried fully one half round the blood veffel. It muft now be drawn out; and being again pufhed forward till it has completely encircled the mouth of the artery, it is then to be pulled out; and a knot to be tied of a fufficient firmnefs, as was already directed when the tenaculum is ufed.

Chap. XI. *Of* Aneurisms.

The term *Aneurifm* was originally meant to fignify a tumor formed by the dilatation of the coats of an artery; but by modern practitioners it is made to apply not only to tumors of this kind, but to fuch as are formed by blood effufed from arteries into the contiguous parts. There are three fpecies; the true or encyfted, the falfe or diffufed, and the varicofe aneurifm.

The *true* or *encyſted aneuriſm*, when ſituated near the ſurface of the body, produces a tumor at firſt ſmall and circumſcribed; the ſkin retains its natural appearance, when preſſed by the fingers, a pulſation is evidently diſtinguiſhed; and with very little force the contents of the ſwelling may be made to diſappear; but they immediately return upon removing the preſſure. By degrees the ſwelling increaſes and becomes more prominent; but ſtill the patient does not complain of pain: on preſſure the tumor continues of an equal ſoftneſs, and is compreſſible. After this the ſwelling becomes large, the ſkin turns paler than uſual, and in more advanced ſtages œdematous: the pulſe ſtill continues; but parts of the tumor become firm from the coagulation of the contained blood, and yield little to preſſure; at laſt the ſwelling increaſes in a gradual manner, and is attended with a great degree of pain. The ſkin turns livid, and has a gangrenous appearance. An oozing of bloody ſerum occurs from the integuments; and, if a real mortification do not take place, the ſkin cracks in different parts; and the artery being now deprived of the uſual reſiſtance, the blood burſts out with ſuch force as to occaſion the almoſt immediate death of the patient. Thus the diſeaſe terminates in the large cavities of the body; but in the extremities we can, by means of the tourniquet, prevent the ſudden termination of the diſeaſe.

When affections of this kind happen in the larger arteries, the effects produced upon the neighbouring parts are often ſurpriſing; the ſoft parts not only yield to a great extent, but even the bones frequently undergo a great degree of derangement.

The *falſe* or *diffuſed aneuriſm* conſiſts in a wound or rupture in an artery, producing, by the blood thrown out of it, a ſwelling in the contiguous parts. It is moſt frequently produced by a wound made directly into the artery.

The following is the uſual progreſs of the diſorder. A tumor, about the ſize of a horſe-bean, generally riſes at the orifice in the artery ſoon after the diſcharge of the blood has been ſtopped by compreſſion. At firſt it is ſoft, has a ſtrong degree of pulſation, and yields a little to preſſure, but cannot be made entirely to diſappear; for here the blood forming the tumor being at reſt, begins to coagulate. If not improperly treated by much preſſure, it generally remains nearly of the ſame ſize for ſeveral weeks. The enlargement, however, proceeds more rapidly in ſome caſes than in others. Inſtances have occurred of the blood being diffuſed over the whole arm in the ſpace of a few hours; while, on the contrary, ſwellings of this kind have been many months, nay even years, in arriving at any conſiderable ſize.

As the tumor becomes larger, it does not, like the true aneuriſm, grow much more prominent, but rather ſpreads and diffuſes itſelf into the ſurrounding parts. By degrees it acquires a firm conſiſtence; and the pulſation, which was at firſt conſiderable, gradually diminiſhes, till it is ſometimes ſcarcely perceptible. If the blood at firſt thrown out proceed from an artery deeply ſeated, the ſkin preſerves its natural appearance till the diſorder is far advanced: but when the blood gets at firſt into contact with the ſkin, the parts become inſtantly livid, indicating the approach of mortification; and a real ſphacelus has ſometimes been induced. The tumor at firſt produces little uneaſineſs; but as it increaſes in ſize, the patient complains of ſevere pain, ſtiffneſs, numbneſs, and immobility of the whole joint; and theſe ſymptoms continuing to augment, if the artery be large, and aſſiſtance not given, the teguments at laſt burſt, and death muſt enſue

When an artery is punctured through a vein, as in bloodletting at the arm, the blood generally ruſhes into the yielding cellular ſubſtance, and there ſpreads ſo as to ſhut the ſides of the vein together. But in ſome inſtances where the artery happens to be in contact with the vein, the communication opened has been preſerved; and the vein not being ſufficiently ſtrong for reſiſting the impulſe of the artery, muſt conſequently be dilated. This is a *varicoſe aneuriſm*. It was firſt accurately deſcribed by Dr. Hunter, and ſince that time has been frequently obſerved by different practitioners. Here the ſwelling is entirely confined to the veins. Soon after the injury the vein immediately communicating with the artery begins to ſwell, and enlarge gradually. If there be any conſiderable communications in the neighbourhood, the veins which form them are alſo enlarged. The tumor diſappears upon preſſure, the blood contained in it being chiefly puſhed forwards in its courſe towards the heart; and when the tumor is large, there is a ſingular tremulous motion, attended with a perpetual hiſſing noiſe, as if air was paſſing into it through a ſmall aperture.

If a ligature be applied upon the limb immediately below the ſwelling, tight enough to ſtop the pulſe in the under part of the member, the ſwelling diſappears by preſſure, but returns immediately upon the preſſure being removed. If, after the ſwelling is removed by preſſure, the finger be placed upon the orifice in the artery, the veins remain perfectly flaccid till the preſſure is taken off. If the trunk of the artery be compreſſed above the orifice ſo as effectually to ſtop the circulation, the tremulous motion and hiſſing immediately ceaſe; and if the veins be now emptied by preſſure, they remain ſo till the compreſſion upon the artery be removed. If the vein be compreſſed a little above, as well as below the tumor, all the blood may generally, though not always, be puſhed through the orifice into the artery; from whence it immediately returns on the preſſure being diſcontinued.

When the diſeaſe has continued long, and the dilatation of the veins has become conſiderable, the trunk of the artery above the orifice generally becomes greatly enlarged, while that below becomes proportionably ſmall; of conſequence the pulſe in the under part of the member is always more feeble than in the ſound limb of the oppoſite ſide.

The *cauſes producing aneuriſms*, in general, are a natural diſeaſe of the arteries. Thus a partial debility of their coats may readily produce the diſeaſe; or they may ariſe, eſpecially in the internal parts of the body, from great bodily exertions. They are likewiſe produced by wounds of the coats of the arteries, as now and then happens in bloodletting at the arm; or from acrid matter contained in a neighbouring ſore; or from the deſtruction of ſurrounding parts, by which the natural ſupport is removed.

Aneuriſms have frequently been miſtaken for abſceſſes and other collections of matter, and have been laid open by inciſion; on which account great attention is ſometimes required to make the proper diſtinction. In the commencement of the diſeaſe the pulſation in the tumor is commonly ſo ſtrong, and other concomitant circumſtances ſo evidently point out the nature of the diſorder, that little or no doubt reſpecting it can ever take place; but in the more advanced ſtages of the diſeaſe when the ſwelling has become large, and has loſt its pulſation, nothing but a minute attention to the previous hiſtory of the caſe can enable the practitioner to form a judgment of its nature.

Aneuriſms may be confounded with ſoft encyſted tumors, ſcrophulous ſwellings, and abſceſſes ſituated ſo near to an artery as to be affected by its pulſation. But one ſymptom, when connected with ſtrong pulſation, may always lead to a certain determination that the ſwelling is of the aneuriſmal kind, viz. the contents of the tumor being made eaſily to diſappear upon preſſure, and their returning on the compreſſion being removed. The want of this circumſtance, however,

ought not to convince us that it is not of that nature; for it frequently happens, especially in the advanced stages of aneurisms, that their contents become so firm that no effect is produced upon them by pressure. Hence the propriety, in doubtful cases, of proceeding as if the disease was clearly of the aneurismal kind.

In the *prognosis*, three circumstances are chiefly to be attended to; the manner in which the disease appears to have been produced, the part of the body in which the swelling is situated, and the age and habit of the body of the patient.

If an aneurism has come forward in a gradual manner, without any apparent injury done to the part, and not succeeding any violent bodily exertion, there will be reason to suppose that the disease depends upon a general affection either of the trunk in which it occurs, or of the whole arterious system. In such cases art can give little assistance; whereas if the tumor has succeeded an external accident, an operation may be attended with success.

In the *varicose aneurism* a more favourable prognosis may generally be given than in either of the other two species. It does not proceed so rapidly; when it has arrived at a certain length, it does not afterwards acquire much additional size; and it may be sustained without much inconvenience for a great number of years. As long as there is reason to expect this, the hazard which almost always attends the operation ought to be avoided.

In the second volume of the London Medical Observations, two cases are related by Dr. Hunter of the varicose aneurism. One of them at that time was of fourteen years' standing, and the other had subsisted for five years, without there being any necessity for an operation. And in vol. iii. of the same work a similar case of five years' duration is related by Dr. Cleghorn.

Though this aneurism, when it has arrived at a certain size, commonly remains stationary, and may be borne without much inconvenience for a long time, this is not always the case; for some instances have occurred, where the disease was attended with great uneasiness, and where the operation was performed with much difficulty.

In judging further of the probable event of aneurisms in general, the situation of the tumor next requires attention. When it is so situated that no ligature or effectual compression can be applied for stopping the circulation in the part, if the artery be large, there would be the greatest danger in opening it. In this case, therefore, the most fatal consequences are to be apprehended.

When aneurisms are situated near the upper parts of the extremities, surgeons have been hitherto doubtful whether, after tying up the humeral or femoral arteries, the lower parts of the limb would be supplied with blood; and though several successful instances of performing that operation have been published, the success has been pretty generally ascribed to unusual branching of the great arteries of those patients, on whom the operation was performed, above the aneurism. Mr. John Bell, however, in his late very ingenious and important *Discourses on Wounds*, has proved, to our satisfaction at least, that the inosculations which take place between the internal iliac and the arteries of the leg, by means of the glutæal arteries and the profunda femoris, are in every case sufficient to supply nourishment to the limb; that the same is the case in the arm; and that therefore in every aneurism, even of the humeral or femoral artery, we ought to perform the operation. Several instances of success are there related; among others, an operation performed by Mr. J. Bell himself.

In every case of aneurism, the use of *pressure* has been indiscriminately recommended, not only in the incipient period of the disease, but even in its more advanced stages.

In the *diffused* or *false aneurism*, as pressure cannot be applied to the artery alone, without at the same time affecting the refluent veins; and as this, by producing an increased resistance to the arterial pulsations, must force an additional quantity of blood to the orifice in the artery—no advantage is to be expected from it, though it may be productive of mischief.

In the early stages of *encysted aneurism*, while the blood can be yet pressed entirely out of the sac into the artery, it often happens, by the use of a bandage of soft and somewhat elastic materials, properly fitted to the part, that much may be done in preventing the swelling from receiving any degree of increase; and on some occasions, by the continued support thus given to the weakened artery, complete cures have been at last obtained. In all such cases, therefore, particularly in every instance of the varicose aneurism, much advantage may be expected from moderate pressure.

But pressure, even in encysted aneurism, ought never to be carried to any great length; for tight bandages, by producing an immoderate degree of reaction in the containing parts to which they are applied, instead of answering the purpose for which they were intended, have evidently the contrary effect. Indeed the greatest length to which pressure in such cases ought to go, should be to serve as an easy support to the parts affected, and no farther.

In *performing the operation* for aneurism, the first step ought to be to obtain a full command of the circulation in the inferior part of the member by means of the tourniquet. This being done, the patient should be so placed, that the diseased limb, on being stretched on a table, is found to be of a proper height for the surgeon; who, as the operation is generally tedious, ought to be seated. The limb being properly secured by an assistant, the operator is now with a common scalpel, to make an incision through the skin and cellular substance along the whole course of the tumor; and as freedom in the remaining parts of the operation is here a matter of much importance, it is even of use to carry this external incision half an inch or so both above and below the farthest extremities of the swelling.

All the effused blood ought then to be wiped off by means of a sponge; and the softest part of the tumor being discovered, an opening ought there to be made into it with a lancet, large enough for admitting a finger of the operator's left hand. This being done, and the finger introduced into the cavity of the tumor, it is now to be laid open from one extremity to the other, by running a blunt-pointed bistoury, Plate 24. fig. 12. along the finger from below upwards, and afterwards from above downwards, so as to lay the whole cavity fairly open.

The cavity of the tumor being thus laid freely open, all the coagulated blood is to be taken out by the fingers of the operator, together with a number of tough membranous filaments commonly found here. The cavity of the tumor is now to be rendered quite dry, and free from the blood which, on the first opening of the swelling, is discharged into it from the veins in the inferior part of the member: the tourniquet is then to be slackened to discover, not only the artery itself, but the opening into it, from whence the blood collected in the tumor has been all along discharged. This being done, the next point to be determined is the manner of *securing this opening* into the artery, so as to prevent in future any farther effusion of blood. Various means have been proposed for accomplishing this; but the effects of all of them may be comprehended under the three following heads.

1. The effects of ligature upon a large artery having on some occasions proved fatal to the inferior part of the member, it was long ago proposed, that so soon as the opening into the artery has been discovered, instead of applying a ligature round it, which for certain is to obliterate its cavity entirely, a piece of agaric, vitriol, alum, or any other *astringent* substance, should be applied to the orifice, in order if possible to produce a reunion of its sides.

2. Upon the same principle with the preceding, viz. that of still preserving the circulation in the artery, it was several years ago proposed by an eminent surgeon of Newcastle, Mr Lambert, that the orifice in the artery should be secured by means of the *twisted suture*. A small needle being pushed through the edges of the wound, they are then directed to be drawn together by a thread properly twisted round the needle, as was formerly directed when treating of sutures.

Strong objections, however, occur to both of these methods. In the first place, no astringent application with which we are acquainted is possessed of such powers as to deserve much confidence. In almost every instance in which they have been used, the hæmorrhagy has recurred again and again, so as to prove very distressing, not only to the patient, but to the practitioner in attendance; little or no attention is therefore to be paid to remedies of this kind in ordinary practice.

Mr. Lambert's method of stitching the orifice in the artery is certainly a very ingenious proposal; and would in all probability, at least in most instances, prove an effectual stop to all farther discharge of blood: but as we have yet only one instance of its success, little can be said about it. Two material objections, however, seem to occur to this practice. One is, that in the operation for the aneurism, in almost every instance, a very few only excepted, the artery lies at the back-part of the tumor; so that when all the collected blood is removed, there is such a depth of wound, that it must be always a very difficult matter, and on many occasions quite impracticable, to perform this nice operation upon the artery with that attention and exactness which, in order to ensure success, it certainly requires. But there is another very material objection. By introducing a needle through the sides of the orifice, and drawing these together by a ligature, the cavity of the artery must undoubtedly be at that point much diminished. Indeed Mr. Lambert, in his account of the case in which this operation was performed, acknowledges that the diameter of the artery was thereby diminished. Now the passage of the blood being thus contracted at one point, the impulse upon that particular part must be very considerable: so that the very remedy employed for the cure of one species of aneurism, will in all probability prove a very powerful agent in inducing another; for the blood being thus obstructed in its usual course, there will be no small danger incurred of a dilatation being produced immediately above this preternatural stricture.

3. Neither of the methods we have yet been considering being found eligible for securing the orifice in the artery, we shall now proceed to describe *the ordinary manner of performing this operation*; which consists in obliterating the arterial cavity entirely by means of ligatures.

The artery being laid bare in the manner directed, and all the coagulated blood being carefully removed from the cavity of the tumor, on the tourniquet being now slackened so as to bring the orifice in the artery into view, a small probe curved at the extremity is to be introduced at the opening, in order to raise the artery from the neighbouring parts, so as that the surgeon may be enabled with certainty to pass a ligature round it, without comprehending the contiguous nerves, which in general run very near to the large blood-vessels of a limb. By this precaution the nerves may be always avoided; and by doing so, a great deal of mischief may be prevented, which otherwise might supervene. When the disorder is situated either in the ham, or in the usual part of blood-letting in the arm, bending the joints of the knee or of the elbow, as it relaxes the artery a little, renders this part of the operation more easily effected than when the limbs are kept fully stretched out.

The artery being thus gently separated from the contiguous parts, a firm waxed ligature must be passed round it, about the eighth part of an inch or so above the orifice, and another must in the same manner be introduced at the same distance below it.

The ligatures being both finished in the manner directed, the tourniquet is now to be made quite loose; and if no blood is discharged at the orifice in the artery, we may then rest satisfied that the operation is so far properly completed.

The wound is now to be lightly covered with soft lint, with a pledgit of any emollient ointment over the whole; and a compress of linen being applied over the dressings, all the bandage in any degree requisite is two or three turns of a roller above and as many below the centre of the wound, making it press with no more tightness than is absolutely necessary for retaining the application we have just now mentioned.

The patient being now put into bed, the member should be laid in a relaxed posture upon a pillow, and ought to be so placed as to create the least possible uneasiness from the posture in which it is laid.

As the operation for the aneurism is always tedious, and produces much pain and irritation, a full dose of laudanum should be given immediately on the patient being got into bed. In order to diminish sensibility during some of the more capital operations, different trials have been made of opiates given an hour or so before the operation. On some occasions this proved evidently very useful; but in others it seemed to have the contrary effect; particularly in weak nervous constitutions, in which with any doses, however small, they appeared to be rendered more irritable and more susceptible of pain, than if no opiate had been given. Immediately after this operation, however, an opiate ought to be exhibited, to be repeated occasionally according to the degrees of pain and restlessness.

In some few cases of aneurism, it has happened that the pulse in the under part of the member has been discovered immediately after the operation. This, however, is a very rare occurrence: for as this disorder is seldom met with in any other part than at the joint of the elbow as a consequence of blood-letting, and as it rarely happens that the brachial artery divides till it passes an inch or two below that place, the trunk of this artery is therefore most frequently wounded; and when, accordingly, the ligature, in this operation, is made to obliterate the passage of almost the whole blood which went to the under part of the arm, there cannot be the least reason to expect any pulsation at the wrist, till in a gradual manner the anastomosing branches of the artery have become so much enlarged as to transmit such a quantity of blood to the inferior part of the member as is sufficient for acting as a stimulus to the larger branches of the artery.

Immediately after the operation, the patient complains of an unusual numbness or want of feeling in the whole member; and as it generally, for a few hours, becomes cold, it is therefore right to keep it properly covered with warm soft flannel; and in order to serve as a gentle stimulus to the parts below, moderate frictions appear to be of use. In the space of ten or twelve hours from the operation, although the numbness still continues, the heat of the parts generally begins to return; and it frequently happens, in the course of a few

hours more, that all the inferior part of the member becomes even preternaturally warm.

Immediately after this operation, the want of feeling in the parts is often very great; and in proportion as the circulation in the under part of the member becomes more confiderable, the degree of feeling alfo augments. If we could fuppofe the nerves of the parts below to be always included in the ligature with the artery, that numbnefs which fucceeds immediately to the operation might be eafily accounted for; but it has been alfo known to happen when nothing but the artery was fecured by the ligature.

In the mean time, the patient being properly attended to as to regimen, by giving him cordials and nourifhing diet when low and reduced, and confining him to a low diet if his conftitution is plethoric, the limb being ftill kept in an eafy relaxed pofture, towards the end of the fourth or fifth day, fometimes much fooner, a very weak feeble pulfe is difcovered in the under part of the member, which becoming ftronger in a gradual manner, the patient in the fame proportion recovers the ufe and feeling of the parts.

So foon as there is an appearance of matter having formed freely about the fore, which will feldom happen before the fifth or fixth day, an emollient poultice fhould be applied over it for a few hours, in order to foften the dreffings, which may be then removed. At this time the ligatures might be taken away; but as their continuance for a day or two longer can do no harm, it is better to allow them to remain till the fecond or third dreffing, when they either drop off themfelves, or may be taken away with perfect fafety. The dreffings, which fhould always be of the fofteft materials, being renewed every fecond or third day according to the quantity of matter produced, the fore is in general found to heal very eafily; and although the patient may for a confiderable time complain of great numbnefs and want of ftrength in the whole courfe of the difeafed limb, yet in moft inftances a very free ufe of it is at laft obtained.

Very often after the artery feems to be fecured it gives way, and fatal hæmorrhagies enfue; nor is the patient free from this danger for a great length of time. In one of Mr. Hunter's operations the artery gave way on the twenty-fixth day. It is to this difficulty of procuring adhefion between the fides of the artery, which frequently may be difeafed to fome diftance above the ligature, that a great part of the danger of this operation is to be afcribed.

Chap. XII. *Of* Affections of the brain *from External Violence.*

When the brain is *compreffed*, a fet of fymptoms enfue extremely dangerous, though fometimes they do not make their appearance till after a confiderable interval. But at whatever time they appear, they are uniformly of the fame kind, and are in general as follow: drowfinefs, giddinefs, and ftupefaction, dimnefs of fight, dilatation of the pupil; and, where the injury done to the head is great, there is commonly a difcharge of blood from the eyes, nofe, and ears. Sometimes the fractured bone can be difcovered through the integuments, at others it cannot. There is an irregular and oppreffed pulfe, and fnoring or apoplectic ftertor in breathing. There is likewife naufea and vomiting, with an involuntary difcharge of fæces and urine. Among the mufcles of the extremities and other parts, there is lofs of voluntary motion, convulfive tremors in fome parts of the body, and palfy in others, efpecially in that fide of the body which is oppofite to the injured part of the head.

Some of the milder of thefe fymptoms, as vertigo, ftupefaction, and a temporary lofs of fenfibility, are frequently induced by flight blows upon the head, but commonly foon difappear, either by reft alone, or by the means to be afterwards pointed out. But when any other fymptoms enfue, fuch as dilatation of the pupils, and efpecially when much blood is difcharged from the eyes, nofe, and ears, and that there is an involuntary difcharge of fæces and urine, it may be reafonably concluded that compreffion of the brain is induced.

The cavity of the cranium, in the healthy and natural ftate, is every-where completely filled by the brain; whatever therefore diminifhes that cavity, will produce a compreffion of the brain.

The caufes producing fuch a diminution may be of various kinds, as fracture and depreffion of the bones of the cranium; the forcible introduction of any extraneous body into the cavity of the cranium; effufion of blood, ferum, pus, or any other matter; the thicknefs of the bones of the cranium in certain difeafes, as in lues venerea, rickets, or fpina ventofa; or water collected in hydrocephalous cafes. The firft fet of caufes fhall be confidered in their order. The four laft mentioned belong to the province of the phyfician, and have been confidered in a former part of this Work.

Sect. I. *Of Fracture and Depreffion of the Cranium producing Compreffion of the Brain.*

Fractures of the cranium have been differently diftinguifhed by different authors; but it feems fufficient to divide them into thofe attended with depreffion, and thofe which are not fo.

In fracture and depreffion of the cranium, the treatment ought to be, 1. To difcover the fituation and extent of the fracture. 2. To obviate the effects of the injury done to the brain, by raifing or removing all the depreffed parts of the bone. 3. To endeavour to complete the cure by proper dreffings, and attention to the after-treatment.

When the teguments correfponding to the injury done to the bone are cut or *lacerated*, and, as is fometimes the cafe, entirely removed, the ftate of the fracture is immediately difcovered; but when the integuments of the fkull remain *entire*, even though the general fymptoms of fracture be prefent, there is fometimes much difficulty in afcertaining it. When, however, any external injury appears, particularly a tumor from a recent contufion, attended by the fymptoms already defcribed, there can be no doubt of the exiftence of a fracture. But it fometimes happens that compreffion exifts without the fmalleft appearance of tumor. In fuch cafes, the whole head ought to be fhaved, when an inflammatory fpot may frequently be obferved. Sometimes the place of the fracture has been difcovered by the patient applying the hand frequently on or near fome particular part of the head.

When the fymptoms of a compreffed brain are evidently marked, no time ought to be loft in fetting about an examination of the ftate of the cranium, wherever appearances point out, or even lead us to conjecture, in what part a fracture may be fituated. For this purpofe an incifion is to be made upon the fpot through the integuments to the furface of the bone, which muft be fufficiently expofed to admit of a free examination.

Some authors have recommended a crucial incifion; others one in form of the letter T; while many advife a confiderable part of the integuments to be entirely removed. But as it is more agreeable to the prefent mode of practice to fave as much of the fkin as poffible, a fimple incifion is generally preferred, unlefs the fracture run in different directions, and then the incifion muft vary accordingly. It will frequently happen, that a confiderable part of the integuments muft be

ſeparated from the ſkull, in order to obtain a diſtinct view of the full extent of the fracture; but no part of the integuments is to be entirely removed.

When blood-veſſels of any conſiderable ſize are divided, either before or in time of the examination, they ought to be allowed to bleed freely, as in no caſe whatever is the loſs of blood attended with more advantage than the preſent. When, however, it appears that the patient has loſt a ſufficient quantity, the veſſels ought to be ſecured.

After the integuments have been divided, if the ſkull be found to be fractured and depreſſed, the nature of the caſe is rendered evident; but even where there is no external appearance of fracture, tumor, diſcoloration, or other injury, if the patient continue to labour under ſymptoms of a compreſſed brain, if the pericranium has been ſeparated from the bone, and eſpecially if the bone has loſt its natural appearance, and has acquired a pale white or duſky yellow hue, the trepan ought to be applied without heſitation at the place where theſe appearances mark the principal ſeat of the injury.

Again, although no mark either of fracture or of any diſeaſes underneath ſhould appear on the outer table of the bone, yet there is a poſſibility that the inner table may be fractured and depreſſed. This indeed is not a common occurrence, but it happens probably more frequently than ſurgeons have been aware of; and where it does happen, the injury done to the brain is as great, and attended with as much danger, as where the whole thickneſs of the bone is beat in. The application of the trepan is therefore neceſſary.

But if, after the application of the trepan, it happens that no mark of injury appears either in the outer or inner table in that part, or in the dura mater below it, and that the ſymptoms of a compreſſed brain ſtill continue, a fracture in ſome other part is to be ſuſpected; or that kind of fracture termed by practitioners *counter fiſſure*, where the ſkull is fractured and ſometimes depreſſed on the oppoſite ſide to, or at a diſtance from, the part where the injury was received. This is fortunately not a very frequent occurrence, and has even been doubted by ſome; but different inſtances of it have, beyond all queſtion, been found. If therefore the operation of the trepan has been performed, and no fracture is diſcovered, no extravaſation appears on the ſurface of the brain; and if blood-letting and other means uſually employed do not remove the ſymptoms of compreſſion, the operator is to ſearch for a fracture on ſome other part. The whole head ſhould again be examined with much accuracy; and, by preſſing deliberately but firmly over every part of it, if the ſmalleſt degree of ſenſibility remains, the patient will ſhow ſigns of pain, either by moans or by raiſing his hands, when preſſure is made over the fractured part. In this way fractures have been frequently detected, which might otherwiſe have been concealed.

Having now conſidered every thing preparatory to the operation of the trepan, we ſhall next point out the means beſt adapted for the removal or elevation of a depreſſed portion of the bone.

The firſt thing to be done is, after ſhaving the head, to make an inciſion as deep as the bone, and directly upon the courſe of the fracture.

The patient ought to be laid on a table, with a mattreſs under him, while his head is placed upon a pillow, and ſecured by an aſſiſtant. When the extent of the fracture has been determined, and the bleeding from the inciſion ſtopped, the depreſſed bone is now to be elevated; but previous to this it is neceſſary to ſearch for detached pieces. Should any be found, they ought to be removed by a pair of forceps adapted to this purpoſe. By the ſame inſtrument any ſplinters of bone which may have been beaten in may be removed; but when a part of the bone is beaten in beyond the level of the reſt of the cranium, as much of the pericranium is then to be removed by a raſpatory, Plate 24. fig. 13. as will allow the trephine, fig. 14. to be applied; or, if the operator incline, for the ſake of diſpatch, he may uſe the trepan, which, however, though more expeditious, is much leſs ſafe in the application. The operation indeed may be begun and finiſhed with the trephine, while the trepan may perform the middle and principal part of the work. This part of the work is begun by making a hole with the perforator deep enough to fix the central pin of the trephine, in order to prevent the ſaw from ſlipping out of its central courſe, till it has formed a groove ſufficiently deep to be worked ſteadily in; and then the pin is to be removed. If the bone be thick, the teeth of the ſaw muſt be cleaned now and then by the bruſh (fig. 15.) during the perforation, and dipped in oil as often as it is cleaned, which will conſiderably facilitate the motion, and render it more expeditious; making it at the ſame time much leſs diſagreeable to the patient, if he poſſeſs his ſenſes. That no time may be loſt, the operator ought to be provided with two inſtruments of the ſame ſize, or at leaſt to have two heads which can be readily fitted to the ſame handle.

After having made ſome progreſs in the operation, the groove ought to be frequently examined with a pick-tooth, or ſome ſuch inſtrument, in order to diſcover its depth; and if one ſide happen to be deeper than the other, the operator ought to preſs more on that ſide which is ſhalloweſt. Precautions are more particularly neceſſary when the operation is performed upon a part of the ſkull which is of an unequal thickneſs, eſpecially after the inſtrument has paſſed the diploe. And though it be ſaid by writers in general that the inſtrument may be worked boldly till it comes at the diploe (which is generally known by the appearance of blood), yet the operator ſhould be upon his guard in this point, examining from time to time if the piece be looſe, leſt through inadvertence the dura mater be wounded; for in ſome parts of the ſkull there is naturally very little diploe, and in old ſubjects ſcarcely any. It ought likewiſe to be remembered, that the ſkulls of children are very thin. When the piece begins to vacillate, it ought to be ſnapped off with the forceps (fig. 16.), or levator (fig. 17.); for the ſawing ought by no means to be continued till the bone be quite cut through, otherwiſe the inſtrument may plunge in upon the brain, or at leaſt injure the dura mater. If the inner edge of the perforation be left ragged, it is to be ſmoothed with the lenticular (fig. 18.), to prevent it from irritating the dura mater. Particular care is to be taken in uſing the inſtrument, leſt it ſhould preſs too much upon the brain.

The next ſtep is to raiſe the depreſſed part of the bone with the levator, or to extract the fragments of the bone, grumous blood, or any extraneous body. After this, if there appear reaſon to apprehend that blood, lymph, or matter, is contained under the dura mater, it ought to be cautiouſly opened with a lancet, endeavouring to avoid the blood-veſſels running upon it, or lying immediately under it.

When the trepan is to be uſed on account of a fiſſure in which the bone will not yield, the inſtrument ſhould be applied ſo as to include part of it, if not directly over it, as it is moſt probable that the extravaſated fluid will be found directly under it. And when the fiſſure is of great extent, it may be proper to make a perforation at each end, if the whole can be conveniently brought into view; and in ſome caſes ſeveral perforations may become neceſſary.

When it is propoſed to make ſeveral perforations to remove depreſſed fragments of the bone which are firmly fixed, and having the internal ſurface larger than the external, or to raiſe them ſufficiently, it is neceſſary to apply the trepan as near the fractured parts as poſſible; making the perforations join

each other, to prevent the trouble of cutting the intermediate ſpaces.

When the ſkull is injured over a ſuture, and it is not thought adviſeable to uſe the trepan, a perforation ought to be made on each ſide of the ſuture, eſpecially in young ſubjects, in whom the dura mater adheres more ſtrongly than in adults; becauſe there cannot be a free communication between the one ſide and the other, on account of the attachment of that membrane to the ſuture.

After the elevation of the depreſſed pieces, or the removal of thoſe which are quite looſe, the extraction of extraneous bodies, and the evacuation of extravaſated fluids, &c. the ſore is to be dreſſed in the lighteſt and eaſieſt manner; all that is neceſſary being to apply a pledget of fine ſcraped lint, covered with ſimple ointment, to that part of the dura mater which is laid bare by the trepan, or otherwiſe; after which the edges of the ſcalp are to be brought together or nearly ſo, and another pledget laid along the whole courſe of the wound; a piece of fine ſoft linen is to be laid over all, and the dreſſings may be retained in their place by a common night-cap applied cloſe to the head and properly fixed.

The patient is to be placed in as eaſy a *poſition* in bed as poſſible, with his head and ſhoulders elevated a little more than ordinary. If the operation be attended with ſucceſs, the patient will ſoon begin to ſhow favourable ſymptoms; he will ſoon ſhow ſigns of increaſing ſenſibility, and the original bad ſymptoms will gradually diſappear. After this he ought to be kept as quiet as poſſible; proper laxatives are to be adminiſtered, and ſuch as may be leaſt of a nauſeating nature. His food ought to be ſimple and eaſy of digeſtion, and his drink of the moſt diluent kind. If he complain of the wound being uneaſy, an emollient poultice ſhould be immediately applied, and renewed three or four times in the twenty-four hours. By theſe means there will commonly be a free ſuppuration from the whole ſurface of the ſore.

Every time the *wound is dreſſed*, the purulent matter ought to be wiped off with a fine warm ſponge; and if any degree of ſloughineſs take place on the dura mater or parts adjacent, it will then be completely ſeparated. Granulations will begin to form, which will continue to increaſe till the whole ariſe to a level with the ſurface of the cranium. The edges of the ſore are now to be dreſſed with cerate ſtraps, and the reſt of it covered with fine ſoft lint, kept gently preſſed on by the night-cap properly tied. In this way the cure will go on favourably; luxuriance of granulations will commonly be prevented; the parts will cicatrize kindly; and as all the ſkin has been preſerved in making the firſt inciſion, the cicatrix will be but little obſerved.

But things do not always proceed in this favourable manner. Sometimes in a few hours after the operation the patient is ſeized with a kind of reſtleſſneſs, toſſing his arms, and endeavouring to move himſelf in bed, while the ſymptoms of a compreſſed brain remain nearly the ſame as formerly. In this caſe, eſpecially if the pulſe be quick and ſtrong, the patient ought to be bled freely, as there will be reaſon to ſuſpect ſome tendency to inflammation in the brain. Sometimes, though the trepan has been properly applied, the ſymptoms are not relieved, on account of extravaſated fluids collected internally under the dura mater, or between the pia mater and brain, or in the cavity of the ventricles. The danger in theſe caſes will be in proportion to the depth of the collection. Particular attention therefore ought always to be paid to the ſtate of the dura mater after the perforation has been made. If blood be collected below the dura mater, this membrane will be found tenſe, dark coloured, elaſtic, and even livid; in which caſe, an opening becomes abſolutely neceſſary to diſcharge the extravaſated fluid. Gentle ſcratches are to be made with a ſcalpel, till a probe or directory can be introduced; upon which the membrane is to be ſufficiently divided in a longitudinal, and ſometimes even in a crucial direction, till an outlet to the fluid be given.

After the dura mater has been cut in this manner, there is ſome danger of the brain protruding at the opening; but the danger from this is not equal to the bad effects ariſing from effuſed fluids compreſſing the brain.

A troubleſome and an alarming appearance now and then follows the operation of the trepan; namely, the excreſcences called *fungi*, formerly ſuppoſed to grow immediately from the ſurface of the brain, but which, in general, originate from the ſurface of the dura mater or cut edge of the bone granulating too luxuriantly.

It often happens that they poſſeſs little ſenſibility; and then the beſt method to prevent their riſing to any great height is to touch them frequently with lunar cauſtic: but ſome caſes occur where their ſenſibility is ſo great that they cannot be touched, unleſs they hang by a ſmall neck; and then a ligature may be put round them, and tightened from time to time till they drop off, which will commonly be in the courſe of a few days. It ſeldom happens, however, that there is any occaſion for applying ſuch means for the removal of theſe tumors, for they generally fall off as the perforations of the bone fill up.

If they do not, as the connection between them and the brain will be in a great meaſure intercepted, they may be with more ſafety removed, either by exciſion, by cauſtic, or by ligature.

The cure being thus far completed, only a ſmall cicatrix will remain, and in general the parts will be nearly as firm as at firſt; but when much of the integuments have been ſeparated or deſtroyed, as they are never regenerated, the bone will be left covered only by a thin cuticle, with ſome ſmall quantity of cellular ſubſtance. When this is the caſe, the perſon ought to wear a piece of lead or tin, properly fitted and lined with flannel, to protect it from the cold and other external injuries.

This is the method now commonly practiſed in caſes of compreſſion; but it frequently happens, that inſtead of compreſſion, ſuch a degree of concuſſion takes place that no aſſiſtance from the trepan can be attended with any advantage; for the effects of concuſſion are totally different from thoſe of compreſſion, and therefore to be removed in a different manner.

Sect. II. *Of Concuſſion of the Brain.*

By *concuſſion* of the brain is meant ſuch an injury from external violence, as either obſtructs or deſtroys its functions, without leaving behind it ſuch marks as to allow its nature to be aſcertained by diſſection.

Moſt of the ſymptoms attending compreſſion of the brain occur alſo in concuſſion; but in a compreſſed ſtate of the brain they are more permanent. There is no diſcharge of blood from the eyes, noſe, or ears, which frequently happens in compreſſion; and inſtead of that apoplectic ſtertor in breathing which accompanies compreſſion, the patient ſeems to be in a ſound and natural ſleep. The pulſe is irregular and ſlow in compreſſion, and grows ſtronger and fuller by blood-letting; but in concuſſion it is weaker, being ſoft and equal, and ſinks by blood-letting. There are beſides convulſions in compreſſions, which are not obſerved in a ſtate of concuſſion. The ſymptoms ariſing from concuſſion come on immediately after the injury is received. In the violent degrees of theſe the patient remains quite inſenſible; the pupils are much dilated, and do not contract though the eyes be expoſed to the ſtrongeſt light.

In more violent ſymptoms, eſpecially when the patient is rendered inſenſible, it is extremely difficult to diſtinguiſh between concuſſion and depreſſion; for ſymptoms which have been ſuppoſed to ariſe entirely from concuſſion have, after death, been found to be owing to extravaſation or undiſcovered fracture; and extravaſation has been blamed, when, on diſſection, not the leaſt morbid appearance could be diſcovered.

In concuſſion the pulſe will frequently ſink and become feeble, even after the diſcharge of eight or ten ounces of blood: in doubtful caſes, therefore, blood-letting ſhould be practiſed with great caution. If the pulſe become fuller and ſtronger after diſcharging a moderate quantity, if the blood appear ſizy, and eſpecially if the patient become more ſenſible, it may be concluded that the ſymptoms depend upon extravaſation, depreſſion of the ſkull, or ſome degree of inflammation; and as long as advantage ſeems to be derived from blood-letting, we may repeat it: but if, upon drawing a few ounces of blood, the pulſe become feeble, and eſpecially if along with this the patient become more weakly, we ſhould immediately deſiſt from any farther evacuation of blood; and in place of it we ought to give ſuch remedies as may ſupport and ſtrengthen the patient: cordials ought to be given internally, and ſtimulants applied externally. Warm wine ſhould be given in proportion to the degree of debility induced; the patient, who is apt, in this caſe, to become cold, ſhould be kept warm by proper coverings; a bliſter ought to be put to all that part of the head in which the ſkin has not been injured; ſinapis ſhould be applied to the feet; gentle laxatives are uſeful, and ſhould be regularly given, ſo as to keep the body open. If the patient cannot ſwallow wine in ſufficient quantity, volatile alkali, ardent ſpirits, and other cordials of a ſtimulating kind, ſhould be given. In concuſſions of the brain, Mr. Bromfield has recommended the uſe of opiates, and ſeveral other practitioners agree with him; though ſome conſider it as hurtful in the early ſtages of the diſorder, and are of opinion that even wine and other cordials ought to be given with ſome degree of caution. Iſſues, or the frequent repetitions of bliſters to the different parts of the head and neck, by which an almoſt conſtant ſtimulus is preſerved, are much recommended. When patients are recovering from accidents of this kind, a liberal uſe of bark, ſteel, and mineral waters, &c. have ſometimes been of ſervice. When the ſtomach is loaded, gentle vomits become neceſſary; and white vitriol is reckoned the beſt in ſuch caſes. When much languor, inactivity, and loſs of memory, continue, electricity long applied has been attended with advantage. This remedy, however would be hurtful where any ſymptoms of compreſſion or inflammation of the brain are preſent.

Sect. III. *Of Inflammation of the Membranes of the Brain, or of the Brain itſelf, from external Violence.*

Inflammation of the brain and of its membranes is attended with ſymptoms which occur in inflammations affecting other parts of the body, and from ſimilar cauſes, and likewiſe with ſymptoms peculiar to the brain itſelf. This diſorder differs eſſentially from concuſſion in its not appearing immediately; ſeldom till ſeveral days after the accident, and ſometimes not till two, three, or more weeks, or even as many months, have elapſed; when the patient begins to feel an univerſal uneaſineſs over his head, attended with liſtleſſneſs, ſome degree of pain in the part upon which the injury was inflicted, though of this there was perhaps no previous ſenſation. Theſe ſymptoms gradually increaſe; the patient appears dull and ſtupid; there is now a ſenſation of fulneſs, as if the brain were girt or compreſſed; he complains of giddineſs and of nauſea, which ſometimes terminate in vomiting; he is hot, and extremely uneaſy; his ſleep is much diſturbed, neither natural ſleep nor that procured by opiates affording him relief; the pulſe is hard and quick; the face is fluſhed; the eyes inflamed, and unable to bear an expoſure to much light. Sometimes, where a wound of the head accompanies theſe ſymptoms, its edges become hard and ſwelled, and an eryſipelatous inflammation ſpreads quickly over the whole head, and eſpecially towards the forehead and eyelids, which frequently ſwell to ſuch a degree as to ſhut up the eyes entirely. This ſwelling is ſoft and painful to the touch; it receives the impreſſion of the finger, and frequently originates merely from the external wound; on which account the attending ſymptoms are commonly eaſily removed by the means beſt ſuited to eryſipelas of the parts. In a few inſtances, however, this ſymptom is likewiſe connected with, and ſeems to originate from, ſome affection of the dura mater. Its tendency is then of the moſt dangerous kind, and therefore requires the greateſt attention. Soon after theſe ſymptoms become formidable, the part which received the blow begins to put on a diſeaſed appearance. If the bone has been expoſed by the accident, it now loſes its natural complexion, becomes pale, white, and dry, either over its whole ſurface or in particular ſpots: but when the bone has not been denuded, nor the ſofter parts divided, but merely contuſed, they now ſwell, become puffy, and painful to the touch; and when the head is ſhaved, the ſkin over the part affected is redder that the reſt of the ſcalp; and if the ſwelled part be laid open, the pericranium will probably be found to be detached from the ſkull, and a little bloody fetid ichor will be obſerved between this membrane and the bone, which will be found diſcoloured in nearly the ſame manner as if it had been laid bare from the beginning.

By the application of proper remedies theſe ſymptoms are frequently entirely removed; but when neglected, or when they do not yield to the means employed, they conſtantly become worſe. Delirium enſues; the patient becomes extremely hot; and is at times ſeized with ſlight ſhiverings, which continue to increaſe and are attended with ſome degree of coma or ſtupor. The former ſymptoms now in a great meaſure diſappear; palſy of one ſide is ſoon followed by deep coma; the pupils are dilated; the urine and fæces are paſſed involuntarily; ſubſultus tendinum and other convulſions enſue; and death certainly follows, if the patient be not ſpeedily relieved.

Of the above ſmptoms, the firſt ſet point out the inflammatory, the other the ſuppurative, ſtage of the diſeaſe. The remedies which are uſeful in the one are highly improper in the other. During the inflammatory ſtage, blood-letting is the principal remedy; but this is improper after the ſuppurative ſymptoms appear, for then the trepan is the only thing that can give relief.

The *indications of cure* are; 1. To employ the moſt effectual means for preventing inflammation. 2. To endeavour to procure the reſolution of inflammation by general and topical remedies. 3. When the inflammation cannot be removed by reſolution, and when ſuppuration has taken place, to give a free vent to the matter. 4. If the affected parts be attacked with gangrene, to endeavour to remove it and obviate its effects.

To anſwer the *firſt* indication, when the contuſion is conſiderable, *blood letting*, both general and topical, ought to be employed, and to a conſiderable extent; the bowels ought to be kept open by the uſe of laxatives; a watery ſolution of ſaccharum ſaturni ſhould be applied to the part affected, and a low diet, with a total abſtinence from exerciſe, ought to be enjoined: but if theſe means fail, or, as frequently happens, the practitioner has not been called in ſoon enough for their

proper application, and if inflammation have actually commenced, the fecond indication ought then to be attended to. For this purpofe, blood-letting, not from the feet according to the advice of old practitioners, but as near as poffible to the part affected, is to be performed by leeching, cupping, or fcarifying with a lancet or fcalpel.

When, inftead of this, general blood-letting is thought more advifable, it is commonly reckoned beft to open the external jugular vein, or the temporal artery; and the rule, with regard to the quantity to be evacuated, ought to be, to draw blood as long as the pulfe continues firm; fo that, in violent cafes, taking away from twenty to twenty-five ounces at once will be found to anfwer the purpofe better than to extract even a larger quantity, but at different intervals. A few hours afterwards, if the fymptoms continue violent, it may be proper to difcharge an additional quantity; but this muft depend upon the ftrength of the patient and the fulnefs of the pulfe.

Along with the liberal ufe of blood-letting, *brifk purgatives* fhould be given. The bowels fhould not merely be kept open; but in order to receive full advantage from the practice, a fmart purging fhould be kept up by repeated dofes of calomel, jalap, or fome other neutral falt. Where the patient cannot fwallow in fufficient quantity, ftimulating injections fhould be frequently exhibited.

A moift ftate of the fkin is ufeful in every cafe of inflammation, and ought therefore to be here particularly attended to. In general a mild perfpiration may be induced by applying warm fomentations to the feet and legs, and by laying the patient in blankets inftead of linen. But when thefe means are infufficient, diaphoretics or even fudorifics may be given.

When much pain or reftleffnefs takes place, opiates fhould be adminiftered freely, which are now found to be attended with real advantage.

With refpect to the *external treatment* of this diforder, attention fhould be paid to thofe means which may moft readily induce a free difcharge of purulent matter from the feat of the injury. With this view, if the original accident be attended with a wound or divifion of the integuments, as the lips of the fore are commonly obferved to be hard, painful, and dry, it fhould be covered with pledgets fpread with an emollient ointment, and warm emollient poultices laid over the whole; by which means, and efpecially by a frequent renewal of the poultices, a free difcharge of matter will commonly be induced, and the bad fymptoms will generally be much mitigated, or entirely removed.

In cafes unattended with a divifion of the integuments, as foon as it is fufpected that bad fymptoms may fupervene, the tumor fhould be divided down to the pericranium; and if that membrane be found feparated from the bone, it ought likewife to be divided; and by inducing a fuppuration in the way already mentioned, the inflammatory fymptoms will probably be removed. As matter formed here is commonly of an acrid nature, and therefore apt to affect the bone, and by communication of veffels the membranes under it, inftead of wafting time till fluctuation be diftinctly perceived, a free incifion fhould be made as foon as a tumor is obfervable. But this would be extremely improper in the treatment of tumors which immediately fucceed to external injuries; for it often happens that fuch tumors difappear fpontaneoufly, or by the ufe of aftringent applications. It is only when a tumor attended with pain appears at a diftant period upon the fpot where the injury was received, that it ought to be opened as foon as perceived.

The next part of the practice regards the remedies to be ufed when the diforder has either proceeded to fuppuration, or when, on a removal of a portion of the cranium, the dura mater is obferved to be floughy with a tendency to gangrene; and this includes the third and fourth indications of cure.

The fuppurative ftate of the difeafe is known by the inflammatory fymptoms, inftead of yielding to the remedies already advifed, increafing in violence; and being fucceeded by coma, dilatation of the pupils, a flow and full pulfe, involuntary difcharge of fæces and urine, palfy, and irregular convulfive motions, and efpecially when thefe fymptoms are fucceeded by fits of rigor and fhivering.

The exiftence of matter within the cranium being afcertained, as no other remedy can be depended upon for removing it, the operation of the trepan fhould be immediately employed, and as many perforations ought to be made as may be fufficient for evacuating the matter. But if, after the fkull is perforated, little or no matter appear between the bone and membranes; if the dura mater feem more tenfe than ufual; this membrane is likewife to be opened, fo as to give a free difcharge to any matter which may be between the brain and its membranes.

When it is perceived that the dura mater has already become floughy, with fome tendency to gangrene, the greateft danger is to be dreaded. If mortification has commenced, there will be much reafon to think that death will foon follow; but different inftances have occurred of floughs forming upon the dura mater, and of cures being made after thefe have feparated. All that can be attempted is to keep the fores clean, to give a free difcharge to the matter, to apply nothing but light eafy dreffings, and to give bark in as great quantities as the ftomach can bear. If there be ftill fome tendency to inflammation, the diet fhould be low and cooling, the patient fhould drink freely of whey or other diluent liquors, and the bowels fhould be kept moderately open: but if, on the contrary, the fyftem be low and the pulfe feeble, wine is the moft effectual cordial.

SECT. IV. *Of* FISSURES, *or fimple* FRACTURES *of the* SKULL.

THE term is here meant to imply a mere divifion of one or both the tables of the fkull, with or without a wound of the integuments, not attended with depreffion. Fractures of this kind are not dangerous as far as affects the fkull only, for it frequently happens that extenfive fiffures heal without producing bad fymptoms. But as they are frequently attended with effufions of blood or ferum upon the brain or its membranes, or as they may tend to excite inflammation in thefe, they require particular attention.

When effufions occur, fymptoms of compreffion immediately follow. The remedies beft fuited to this difeafe muft then be applied; and the trepan is alone to be depended upon. The fiffures fhould be traced through their whole extent, and a perforation made on the moft depending part of each of them. If this be unfuccefsful, the operation fhould be repeated along the courfe of the fiffures as long as fymptoms of a compreffed brain continue; and as the effufed matter will commonly be found contiguous to the fiffures, they ought to be included in each perforation.

If the fiffure be fo large as to produce an obvious feparation of the two fides of the bone, the nature of the cafe will be at once rendered evident; but where it is extremely fmall, there is difficulty in diftinguifhing it from the natural futures, or from futures furrounding fmall bones, which fometimes occur, and get the name of *offa triquetra*. But this may be known by the firmer adhefion which always exifts between the pericranium and futures; whereas this membrane is always fomewhat feparated from that part of the bone where a fiffure is formed. When the pericranium is feparated by the accident

for a confiderable way from the furface of the bone, various means have been contrived for difcovering the nature of the cafe; as pouring ink upon the part fufpected to be fractured, which in cafe of a fracture cannot be wiped entirely off; or making the patient hold a hair or piece of catgut between his teeth, while the other extremity of it is drawn tenfe, which, when ftruck, is faid to produce a difagreeable fenfation in the fractured part. But fuch tefts are little to be depended on; ink will penetrate the futures; and the others are ineffectual, unlefs the fracture be extenfive, and the pieces confiderably feparated from each other. The oozing of the blood from a fiffure is a better mark. The afcertaining of this point, however, appears not very material; for unlefs alarming fymptoms are prefent, although there fhould be a fiffure, no operation is neceffary; and if fuch fymptoms occur, the bone ought to be perforated whether there be a fiffure or not.

When a fiffure is not attended with fymptoms of a compreffed brain, the trepan ought not to be applied, efpecially as the operation itfelf tends in fome degree to increafe inflammation of the part. The fiffure fhould be treated merely as a caufe which may induce inflammation. The patient fhould be blooded according to his ftrength; the bowels fhould be kept lax, and the fore treated with mild, eafy dreffing; and violent exertion fhould be avoided as long as there is any danger of inflammation occurring.

CHAP. XIII. DISEASES of the EYES.

Sect. I. *Of* Wounds *of the* Eyelids *and* Eyeball.

In cafes of fuperficial *wounds of the eyelids*, it will be fufficient to bring the edges of the wounds together and retain them in their place by flips of adhefive plafter; but when a wound is deep, particularly when the tarfus is divided, it will be neceffary to employ either the interrupted or the twifted future, care being taken that the futures be not carried through the inner membrane of the eyelid, otherwife the eye would be irritated and inflamed. After fuch an operation, the motion of both eye-lids fhould be prevented as much as poffible, elfe no union of the divided parts can be obtained. After the futures are finifhed, the eye-lids fhould be clofed and covered with a pledget of emollient ointment, and over this fhould be laid a comprefs of foft lint, and one of a fimilar nature ought likewife to cover the found eye; then a napkin fhould be made to prefs equally on both eyes, and be properly fixed. Inflammation fhould be guarded againft, or, if already prefent, it muft be removed in the manner directed under the article *Ophthalmia* (fee Medicine). The futures may be removed in about three days from their introduction, when the parts will commonly be found reunited.

When a portion of the eye-lids is fo much deftroyed, or perhaps fo completely removed, as to prevent the remaining parts from being brought together, without obftructing the motion of the eye, the beft method will be to treat them with light eafy dreffings, trufting to nature for fupplying the deficiency.

If the *cornea* be wounded, it will commonly be attended with partial or total blindnefs. If any of the other parts of the ball be wounded, the danger will generally be in proportion to the extent of the wound. The principal attention ought to be directed to the prevention or removal of inflammation. When pain occurs, it ought to be removed by opiates; and with thefe a ftrict antiphlogiftic courfe is to be enjoined.

When the wound is large, and the humours completely evacuated, blindnefs, with finking of the eye-ball, will almoft always be the confequence; but in wounds of a fmall extent, by proper treatment, a cure may be made and the fight preferved.

Sect. II. *Of* Diseases *of the* Eyelids.

The eyelids are fubject to be infefted with *tumors* of different kinds, which frequently require the affiftance of furgery. The firft of thefe is the hordeolum or ftye, which frequently grows on the edge of the eyelid, and is attended with heat, ftiffnefs, and pain; and unlefs proper means be taken to prevent it, a fuppuration is frequently the confequence. It may be confidered as a common abfcefs feated in an obftructed febaceous duct or gland. It may generally be removed by difcutient applications. Should thefe prove ineffectual, it ought to be brought to fuppurate by a fmall emollient poultice, when it will commonly heal of itfelf; but if it do not, it may be opened with the point of a lancet, that the matter may be difcharged; and the part may be anointed afterwards with faturnine folution.

The eyelids are fubject to encyfted tumors, fteatoms, warts, &c. which are to be treated like the fame tumors when feated in other parts of the body; only in extirpating thefe tumors, fhould part of the eyelid be removed entirely, no dreffings can be applied, as, however mild they may be, they would irritate and inflame the ball of the eye. All that can be done therefore, in fuch cafes, is to lay the lips of the fore as nearly together as poffible, and frequently to remove any matter that may form on it.

The *eyelafhes* are fometimes fo much *inverted* as to rub upon the eye and create much pain and inflammation. Various caufes are affigned for this, fuch as the hairs themfelves taking a wrong direction; inverfion of the tarfus or cartilage of the eyelid; fome cicatrix formed upon the fkin of this part after wounds or abfceffes; tumors preffing the hairs in upon the eye; and, finally, a relaxation of the external integuments.

The treatment of this diforder muft depend much upon a knowledge of the caufe. When it is owing to a derangement of the cilia themfelves, if they have remained long in this ftate, it will be extremely difficult to make them recover their proper direction. They ought therefore to be pulled out by a pair of forceps, and the part wafhed with fome aftringent lotion; and if the new hairs appear to take a fimilar direction, which is very apt to happen, as foon as they are long enough they ought to be turned back upon the eyelid, and kept there for feveral days, or even weeks, by adhefive plafter. When the difeafe proceeds from a contraction of the orbicular mufcles, the contracted part may be cut from the inner furface of the eyelid; in which place a cut commonly foon heals. If the caufe proceed from a tumor or cicatrix, this muft be removed before a cure can be expected; or if it be owing to relaxation of the fkin, the parts ought to be bathed with fome ftrong aftringent. If this fail, the relaxed fkin fhould be removed, and the part healed by the firft intention. Sometimes the cilia of the upper eyelid are turned in on account of dropfical fwelling in that place. When this happens, the water is to be evacuated by a few punctures with a lancet; but when fuch means fail, and when the difeafe is quite local, if vifion be difturbed, a fufficient part of the fkin ought to be removed with a fcalpel, and a cure made by adhefive plafter or the twifted future.

When the *gaping eye* takes place to any great degree, it is attended not only with much deformity and uneafinefs, from a large portion of the lining of the eyelid being turned outwards, but likewife from too much of the eye being expofed. The diforder may arife from an enlargement of the eyeball, from dropfical fwelling, or from the cicatrix of an old wound or abfcefs: hence it is frequently produced by the fmall-pox,

burns, or ſcrophula; but more frequently by a laxity of the part in old age.

When the diſorder is induced by an enlargement of the ball of the eye, nothing but a removal of this ſwelling can be effectual. If from dropſical ſwelling, when this is connected with general anaſarca, the affection of the ſyſtem muſt firſt be cured; but if it appear to be local, nothing anſwers ſo well as punctures. When it ariſes from a cicatrix, the ſkin ſhould be divided, and the effects of inflammation guarded againſt. If it be owing to inflammation, the antiphlogiſtic courſe muſt be uſed; when it ariſes from old age, the eyes ought to be daily bathed with cold water, or ſome aſtringent and ſtimulant ſolution.

Concretion of the eyelids ſometimes ariſes from a high degree of ophthalmia; in which caſe the eyelids are not only connected by their edges to each other, but now and then grow to the ſurface of the eyeball. A coheſion is ſometimes obſerved alſo in children at birth. When the adheſion is ſlight, it may in general be removed by the end of a blunt probe; but when it is conſiderable, a cure can only be effected by a cautious diſſection. If the eyelids on one ſide be ſound, they will ſerve as a guide to direct the inciſion. The tarſi are carefully to be divided from each other; after which, if there be no other adheſions, the eyelids may be readily opened: but if they adhere to the eye, the operator is gently to pull and ſeparate the eyelids, while the patient is deſired to move the eye in the oppoſite direction. When this is effected, nothing is further neceſſary than to drop a little oil upon the eye, and cover the eyelids with ſoft lint ſpread with ſome cooling emollient ointment. The oil and ointment are frequently to be repeated, and every precaution taken to prevent inflammation and irritation.

Sect. III. *Of* Specks, Films, *or* Excrescences *on the* Eye.

Specks are ſometimes formed upon the white part of the eye, but more frequently upon the cornea. In the former caſe they are ſeldom attended with much inconvenience, but in the latter they are often the cauſe of partial or total blindneſs. They are almoſt univerſally the conſequence of inflammation, and ſeldom go much deeper than the tunica adnata. Two very different ſtates of the diſorder occur; the one from an effuſion immediately under the outer layer of the cornea, and in this caſe the cornea does not appear to be raiſed; the other takes place from one or more little ulcers, which breaking, leave as many opaque ſpots in the centre, which are more elevated than the reſt of the cornea: and the inconvenience attending either ſituation muſt always be in proportion to their extent and degree of opacity, or their vicinity to the pupil. When viſion is little affected by them, they need ſcarcely be conſidered as an object of ſurgery; but whenever viſion is materially impaired, remedies become neceſſary, and theſe ſhould be ſuch as are beſt ſuited for removing inflammation, promoting abſorption, and reſtoring tone to the veſſels. For the means adapted for removing inflammation, ſee Opthalmia under Medicine.

Veſſels running upon the ſurface of the eye into the ſpeck are to be divided, and the eye frequently bathed with ſome refrigerant collyrium. By theſe means the ſimpleſt kind of ſpecks, when recently formed, may generally be removed; but where they have been of long ſtanding, their removal is attended with great difficulty. Where the ſpeck is owing to an effuſion of fluids between the layers of the cornea, and where it is not attended with any prominence, local applications are of little advantage, as it is impoſſible to remove the effuſed matter without injuring the cornea; but conſiderable ſervice is derived from the uſe of ſuch remedies as are moſt effectual for promoting abſorption; and with this view a gentle, long-continued courſe of mercury, briſk purgatives occaſionally, and iſſues in the neck, are found to be the moſt effectual remedies.

In the management of ſpecks which are prominent upon the cornea, and where inflammation is removed and the opacity is conſiderable, if the cornea beneath be ſound, the removal of the diſeaſed part will leave it tranſparent and fit for viſion. The remedies proper for this purpoſe are eſcharotics or the knife. The former are applied in the form of a powder, an ointment, or a waſh; and theſe ought to be very finely prepared, otherwiſe they will be in danger of irritating and inflaming the eye; and they ought merely to be of ſuch ſtrength as the eye can eaſily bear.

The applications ſhould be long perſiſted in and frequently repeated; and to make them ſtill more uſeful, ſome of the powders or ointments may be applied evening and morning, and the ſolution two or three times through the courſe of the day. To the remedies already mentioned cauſtic is ſometimes preferred. With this the centre of the ſpeck is to be frequently touched, till the patient complain of conſiderable pain, when pure water is to be applied by a pencil, or by dipping the eye in water, with the eyelids open, till the pain occaſioned by the application of the cauſtic be removed. The eye is then to be covered with compreſſes moiſtened in ſome ſolution, and this frequently repeated. The cauſtic to be repeated every ſecond or third day, unleſs prevented by inflammation. When the ſurgeon chooſes to employ the knife, which frequently may be more effectual, the eye is to be fixed by a ſpeculum (Plate 24. fig. 19.), or levator (fig. 20.); the tumor is then to be cautiouſly ſeparated by means of a ſmall knife, and every attention paid to prevent inflammation. Theſe are the methods moſt likely to be of ſervice; and when properly managed, they will frequently remove ſpecks, which otherwiſe would entirely deprive the patient of the uſe of the eye; though it is to be regretted that caſes frequently occur which baffle art.

A membraneous excreſcence, called *pterygium*, is frequently found upon the white part of the eye, which often ſpreads over the cornea ſo as entirely to deſtroy viſion. It is ſometimes owing to external injuries; at other times it ariſes from a general diſeaſe of the ſyſtem, as lues venerea or ſcrophula; but inflammation is always the more immediate cauſe.

By a proper application of the remedies above mentioned affections of this kind may generally be prevented from becoming formidable; but when the reverſe takes place, and excreſcences begin to ſpread over the cornea, other means muſt be uſed. When the diſeaſed part is only ſlightly attached, it may be freely removed by a cut of the knife; but when this cannot be done without difficulty, it is better to deſtroy the veſſels by the extenſion of which this ſubſtance is chiefly formed. The manner of performing the operation in general is this: the patient being properly ſeated, the eyelids opened, and the eye ſecured, the operator, with a ſmall knife, makes a ſcarification through the whole thickneſs of the excreſcence, entirely round, and at a little diſtance from the circumference, by which the ſource of nouriſhment will be cut off; and, after the blooding is abated, one or two inciſions more may be made, in a ſimilar manner, within the former. Some practitioners raiſe the excreſcence with a needle and ligature before the inciſion is made; and in ſome caſes, this may be done with advantage, though not in others.

After the bleeding is over, the part is to be bathed two or three time a-day with a weak ſaturnine ſolution; and the

operation may be repeated occafionally till the excrefcence is removed. In this way the operation commonly proves effectual, but inftances fometimes occur where, inftead of being ufeful, it increafes the difeafe. Whenever this happens, a palliative courfe is the only thing to be tried; and although it will not remove the diforder, it may commonly prevent the excrefcence from acquiring any additional fize. With this intention it ought to be frequently bathed with the folution laft mentioned, and afterwards covered with a cooling ointment. When the diforder cannot even be palliated, when vifion is deftroyed, and particularly when the pain attending it is fevere, there is reafon to fufpect cancer. In this cafe the eye ought to be extirpated, otherwife deeper parts may fuffer, and the life of the patient be endangered. The method of performing this operation will be afterwards pointed out.

Sect. IV. *Of* Abscesses *in the* Globe *of the* Eye.

Though inflammation of the eye generally terminates by refolution, inftances fometimes occur in which an abfcefs enfues. This is owing either to improper treatment, or a bad habit of body which counteracts all remedies. The greateft danger attending thefe complaints is when they are fituated on the cornea, as the cicatrix left by them may deftroy vifion. When deep feated, a purulent matter is fometimes apt to be found in fome of the chambers of the eye, the ball becomes enlarged, the humours are difturbed, and neither the iris, pupil, nor lens, can be diftinguifhed. In fome rare cafes again, after thefe appearances have continued fome time, the cornea burfts, part or whole of the humours are evacuated, and the iris protrudes in a thickened diftended ftate. This has now the appearance of an excrefcence, which is called *ftaphyloma* from a kind of refemblance to a grape. But under this term fome authors include all collections like thofe above defcribed. In moft inftances the cornea protrudes, but in others the tunica fclerotica or opaque part is affected with partial fwellings or protrufions.

While the difeafe is forming, befides the lofs of fight, the patient commonly feels great diftrefs in the eye and head, accompanied by fymptoms of fever. When no other diftrefs is experienced than the lofs of fight, the fwelling is but fmall, and contains chiefly a watery fluid. In the treatment, as vifion is feldom preferved, the principal thing is to abate the pain, and remove deformity. There is another kind of abfcefs in the eye, termed *hypopyon*, where the matter is lodged in the fubftance of the coats. It is fometimes produced by external injuries, but more frequently from puftules of fmallpox. If this termination cannot be prevented by the remedies mentioned in the article Medicine, the matter muft be evacuated by an incifion into the eye, not regarding the humours, as vifion previous to this time is entirely deftroyed. The proper part is the cornea or the moft prominent part of the tumor.

A variety of this diforder fometimes, though rarely, happens, where the humours are abforbed; but ftill the fame external appearances are obferved. In this cafe the tumor is formed by a thickening of the coats, efpecially the iris. The only means of relief is extirpation of the prominent part by the ufe of the knife. After the contents of the eye have been difcharged, the parts are to be covered with a comprefs moiftened with a faturnine folution, and the antiphlogiftic courfe followed, till a cure is perfected, or at leaft inflammation removed. If the ulcers difcharge a thin acrid matter, they may be wafhed two or three times a-day with a folution of corrofive fublimate, or of white vitriol, &c. Fungous excrefcences, fometimes confidered as a cancer of the eye, are apt to form in both thefe difeafes after the matter is evacuated; but they may be prevented from increafing to a confiderable fize by burnt alum finely powdered, or by touching them occafionally with lunar cauftic.

Ulcers on the eye may arife from the fame caufes which produce ulcers on other parts of the body, as wounds, burns, &c; or they may arife from a general affection of the conftitution, as lues or fcrophula; but they are more immediately produced by inflammation. In the treatment therefore of fuch difeafes, blood-letting, bliftering, laxative and cooling applications, as already defcribed in the cafe of ophthalmia, are to be employed. When the inflammatory ftate is removed, their management muft be almoft the fame with that for fimilar affections in other parts of the body. When the diforder arifes from an affection of the fyftem, the primary difeafe muft be attended to before a cure can be performed. With refpect to the fores themfelves, if acrid matter be difcharged, we muft have recourfe to detergent ointments and wafhes before a citratrix can be formed. When thefe have not the defired effect, and when the fore becomes foft and higher than the reft of the eye, aftringent applications are moft efficicaous. If excrefcences be prefent, thefe are to be removed by efcharotics, or by the knife. In fome rare inftances excrefcences of a fungous nature are found to be connected with the interior parts of the eye, and become fo prominent as even to reft upon the cheek. When fuch occur, nothing but the removal of the eye itfelf can effect a cure.

Sect. V. *Of* Dropsical Swellings *of the* Eye.

The eye is fometimes enlarged by an *accumulation of the aqueous humour*. The fymptoms are, a fenfe of fullnefs in the eyeball; by degrees the motions of the eyelids become impeded; vifion gradually becomes more and more imperfect, till at laft the patient can only diftinguifh light from darknefs. As the difeafe increafes, the ball of the eye becomes greatly enlarged, and at this time the cornea begins to protrude; when, if a puncture be not made, the eye burfts and empties itfelf. This difeafe is apt to be confounded with ftaphyloma. But in the dropfical fwelling the patient is always fenfible to the effects of light, and the pupil is obferved to contract, which does not happen in ftaphyloma. In the early ftages of this difeafe vifion may be preferved by puncturing the under edge of the cornea, and allowing the aqueous humour to pafs out by the anterior chamber; or by puncturing the tunica fclerotica a little behind the iris, by which the fluid will pafs out by the pofterior chamber. The puncture may be made either with a lancet, pointed knife, or with a very fmall flat trocar. The eye ought afterwards to be dreffed with a comprefs made moift with a faturnine folution, guarding againft exceffive inflammation. When the ufe of the eye is fomewhat recovered, tone may be reftored to the parts, and a return of the difeafe as much as poffible prevented, by frequently bathing the eye in aftringent lotions; but where the cornea is deftroyed, the fight cannot be reftored: we can then only diminifh the fize of the eye, and render it fomewhat more comfortable to the patient.

Blood may be *effufed* into the chambers of the eye from various caufes, as in putrid difeafes, or in confequence of inflammation, but moft frequently from a rupture of the bloodveffels induced by external injury. In whatever way it gets into the eye it mixes with the aqueous humour, and renders it opaque. It is fometimes taken up by the abforb-

ents; when it is otherwife, it ought to be difcharged by a puncture.

A few inftances have occurred where the blood has fallen to the under fide of the eye, and remained there without mixing with the aqueous humour. In fuch a fituation it ought to be allowed to remain.

When a puncture is neceffary, it is to be made in the fame manner as in cafes of dropfy of the eye; only the opening may require to be fomewhat larger, otherwife the blood may not pafs readily out. After the operation, nothing is neceffary but to apply a compreſs of foft lint, moiftened with a weak faturnine folution.

Sect. VI. *Of the* Protrusion *of the* Eyeball *beyond its Socket.*

The eye may *protrude* in confequence of external violence, or from tumors forming behind it, or on account of fome of the ulcers, excrefcences, or dropfical fwellings, already mentioned. When the eye is forced out of its focket by external violence, if the eyeball be not entirely feparated from the neighbouring parts, it ought to be freed from any extraneous matter which may adhere to it, and immediately replaced; and if the optic nerve be not quite divided, the ufe of the eye may be recovered. With a view to prevent or moderate inflammation, every part of the antiphlogiftic regimen ought to be ftrictly adhered to. If the protrufion is occafioned by a tumor, the cure muft depend upon the removal of this; and if the difeafe has advanced fo far that the bones are become carious, they muft likewife be feparated. But more frequently, inftead of the bones becoming carious, they affume a gelatinous or rather cartilaginous nature. In fuch a fituation an operation could be of little advantage. The beft method to prevent the bones from being fo affected is an early performance of the operation.

A few inftances have happened of the eye being pufhed from its focket by an *enlargement of the lachrymal gland.* When this occurs, if the enlargement be confiderable, the ftructure of the eye will moft probably be fo much injured, that vifion will be deftroyed; but inftances have occurred of this gland, in the enlarged ftate, having been removed without any injury being done to the eye.

Sect. VII. *Of* Cancer *of the* Eye, *and* Extirpation *of the* Eyeball.

Scirrhus and cancer may arife from repeated inflammations of the eye, or from ftaphyloma, or fome of the other difeafes which frequently attack this organ. The fymptoms are, an enlargement, hardnefs, and protrufion of the ball, with a red, fungous appearance, fometimes difcharging thick, yellow matter, but more frequently a thin acrid ichor. At firft there is only a fenfation of heat in the tumor; but this gradually increafing, changes at laft into darting pains, which likewife fhoot through to the oppofite fide of the head. In this fituation, blood-letting, opiates, and emollient applications, may alleviate the pain. A hemlock poultice applied to the eye, and a wafh of lime-water, with a little opium diffolved in it, and applied every time the poultice is renewed, gives fome relief; but although the pain be moderated by thefe means, it does not prevent the difeafe from fpreading, nor can any thing elfe but extirpation produce a radical cure.

After the difeafe is difcovered to be cancerous, the operation fhould be performed without delay, to prevent the parts in the neighbourhood, as well as the conftitution at large, from fuffering. In performing the operation the patient fhould be placed in a proper light, and the head fupported by an affiftant. If the eyelids are difeafed, they muft be feparated along with the tumor; but where they are found, they ought to be carefully preferved; and for this purpofe they may be kept out of the way by two levators held by affiftants. When the eyeball protrudes confiderably, the operator may lay hold of it with his fingers; but if this be impracticable, a broad ligature fhould be introduced through the centre of it, that it may be the more readily removed from the orbit. Sometimes it will be neceffary to enlarge the opening of the eyelids, by cutting the external angle to allow the eyeball to be more readily removed. The whole of the difeafed parts are now to be feparated by a knife bent fo as to correfpond with the fides of the orbit, guarding at the fame time againft wounding the periofteum or the bones of the orbit, which are commonly extremely thin. The eye being in this manner extirpated, the hemorrhagy from the ocular arteries is to be fuppreffed by means of agaric, or by a bit of fponge; then over this is to be laid foft lint, with a napkin to cover the whole. After fuppuration takes place, the dreffings are to be removed, when a little lint, applied with an emollient pledget over it, will be fufficient as long as any matter is difcharged. After the wound is healed, the deformity may be in fome meafure obviated by wearing an artificial eye; though it is chiefly in cafes where part of the humours of the eye have been evacuated that this can be ufed with much propriety; for when the orbit is empty the artificial eye finks too far into it.

Sect. VIII. *Of the* Cataract.

The ancients, and fome of the modern writers, had a confufed idea of the *feat of the cataract;* different authors placing it in different parts of the eye. It confifts of an affection of the cryftalline lens or of its capfule, by which the rays of light are prevented from falling upon the retina; and is therefore the fame difeafe with the glaucoma of the ancients. It commonly begins with a dimnefs of fight; and this generally continues a confiderable time before any opacity can be obferved in the lens. As the difeafe advances the opacity becomes fenfible, and the patient imagines there are particles of duft or motes upon the eye, or in the air. This opacity gradually increafes till the perfon either becomes entirely blind, or can merely diftinguifh light from darknefs. The difeafe commonly comes on rapidly, though fometimes its progrefs is flow and gradual. The opacity of the lens is found to be nearly in proportion to the degree of blindnefs the patient is affected with; it gradually changes from a ftate of tranfparency to a perfectly white, or light grey colour. In fome very rare inftances a black cataract is found. Sometimes the difeafe is confined to a particular fpot of the lens, but generally the whole is affected. The confiftence alfo varies, being at one time hard, at another entirely diffolved. When the eye is otherwife found, the pupil moves according to the degree of light in which it is placed. This difeafe is feldom attended with pain; fometimes, however, every expofure to light creates uneafinefs, owing probably to inflammation in the bottom of the eye. The real caufe of cataract is not yet well underftood. Numbers of authors confider it as proceeding from a preternatural contraction of the veffels of the lens, arifing fometimes from external violence, though more commonly from fome internal and occult caufe. The difeafe is diftinguifhed from the gutta ferena, by the pupils in the latter being never affected with light, and from no opacity being obferved in the lens. It is diftinguifhed from hypopyon, ftaphyloma, or any other difeafe in the fore part of the eye, by the evident marks which thefe affections produce, as well

as by the pain attending their beginning. But it is difficult to determine when the opacity is in the lens or in its capſule. The lens is generally affected; when the capſule is the ſeat of the diſeaſe, it is termed the membranous cataract.

With reſpect to the *treatment:* if the diſeaſe be in the incipient ſtate, mercury, particularly calomel in ſmall doſes, has been attended with ſome advantage. When any degree of inflammation is preſent, blood-letting and cooling regimen will ſometimes be neceſſary. Electricity, extract. hyoſeyami, flammula Jovis, &c. have likewiſe been extolled; but after theſe or other remedies have failed, the cure muſt depend upon a chirurgical operation. For this purpoſe two methods are in general uſe. The firſt of theſe, and which was practiſed for a long time before the other, is called *couching*. It is done with a view to allow the rays of light to fall upon the retina; and it conſiſts in removing the lens from its capſule, and lodging it in ſome part of the vitreous humour, where it may be entirely off the axis of the eye, and where it is ſuppoſed, in courſe of time, to diſſolve.

The other method is termed *extraction*, where, after an inciſion has been made in the cornea, the lens is puſhed through the pupil, and then entirely removed from the eye. Each of theſe methods has been much practiſed, and it is ſtill a matter of doubt to which we ought to give the preference. The next circumſtance deſerving attention is the time at which the operation for couching or extracting can with moſt propriety be performed. Formerly it was thought neceſſary to wait till the lens had a certain degree of conſiſtence, or was become ripe; but no certain marks of fluidity or firmneſs have been yet diſcovered; neither indeed is there any neceſſity for attending particularly to it, as the operation may be practiſed in every period of the diſeaſe, providing the retina be ſound, the iris have the power of contracting, and the cornea be tranſparent. The proper time for the operation is when the opacity of the lens is ſo conſiderable as to prevent the patient from following his ordinary occupation. When this is not the caſe, or when the patient has the uſe of one eye, it ought not to be performed, as it is always attended with ſome degree of danger.

When the operation is to be performed, the following is the method of doing it: and firſt, *of couching the cataract.* To guard as much as poſſible againſt the effects of inflammation, the patient ſhould be confined, for ſeveral days previous to the operation, to a low regimen; and two or three doſes of ſome cooling laxative ſhould be given at proper intervals. After this he is to be ſeated with his face towards the light; but ſunſhine ought to be avoided. Some, however, prefer a ſide-light both on account of the operator and patient. One aſſiſtant is to ſupport the head, while others ſecure the arms. The operator is either to be ſeated with his elbow reſting upon a table; or, which is preferred by ſome, he ought to ſtand, reſting his arm upon the ſide of the patient. The eye being fixed by the ſpeculum (Pl 24. fig. 19.) or in ſuch a manner as to allow the whole of the cornea and a ſmall portion of the ſclerotic coat to protrude, a couching needle (fig. 21.) is to be held in the right hand, in the manner of a writing pen, if the left eye be the ſubject of operation; the ring and little fingers are to be ſupported upon the cheek or temple of the patient: the needle is to be entered in an horizontal direction through the ſclerotic coat, a little below the axis of the eye, and about one-fourth of a line behind the edge of the cornea, ſo as to get entirely behind the iris. If the needle be of the flat form, the flat ſide ought to be oppoſed to the iris, to prevent that ſubſtance from being wounded. The point of the needle is to be carried forwards till it be diſcovered behind the pupil. The operator is now commonly directed to puſh the point into the lens, and depreſs it at once to the bottom of the eye; but in this way the lens either burſts through the capſule at an improper place, or it carries the capſule with it, tearing it from the parts to which it is connected. Inſtead of this, the needle ought firſt to be puſhed into the lens near its under edge, as Dr. Taylor adviſes, and then carried ſome way down into the vitreous humour, ſo as to clear the way for the lens. It is then to be drawn a little back, and carried to the upper part of the capſule, when, by preſſing upon it, the lens, if ſolid, is to be puſhed down by one, or, if fluid, by ſeveral movements, to the bottom of the vitreous humour. It ſhould then be puſhed downwards and outwards, as Mr. Bell directs, ſo as to leave it in the under and outer ſide of the eye; where, in caſe it ſhould riſe, the paſſage of the light would be little obſtructed. The needle is then to be withdrawn, the ſpeculum removed, and the eyelids cloſed; and a compreſs ſoaked in a ſaturnine ſolution is to be applied over them. Mr. Pellier's method is to cover each eye with a linen bag half filled with fine wool, applied dry and fixed to a circular bandage of linen paſſed round the forehead: the whole is retained by a triangular napkin. The patient is then to be laid in bed, upon his back, with his head very little raiſed; and to be kept in this ſituation for about a week in a dark room. Unleſs he be of a weakly habit, he ought to be bled at the neck, or leeched at the temple, a few hours after the operation. He ſhould be kept upon low diet, and get ſmall doſes of opiates frequently repeated. His belly ſhould be kept moderately open by gentle purgatives. The dreſſings ſhould not be removed till inflammation is at leaſt ſo far gone that no danger will ariſe from uncovering the eye, which may generally be about the eighth or tenth day. Sometimes the patient perceives light immediately on the dreſſings being removed, but more frequently not till ſome time after.

Upon removing the dreſſings, if the cataract has again got back to the axis of the eye, a repetition of the operation may become neceſſary. Some time, however, after the inflammatory ſymptoms are gone, ſhould be allowed to elapſe before any other operation is again attempted; for the cataract frequently diſſolves, providing the aqueous humour gets free acceſs to it. Mr. Pott ſometimes, when he found the cataract to be of the mixed kind, did not attempt depreſſion, but contented himſelf with a free laceration of the capſule; in which caſes the lens hardly ever failed of diſſolving ſo entirely as not to leave the ſmalleſt veſtige of a cataract. When the operation is to be performed upon the right eye, the ſtraight needle muſt either be uſed by the left hand, or the operator muſt place himſelf behind the patient. A needle (fig. 22.) has been contrived, however, with a large curve, by which the operation may be readily performed with the right hand, while the ſurgeon is placed before the patient; only the needle is entered towards the inner, inſtead of the outer, angle of the eye.

The firſt hint of extracting the lens ſeems to have been ſuggeſted by Mr. Petit, who propoſed to open the cornea and extract the lens when it was forced into the anterior chamber of the eye either by external violence or accidentally in couching. At firſt it was conſidered as a dangerous operation, and was ſeldom practiſed till about the year 1737, when Mr. Daviel propoſed and practiſed extraction in preference to couching. The operation is now performed in the following manner: the patient and operator being placed, and the eye fixed in the ſame manner as for couching, the ſpeculum, when the operation is to be done upon the left eye, is to be held in the left hand of the operator. It is neceſſary to make as much preſſure as will ſecure without hurting the eye. Neither ought the cornea to be preſſed too near the iris, leſt the latter be wounded. The operator now takes the knife (fig 23.), and holds it in the ſame way as he does the needle for couching;

he then enters the point of it with the edge undermoſt into the cornea about the diſtance of half a line from its connection with the ſclerotic coat, and as high as the centre of the pupil; he is then to paſs it acroſs the pupil to the inner angle in an horizontal direction, keeping the edge a little outwards to prevent the iris from being cut; the point is then to be puſhed through oppoſite to where it entered; the under half of the cornea is next to be cut, and at the ſame diſtance from the ſclerotics with the parts at which the point of the knife went into and came out from the eye.

In cutting the under half of the cornea, the preſſure of the ſpeculum upon the eye ſhould be gradually leſſened; for if the eye be too much compreſſed, the aqueous humour, with the cataract and part of the vitreous humour, are apt to be forced ſuddenly out immediately after the inciſion is made. The operator then takes a flat probe, and raiſes the flap made in the cornea, while he paſſes the ſame inſtrument or another probe (fig. 24.), rough at the extremity, cautiouſly through the pupil, to ſcratch an opening in the capſule of the lens. This being done, the eye ſhould be ſhaded till the lens be extracted, or the eye-lids are to be ſhut to allow the pupil to be dilated as much as poſſible; and while in this ſituation, if a gentle preſſure be made upon the eye-ball at either the upper or under edge of the orbit, the cataract will paſs through the pupil more readily than it would do when the eye-lids are open.

If the lens cannot be eaſily puſhed through the opening of the cornea, no violent force ſhould be uſed, for this would tend much to increaſe the inflammation. The opening ſhould be enlarged, ſo as to allow the lens to paſs out more freely. When the cataract does not come out entire, or when it is found to adhere to the contiguous parts, the end of a ſmall flat probe, or a ſcoop (fig. 25.), is to be introduced, to remove any detached pieces or adheſions that may be preſent. The iris ſometimes either projects too much into the anterior chamber, or is puſhed out through the opening of the cornea. When this happens, it is to be returned to its natural ſituation by means of the probe already mentioned. Sometimes the opacity is not in the body of the lens, but entirely in the capſule which contains it. The extraction of the lens alone would here anſwer no uſeful purpoſe. Some practitioners attempt to extract, firſt the lens, and then the capſule, by forceps; others, the lens and capſule entire. Thoſe who have had much practice in this branch of ſurgery, as Pellier, ſay they find ſuch a method practicable; but others think it better to truſt entirely to time and a cooling regimen for the cure, which, in ſome inſtances, has taken place. When the operation is to be performed on the right eye, the operator is either to uſe the left hand, to take his ſtation behind the patient, or to employ a crooked knife (fig. 26.).

After the operation is finiſhed, the eye-lids are to be ſhut, and the ſame treatment obſerved as in couching. When the operation ſucceeds, the wound in the cornea is generally healed in little more than eight or ten days; but previous to this time, the eye ought not to be examined; and even then it ſhou'd only be done in a dull light, otherwiſe it may ſuffer conſiderably from the irritation which a ſtrong light might occaſion. When the eye is to be examined, if the eye-lids be found adhering together, they ought to be waſhed with ſome gentle aſtringent. With this the eye ought alſo to be frequently waſhed afterwards, by which it will gradually recover ſtrength and ſight. About the end of the third week the dreſſing may be entirely removed, and a piece of green ſilk put over the eyes as a ſhade; and if every thing has ſucceeded, the patient may generally go out after a month from the time at which the operation was performed.

It ſometimes happens, that in extracting the lens a portion of the vitreous humour is evacuated. This does not in general prevent the ſucceſs of the operation. The eye ſoon begins to fill again, and in the courſe of two or three weeks it is for the moſt part as large as it was previous to the operation. Whether this be owing to a renewal of the vitreous humour, or merely an aqueous ſecretion, is not yet determined; though the latter circumſtance is generally ſuppoſed.

CHAP. XIV. Of the FISTULA LACHRYMALIS.

By this diſeaſe is properly underſtood a ſinuous ulcer of the lachrymal ſac or duct with callous edges, though every obſtruction of this paſſage is commonly called *fiſtula lachrymalis*.

The firſt and moſt ſimple ſtate of the diſeaſe is that termed a *dropſy of the lachrymal ſac*. The ſymptoms are, a tumor between the inner cornea of the eye and ſide of the noſe. This diſappears by preſſure, the tears mixed with mucus paſſing partly into the noſe, but chiefly back upon the eye and over the cheek.

This ſtate of the diſeaſe is what the French have called the *hernia*, or *hydrops ſacculi lachrymalis*. It is frequently met with in children who have been rickety, or are ſubject to glandular obſtructions: and in this ſtate it ſometimes remains for ſeveral years, ſubject to little alterations, as the health or habit ſhall happen to vary, the ſacculus being ſometimes more, ſometimes leſs full and troubleſome; the contents which are preſſed out are ſometimes more, ſometimes leſs cloudy; and now and then the diſeaſe is attended with a ſlight ophthalmy, or an inflammation of the eye-lids, but which, by common care, is eaſily removed. If the ſacculus be not much dilated, the diſcharge ſmall, and produced only by preſſure, the chief inconveniences are the weeping eye, and the gumming together of the lids after ſleeping: but theſe, by being attended to, may be kept from being very troubleſome; and if the diſeaſe makes no further progreſs, may be ſo regulated as to render any more painful proceſs totally unneceſſary. If the dilatation be conſiderable, the ſwelling is more viſible, and the quantity of fluid is larger; it is alſo in this ſtate more frequently mixed, and cloudy, and more troubleſome, from the more frequent neceſſity of emptying the bag; but if the patient be an adult, it may, even in this more dilated ſtate of it, be kept from being very inconvenient.

If an inflammation comes on, the tumor is thereby conſiderably increaſed, the diſcharge is larger, as well during ſleep as upon preſſure; the ſkin covering it loſes its natural whiteneſs and ſoftneſs, becomes hard, and acquires an inflamed redneſs; and with the tears a mixture of ſomething, which in colour reſembles matter, is diſcharged, eſpecially if the preſſure be made with any force, or continued for any time.

When the parts are in this ſtate, the contents of the bag have ſo much the appearance of purulent matter, that they are now generally conſidered as ſuch, though Mr. Pott and ſeveral others have been of a different opinion, conſidering the fluid as merely mucus under a different form; allowing, however, that pus is ſometimes diſcharged. If the puncta lachrymalia be naturally large and open, and the inflammation confined to the ſurface of the ſac, its contents will paſs off pretty freely, and the ſkin will remain entire.

But when the ſkin covering the lachrymal bag has been for ſome time inflamed, or ſubject to frequently returning inflammations, it moſt commonly happens that the puncta lachrymalia are affected by it, and the fluid, not having an opportunity of paſſing off through them, diſtends the inflamed

ſkin; ſo that at laſt it becomes ſloughy, burſts externally, and forms an opening in the moſt prominent part of the tumor, at which the tears and matter contained in it are diſcharged. When the opening thus formed is ſmall, it commonly heals again in a few days, but it burſts as ſoon as a conſiderable quantity of this fluid is collected; and it continues thus to collect and burſt alternately, till the opening becomes ſufficiently large to prevent any further collection. This ſtate of the diſorder exhibits exactly the appearances of a ſinuous ulcer, with callous, and ſometimes with retorted, edges; and this ſtage forms properly the real fiſtula lachrymalis. Tears, mucus, and purulent matter, are now abundantly diſcharged from the ſore. When the bone beneath is ſound, this diſcharge is ſeldom either acrid or offenſive to the ſmell, for the opening being in general in the under part of the tumor, the matter is readily evacuated; but when any of the contiguous bones are carious, they are not only found to be ſo by the introduction of a probe, but by the appearance, ſmell, and effects of the matter upon the neighbouring parts. In this caſe it is thin, fetid, and commonly ſo acrid as to fret and corrode the integuments moſt contiguous to the ulcer; and when the diſorder is connected with ſcrophula or with lues venerea, which is by no means an unfrequent occurrence, the diſcharge and appearance of the ſore will vary according as it happens to be combined with one or other of theſe diſeaſes.

From what has been ſaid, we may divide this diſeaſe into four general heads or ſtates, under which all its more minute diſtinctions may be comprehended. The *firſt* conſiſts in a ſimple dilatation of the ſacculus and obſtruction of the naſal duct, diſcharging, upon preſſure, a fluid either quite clear or a little cloudy; the ſkin covering the bag being entire, and perfectly free from inflammation. In the *ſecond*, the tumor is ſomewhat larger; the ſkin which covers it is in an inflamed ſtate, but entire; and the diſcharge made through the puncta lachrymalia is of a pale yellow or purulent colour. In the *third*, the ſkin covering the ſacculus is become ſloughy, and burſts; by which means the ſwelling is in ſome meaſure leſſened: but the matter which, while the ſkin was entire, uſed to be preſſed out through the puncta lachrymalia, now diſcharges itſelf through the new aperture. The ductus ad nares, both in this and the preceding ſtate, are not otherwiſe diſeaſed than by the thickening of its lining. In the *fourth*, the paſſage from the ſacculus lachrymalis into the noſe is totally obliterated, the inſide of the former being either ulcerated or filled up with a fungus, and attended ſometimes with a caries of the bone underneath.

In the firſt and moſt ſimple ſtate of the diſeaſe, viz. that of mere obſtruction without inflammation, much pains have been taken to reſtore the parts to their natural ſtate and uſe, without making any wound or diviſion at all. The introduction of a probe, the injection of aſtringent fluids, and a conſtant compreſſion made on the outſide of the ſacculus in the corner of the eye, are the principal means by which this has been attempted.

Several years ago, M. Anel made a probe (Pl. 24. fig. 27.) of ſo ſmall a ſize as to be capable of paſſing from the eye-lid into the noſe, being introduced at one of the puncta lachrymalia, and paſſing through the ſacculus and duct; with which probe he propoſed to break through any ſmall obſtruction which might be found in its paſſage. He alſo invented a ſyringe (fig. 28), the pipe of which is ſmall enough to enter one of the puncta, and thus furniſhes an opportunity of injecting a liquor into the ſacculus and duct; and with theſe two inſtruments he pretended to be able to cure the diſeaſe whenever it conſiſted in obſtruction merely, and the diſcharge was not much diſcoloured. The firſt of theſe, viz. the paſſage of a ſmall probe through the puncta, has a plauſible appearance; but will, upon trial, be found very unequal to the taſk aſſigned: the very ſmall ſize of it, its neceſſary flexibility, and the very little reſiſtance it is capable of making, are maniſeſt deficiencies in the inſtrument; the quick ſenſation in the lining of the ſac and duct, and its diſeaſed ſtate, are great objections on the ſide of the parts, ſuppoſing it were capable of anſwering any valuable end, which it moſt certainly is not.

That the paſſing a fine probe from one of the puncta lachrymalia into the noſe is very practicable, is known from experience; but the pain it gives, and the inflammation it often excites, are much greater than any benefit which does or can ariſe from it. It is ſaid that the principal uſe of this probe is to clear the little ducts leading from the puncta into the ſacculus, and the obſtruction of thoſe ducts is often mentioned as a part of this diſeaſe. Hence one would be led to ſuppoſe that it was a circumſtance which frequently occurred; whereas it is ſeldom, if ever, met with. Nor, even if it did happen, could it ever produce the diſeaſe in queſtion; the principal characteriſtic of which is a diſcharge into the inner corner of the eye upon preſſure made in the angle.

The ſyringe, if uſed judiciouſly while the diſeaſe is recent, the ſac very little dilated, and the mucus perfectly clear, will ſometimes be found ſerviceable; it gives no pain; and a few trials render the uſe of it by no means troubleſome. There is very little occaſion, however, to take much trouble, or to put the patient to ſo much uneaſineſs; for if the ſac be emptied by compreſſion, if the liquor which was to have been injected be applied to the puncta, they will abſorb it as readily as the fluid which naturally paſſes through them.

Fabricius ad Aquapendente invented an inſtrument, which was ſo contrived as by means of a ſcrew to make a preſſure externally on the lachrymal bag; from the uſe of which, he ſays, his patients received much benefit. This inſtrument has been conſiderably improved by late practitioners, and is ſtill recommended as very uſeful. See Pl. 2. fig. 30.

All the good that can be obtained by compreſs and bandage, this ſcrew is capable of procuring; but it is alſo ſubject to all the ſame inconveniences, ariſing from the impoſſibility of determining exactly the due degree of preſſure: for if it be ſo great as to bring the ſides of the upper part of the ſac into contact, all communication between it and the puncta will be thereby ſtopped; if it be but ſlight, the accumulation will not be prevented; nor does it in either caſe contribute to the removal of the obſtruction in the naſal duct, the primary and original cauſe of the diſeaſe. If the curative intention was to procure an union of the ſides of the ſacculus, as in the caſe of parts ſeparated from each other by the formation of matter or ſloughs, and the preſſure could be made uniformly and conſtantly, poſſibly it might be ſo managed as to anſwer a valuable purpoſe; but as that is not the intention, the preſſure, whether made by an inſtrument or by a common roller and compreſs, contributes little or nothing toward a cure.

When the diſeaſe is only *beginning to form*, if the lachrymal ſac be frequently preſſed with the finger, the contents of it will be diſcharged before they become acrid, and the complaint, though ſeldom to be cured in this manner, may be ſometimes endured without any other aſſiſtance. But when the diſeaſe has advanced ſo far as to be in a *ſtate of inflammation*, conſiderable relief may be obtained from ſuch remedies as are found to be uſeful in inflammatory affections of other parts of the body, as blood-letting, laxatives, and low diet, together with ſaturnine applications to the parts affected. But when theſe fail, and it is found that the paſſage of the tears to the noſe is completely obſtructed, as the matter, if it does not burſt out-

wardly, may be in danger of corroding the bone underneath, a different practice is to be followed.

In this ſtate an *opening* in the upper part of the ſacculus lachrymalis becomes in general abſolutely neceſſary; and as a wound made by a knife leaves a much leſs diſagreeable ſcar than that which neceſſarily follows the burſting of the ſkin, one being a mere ſimple diviſion, the other a loſs of ſubſtance; it will always be found beſt to anticipate the accident of burſting, by making the opening as ſoon as the integuments are in ſuch a ſtate as to threaten it.

For *making this inciſion*, authors have been very particular in their directions with regard to its place, manner, and form. But all that the ſurgeon need obſerve is, to take care to keep the knife at a proper diſtance from the juncture of the palpebræ, to begin the inciſion a very little above a line drawn from that juncture toward the noſe, and to continue it downward ſo as to lay the ſac completely open; and the beſt-inſtrument to make it with is a ſcalpel of the common form, but of a ſmall ſize. If the ſacculus be already burſt, the place of opening is determined; and the orifice may be enlarged with a knife, or dilated.

The inciſion being made, the contents of the tumor ſhould be moderately preſſed out; after which ſome practitioners adviſe that the naſal duct ſhould be ſearched for by means of a probe; and if found, that a piece of catgut, bougie, or lead, ſhould be introduced, and kept there, its edge being bent a little downwards till the ſides of the duct are ſkinned over and healed. In the mean time, the ſore is to be dreſſed with ſimple pledgets of wax and oil, which are to be retained by means of adheſive plaſter. As ſoon as the paſſage of the tears into the noſe is ſufficiently ſecured, the ſubſtance which has been left in it is to be withdrawn, and the wound healed.

The *laſt ſtate* of this diſorder is that in which the natural paſſage from the ſacculus to the noſe is ſo diſeaſed as to be quite obliterated, or in which the bones are ſometimes found to be carious. The methods hitherto deſcribed have all been calculated to preſerve the natural paſſage, and to drive the lachrymal fluid again through it. In this attempt they are ſometimes ſucceſsful; but when every trial for diſcovering the naſal duct has been unſucceſsful, recourſe muſt be had to an artificial opening for the tears. In performing this part of the operation, the patient ſhould be ſeated oppoſite to a window, with his head ſupported by an aſſiſtant. The ſurgeon is to place himſelf immediately before him, either in a ſitting or ſtanding poſture. The canula of the trocar (Pl. 24. fig. 31.) is now to be introduced to the under and back part of the lachrymal ſac, and held with one hand, while the ſtilette is to be paſſed into it by the other, in a direction obliquely downwards and inwards, between the two ſpongy bones, till it reach the cavity of the noſe, which will be known by ſome bloody mucus paſſing out at the noſtril. As ſoon as the inſtrument has penetrated the noſe, the opening ſhould be made ſufficiently large; then the ſtillette ſhould be withdrawn, and a bit of catgut or bougie, or what is more cleanly and convenient, a leaden probe, is to be introduced, and the canula removed. One end of the probe ought to remain in the noſe, and the other bent in ſuch a way as to hang over the edge of the wound, and at the ſame time be in no danger of coming out. The ſore is now to be covered with a pledget of lint ſpread with emollient ointment, and the whole retained with adheſive plaſter. The probe muſt be removed every day or two, ſo as to allow it and the paſſage to be cleaned: and at each dreſſing ſome aſtringent injection ſhould be thrown in, when the parts are to be dreſſed as at firſt. Several weeks will commonly be neceſſary for rendering the paſſage perfectly callous; but this muſt depend much upon the ſtate of the parts, as well as the conſtitution of the patient

After the paſſage has become ſufficiently *callous*, the dreſſings and probe are to be withdrawn, and the parts cleared from any mucus with which they may be ſtuffed. The ſides of the wound, now already ſufficiently contracted, are to be laid together, and covered with ſome adheſive plaſter. If this be ineffectual, the wound is to be touched with cauſtic, when the cure will generally be quickly completed. To give tone to the parts, moderate preſſure ſhould frequently be made upon the ſac, either by the patient's finger or by the machine already mentioned, and this ſhould be continued for a conſiderable time. Sometimes the diſeaſe returns after a cure has been made, owing to diſeaſes of the conſtitution, carious bone contiguous to the ſore, or ſometimes to too ſmall an opening having been formed. In this caſe a canula of gold, ſilver, or lead, is ſometimes introduced into the artificial paſſage, and the ſkin healed over it; by which means the paſſage will afterwards remain completely open, and no diſeaſe of the conſtitution can ever affect it. We ſhall deſcribe Mr. Pellier's method of performing this operation, who has made ſeveral improvements on it.

The patient is to be ſeated, and his head properly ſupported by an aſſiſtant; then the ſac is to be laid freely open at its inferior part; the naſal duct is to be ſearched for with a firm probe, or with a conductor (fig. 32.) made for the purpoſe; and Pellier aſſerts that he never fails in finding it. As ſoon as this is diſcovered, a conical tube (fig. 33.), with a projection at the top, and another in the middle for ſecuring it in its place, muſt be put upon the conductor, previouſly furniſhed with a compreſſor (fig. 34.), and it ſhould be of ſuch a ſize that the conductor may fit it exactly. The point of the conductor is now to be paſſed into the lachrymal duct, and being puſhed in till it reaches the noſtril, which may be known either by inſerting a probe into it, or by a few drops of blood falling from the noſe, the conductor is to be withdrawn; leaving the compreſſor upon the brim of the canula, which muſt be firmly preſſed down with the left hand, while the conductor is removed with the other. This being done, the compreſſor muſt next be taken out; and to diſcover whether the canula be at a proper depth, a little milk or water ſhould be injected through it. If the injection paſs, it will ſhow that the canula is properly placed. If, on the contrary, any obſtruction occur, there will be reaſon to ſuſpect that it is already puſhed too far, and that it preſſes againſt the os ſpongioſum inferius; in which caſe the canula muſt be withdrawn, ſhortened, and reintroduced as before.

The ſore ought to be kept open for eight or ten days after the operation with ſoft lint ſpread with emollient ointment, and the whole covered with a compreſs of ſoft linen ſecured with a bandage. An injection of milk and water ſhould be daily paſſed through the canula; and as ſoon as the ſore looks clean and healthy, the dreſſings ſhould be entirely removed, and a piece of court-plaſter laid over it. In this ſtate it is to be left to heal; but the plaſter muſt be renewed, if matter appear to form beneath it. By this method Mr. Pellier finds, that fiſtula lachrymalis, not depending upon diſeaſes of the contiguous bones or of the conſtitution, may commonly be completely cured in two or three weeks, which, by the uſual practice, might require ſeveral months.

CHAP. XV. Of AFFECTIONS of the NOSE.

Sect. I. *Of* Hæmorrhagies *from the* Nose.

When the means mentioned for this complaint under Medicine have failed, recourſe muſt be had to *compreſſion*. Doſſils of lint introduced into the noſtrils are ſometimes effectual;

or the gut of fome fmall animal, tied at one end, then introduced by a probe into the nofe as far as the pharinx, and filled with cold water, or that and vinegar, and fecured by a ligature, by adapting itfelf to all the parts, and preffing equally on them, has been attended with advantage. When thefe remedies likewife fail in their effect, a piece of catgut or wire may be introduced through the nofe into the throat, and brought out at the mouth; a piece of fponge, or a bolfter of lint of a fize fufficient to fill the back-part of the noftril, is then to be fixed to it; the fponge is next to be drawn back and properly applied Another is to be applied to the anterior part of the noftril and fecured. The fame may be done to the other noftril, if it be neceffary; or the fponge may be of fuch a fize as to fill the ends of both noftrils at the fame time. By this contrivance the blood not finding an outlet, will foon coagulate, and prevent any farther evacuation.

Sect. II. *Of* Ozæna.

By this is underftood an ulceration within the nofe, which may be occafioned by external violence, by expofure to cold, by irritating fubftances, or by whatever produces inflammation in the membrane lining the noftrils. Sometimes it arifes from venereal infection; and in this cafe the difcharge becomes fo acrid as to corrode, and produce caries in the bones of the nofe. When the difeafe is local, and not depending upon any conftitutional affection, aftringent folutions are found to be the moft ufeful, fuch as a decoction of bark or that mixed with alum. Doffils of lint dipped in thefe are to be introduced into the noftrils three or four times a-day, or fome prefer the injection of fuch fluids by means of a fyringe as being more effectual. If ftronger aftringents be neceffary, a folution of ftyptic powder ought to be ufed. At bed-time, an ointment prepared with zinc or with lapis calaminaris ought likewife to be applied. Upon fome occafions the application of a blifter to the temple has cured the difeafe.

Inftances, however, occur, where the difcharge is occafioned by a collection of matter within the antrum maxillare; and then it is apt to refift every effort till a proper outlet be given to it.

When the complaint is owing to venereal infection, the primary difeafe is to be attended to, and mercurial preparations are to be applied to the part; but when the bones are carious, till thefe are removed we need neither expect that the difcharge will ceafe, nor the difeafe be otherwife completely cured.

Sect. III. *Of* Imperforated Nostrils.

Sometimes the noftrils are in part or entirely obliterated. This may be owing to burns; fmall-pox; different kinds of fores, efpecially thofe of a venereal nature; and fometimes it is the effect of original conformation, for it has been obferved in new-born children.

When any opening appears in the obftructed noftril, it may be readily dilated by the introduction of a furrowed probe, and then cutting upon it in the courfe of the adhefion: but when no paffage appears, the operator muft endeavour, by means of a fcalpel, to difcover one of the noftrils; and when difcovered, it muft be enlarged by a director and biftoury, as in the former cafe. The other noftril is to be treated in the fame manner. After the openings are formed, they might be preferved of a proper fize by the introduction of doffils of lint, which fhould be frequently cleaned or renewed; but metallic tubes anfwer the purpofe better, and allow the patient to breathe freely through them till a cure be performed. Previous to their introduction, they ought to be covered with foft leather fpread with emollient ointment, and retained till the fores are completely healed.

CHAP. XVI. Of Affections of the Mouth and Throat.

Sect. I. *Of the* Division *of the* Parotid Duct.

When the parotid duct is divided, the faliva which it tranfmits paffes over the cheek inftead of going into the cavity of the mouth.

When the furgeon is called to a recent divifion of the duct, he ought to lay the divided ends of it as exactly together as poffible, and to retain them in their fituation till they are united by adhefive plafters, or by the twifted future if there be confiderable retraction of the parts. But when the portion of the duct next the mouth is entirely obliterated, an artificial paffage muft be made into the mouth, and an union formed between the opening and that part of the duct which proceeds from the parotid gland. The artificial paffage ought to be as much as poffible in the direction of the natural duct. For this purpofe a perforation of a proper fize is to be made obliquely into the mouth with the trocar (Pl. 25. fig. 35.), from the fide of the wound exactly oppofite and contiguous to the under extremity of the upper portion of the duct; and then a piece of leaden probe of the fize of the perforator fhould be introduced by means of the canula, and be kept in the cheek till the fides of the opening become callous; when the lead being withdrawn, the extremities of the artificial and natural ducts are to be brought into contact, and retained there by adhefive plafter till the cure is completed. Another method has, in a few inftances, been followed by Mr. Latta (fee his *Syftem of Surgery)*, of introducing one end of a bit of catgut into the artificial opening, and bringing it out at the mouth, while the other is introduced a little way into the extremity of the natural duct, and retained by adhefive plafter till the wound is healed. Whichever way the operation is done, the patient fhould live upon fpoon-meat, and make as little motion as poffible with his lips or jaws.

Sect. II. *Of the* Hare-lip.

The hare-lip is a fiffure in the upper lip, very feldom in the under one. It is attended with want of fubftance, and has its name from a refemblance to the lip of a hare. In general, it is only a fimple fiffure, though fometimes it is double; in which cafe it renders a cure more difficult to be executed. There are many lips where the want of fubftance is fo great, that the edges of the fiffure cannot be brought together, or at leaft where they can but juft touch, and then the attempt fhould be forborne. It is likewife improper in infants, and ought not to be performed till feveral months after they have been weaned, when they will have acquired more ftrength to undergo the operation, and will be lefs liable to be attacked with bowel complaints, which frequently make them cry at an earlier period of infancy.

In proceeding to the *operation*, the patient, if a child, fhould be fecured upon a perfon's knee, or rather perhaps upon a table; but if an adult, he is to be feated upon a chair, in a proper light. The frænum connecting the gums to the upper lip is to be divided; if a fore-tooth project fomuch as to prevent the parts from being brought properly together, it is to be extracted; or when the fiffure runs through the bones of the palate, if a fmall portion of the bone project, this muft be removed. Matters being fo far adjufted, the operator is to lay hold of one fide of the fiffure between the thumb and forefinger, or between

the forceps (fig. 36.), then with a pair of sharp and very strong crooked scissars, or with a scalpel, to cut off a thin portion of the lip, and to repeat the same thing upon the other side of the fissure, so as to render the whole edges of the fissure completely raw; by which, if the operation be properly performed, a piece will be separated in form like an inverted V. After the incisions have been made, the vessels should be allowed to bleed freely to prevent inflammation; and when the bleeding has ceased, the sides of the wound are to be brought accurately together, and kept in that state by the twisted suture. The first pin ought to be as near as possible to the under edge of the lip; another is to be inserted near the upper angle; and if the patient be an adult, a third pin will generally be necessary, half way between the other two. In passing them, they ought to go rather deeper than half through the lip, that the edges of the wound may be kept properly in contact. An assistant now keeps the parts together, while the operator applies a firm waxed ligature first to the under pin; and having made three or four turns with it in the form of an eight figure (Pl. 25. fig. 37.), it should then be carried about the second, and in a similar way about the third, care being taken that the thread be drawn of a proper tightness. After the ligature is secured, a piece of lint, covered with some mucilage, should be laid over the wound to protect it from the air; and this is commonly all the bandage necessary. When, however, from a great want of substance, the retraction has been considerable, some advantage is derived from the use of adhesive plasters applied to the cheeks, and tied between the pins. During the time of the cure the patient should be fed upon spoon-meat, and prevented from making any exertion with the lips, otherwise the cure might be considerably retarded. At the end of five or six days the pins may be taken out, when the parts will commonly be found completely united.

In the case of a *double hare-lip*, the operation should be first done upon one fissure; and when a cure is completed there, it may be done safely upon the other.

Sect. III. *Of* Extirpation *of* Cancerous Lips.

The under lip is much more frequently attacked with cancer than the upper, or indeed than any other part of the body: and as little dependence is to be placed upon external applications or internal remedies, recourse must be had to the knife as the only certain method of cure.

When the disease has not attacked any considerable part of the lip, the diseased part is to be cut out, and the wound cured by the twisted suture. The operation ought therefore to be performed early, to allow the parts to be brought properly together. The general steps of the operation are nearly the same as in the operation for hare-lip, and therefore need not be repeated. It is only to be observed, that all the diseased parts are to be removed, taking care to make the cut in such a way as will most readily admit of the twisted or hare-lip suture. When the parts can be brought together, the lip will have nearly the same appearance as in the operation for hare-lip; but when the disease spreads over a considerable part of the lip, so as to prevent the sound parts from being united after the diseased parts have been removed, all that can be done is to remove the part affected, secure the bleeding vessels, and dress the sore like any other recent wound.

Sect. IV. *Of* Affections *of the* Teeth.

Dentition.] In dentition the gums inflame and swell about the parts where the teeth are afterwards to appear; the child is continually rubbing the gums with its finger; the saliva is commonly increased in quantity, though sometimes the contrary happens; sometimes the bowels are remarkably costive, though more frequently the reverse: there is generally quick pulse, with heat, and other symptoms of fever; and on some occasions these symptoms are attended with convulsions. The means found to be most useful here are such as are most effectual in allaying irritation; as opiates, blisters, and especially warm bathing. When these fail, cutting the gum by means of a fleme (fig. 48.), over the approaching tooth, is frequently found to remove every symptom; but this ought to be done earlier than it commonly is to have the full effect. Whenever the symptoms give reason to think that a tooth is approaching, the gums should be cut freely over that part where the teeth may be first expected. When the symptoms recur, the operation should be repeated. A crucial incision is attended with still more effect; and the bleeding which afterwards takes place is of considerable service. The incision should always be carried as far as the tooth, which ought to be somewhat exposed; and when properly done, is frequently followed with immediate relief. Sometimes the same kind of symptoms attend the cutting of the second set, particularly of the dentes sapientiæ. When this is owing to the thickness of the gums, scarifying gives the greatest relief; but sometimes it is for want of room in the jaw, and then the tooth should be drawn.

Derangement of the teeth.] This happens more frequently in the second than in the first set, and more commonly in the fore than in the back teeth. This may be owing to the first set remaining in the jaw after the second have appeared. Another cause is a waste of space in the jaw; and a third is a mal-conformation of the teeth, where they are too large in proportion to the jaw, and therefore overlope each other. The remedy is the same in each of these cases, viz. to extract the teeth which stand in the way of the rest, to allow those which are out of their place to come into the row, and put on a more uniform appearance.

The usual method of moving teeth which are out of the row is, by fixing them with a ligature to the nearest teeth; or the same thing is done by metalline plates or pieces of wire. But these methods have not been found fully to answer the purpose intended, though in some cases they may be useful. When one or more front teeth are accidentally drawn out of the jaw, they ought to be immediately replaced. When the teeth are broken over or otherwise injured, they may be supplied with others transplanted from the jaws of another person: but this can only be done when the sockets have been newly emptied, for after inflammation comes on it is impracticable. In these cases the inflammation must be allowed to subside, and then artificial teeth can be readily adapted.

Loose teeth.] When the teeth are *loosened by external violence*, by falls and blows, or by improper use of instruments in pulling diseased teeth in the neighbourhood of sound ones, they may again be made tolerably fast by pressing them as firmly as possible into their sockets, and preserving them so with ligatures of catgut, Indian weed, or waxed silk, and keeping the patient upon spoon-meat till they are firm. When loose teeth are owing to tartar, nothing will fasten them till the cause be removed; and this ought to be done early, otherwise it will have no effect. Frequently the teeth become loose from a sponginess in the gums, often, but improperly, attributed to scurvy. The best remedy is scarifying the gums deeply, and allowing them to bleed freely; this should be repeated till they are fully fastened. Mild astringents, as tincture of bark, are here attended with good effects, though those of a strong nature will certainly do harm. The mouth should be frequently washed with cold water strongly impregnated with these, and the patient should not use the teeth which

have been loofe till they become firm again. The loofening of the teeth in old age cannot be remedied, as it is owing to a wafting of their fockets, from which the teeth lofe their fupport.

The teeth fometimes become *yellow or black* without any adventitious matter being obferved in them; at other times they become foul, and give a taint to the breath, in confequence of the natural mucus of the mouth, or part of the food remaining too long about them. The moft frequent caufe of foul teeth is the fubftance called *tartar*, which feems to be a depofition from the faliva, and with which the teeth are often almoft entirely incrufted. When this fubftance is allowed to remain, it infinuates itfelf between the gums and the teeth, and then gets down upon the jaw in fuch a manner as frequently to loofen the teeth. This indeed is by far the moft common caufe of loofe teeth, and when they have been long covered with this or with any other matter, it is feldom they can be cleaned without the affiftance of inftruments. But when once they are cleaned, they may generally be kept fo by rubbing them with a thin piece of foft wood made into a kind of brufh, and dipped into diftilled vinegar; after which the mouth is to be wafhed with common water.

When the teeth are to be *cleaned by inftruments*, the operator ought, with a linen cloth or with a glove, to prefs againft the points of the teeth, fo as to keep them firm in their fockets, with the fingers of the one hand, while he cleans them with the neceffary inftruments, Pl. 25. fig. 41. n° 1, 2, 3, 4, 5, held in the other; taking care not to fcrape them fo hard as to loofen them, or to rub off the enamel. This being done, the teeth fhould be rubbed over with a fmall brufh, or a piece of fponge dipped in a mixture of cream of tartar and Peruvian bark The fame application may be made to the teeth for a few days, after which they may be kept clean as already directed.

The teeth are fometimes covered over with a thin dark-coloured fcurf which has by fome been miftaken for a wafting of the enamel, but which is only an extraneous matter covering it. By perfeverance this may be cleaned off as completely as where the teeth are covered with tartar; but it is apt, after fome time, to appear again. When this is obferved, the fame operation muft be repeated.

For the purpofe of applying powders or wafhes to the teeth, a brufh or a fponge is commonly employed; the latter is fuppofed preferable, as being in lefs danger of wearing down the enamel, or of feparating the teeth.

Tooth-ach.] The caufes producing this may be expofure of the nerve of a tooth, by breaking or wafting of the enamel, inflammation in or about the tooth, or from fympathy when diftant parts are affected, as the eye, the ear, the ftomach, or the uterus, as in time of geftation, After tooth-ach has once been produced and removed, it is apt to return by expofure to cold, by taking hot liquids, by hard bodies preffed againft the nerve in the time of chewing, by the ufe of a pick-tooth, &c.

With refpect to the *cure* of this difeafe, no rule can be laid down which will anfwer with certainty upon all occafions. No remedy has yet been difcovered which will at all times even moderate the pain; relief, however, is frequently obtained from acrid fubftances applied to the tooth, fo as to deftroy the irritability of the nerves, fuch as opium, fpirit of wine, camphire, and effential aromatic oils. When thefe fail, blifters behind the ear, or deftroying the nerve by the cautious ufe of ftrong acids, or by a red-hot wire frequently applied to the part, have been attended with advantage.

When a black or decayed fpot appears on a tooth, if it be quite fuperficial, it may be removed; but if it go through the thicknefs of the enamel, it will be more advifable to let it remain.

When a fmall hole breaks out in a tooth, particular attention fhould be paid to prevent the admiffion of air. Tin, lead, or gold leaf, commonly employed for this purpofe, fometimes give relief for many months, or even years; but at other times are of little advantage, and in fome inftances create great pain. When ftuffing is to be employed, it ought to be done in the intervals of the fits of toothach, otherwife it will give great uneafinefs. When it is to be ufed, the whole cavity of the tooth fhould be filled; and this is to be done with the inftruments, fig. 42. n° 1, 2, 3, in Plate 25.

Tooth-drawing.] When the remedies made ufe of for the removal of tooth-ach have failed in their effect, and it is found that the complaint ftill continues, it will be neceffary to *extract the tooth*. In doing this, it may be obferved, that all the teeth may be pulled to either fide, excepting the dentes fapientiæ of the lower jaw, which ought to be pulled outwards, otherwife the jaw may be fplintered. As foon as the focket is cleared of blood, if the tooth be not much fpoiled, it may be immediately replaced, when it will become as ufeful as before. It is difficult, however, to replace the large grinders, on account of their diverging roots. The more perpendicularly the teeth are pulled, the lefs contufion and injury will be done to the jaws and alveoli. But as no inftrument has been yet invented capable of effecting this properly, furgeons are obliged to be contented with an inftrument which acts in a lateral direction. One of the beft is that well known inftrument in form of a key, with a claw and fulcrum. Previous to the operation, this fhould be covered with a linen rag, to prevent the gum from fuffering. After dividing the gum, or feparating it from the tooth, the claw is to be fixed as deep between the teeth and gum as poffible. Then the fulcrum is to be applied on the oppofite fide. The furgeon may now, with one turn of the handle of the inftrument, pull the tooth out at once. But the turn fhould not be effected by a fudden jerk, but in the moft cautious and flow manner. When it happens to be one of the great molares, whofe roots diverge very much, and when they are firmly fixed, after only loofing it with the firft pull, the claw of the inftrument is to be applied to the other fide of the tooth, and the turn given in a contrary direction to the firft. After it has been fufficiently loofened in this manner, it is to be laid hold of by a common teeth forceps (fig. 43), and extracted in the eafieft manner. Upon extraction of the tooth, any detached fplinters occurring are to be immediately removed. Should any confiderable hæmorrhagy take place, the patient may take fome cold water, vinegar, or fpirit of wine, into his mouth, and doffils of lint may be introduced into the focket. After all thefe fail, recourfe muft be had to the actual cautery.

When ftumps occur from caries, or when the teeth have broken in time of the extracting, the common key will fometimes remove them; if that fail, the punch (fig. 44.) is to be ufed. The operator, having this inftrument in one hand. is to place the fore finger of the other, with a piece of cloth wrapped round it, upon the infide of the jaw oppofite to the ftump, to protect the neighbouring parts.

Tranfplanting teeth.] Teeth can never be *tranfplanted* with propriety in childhood or in old age. The conftitution muft be free from thofe difeafes which affect the gums. The tooth to be tranfplanted muft be taken from a perfon of a found conftitution, otherwife it will convey infection. To guard as much as poffible againft infection, it fhould be immerfed for a few minutes in lukewarm water, and then well dried and cleaned. It ought to fit the focket exactly; if it be too large, it may be filed down, avoiding the enamel as much as poffible. The furface of it fhould be at firft on a level with the reft, or

rather a little more depreſſed, that it may be as ſecure as poſſible in its place. If the tooth fit the ſocket properly, there will be no occaſion for uſing a ligature to fix it; but if a ligature be found neceſſary, it may be made of threads of fine ſilk properly waxed. After the operation is finiſhed, the patient ought to avoid whatever may be in danger of ſhaking the tooth, and this is to be attended to till the tooth is perfectly firm. He ſhould alſo guard againſt cold and moiſt air, and live upon ſpoon-meat.

Sect. V. *Of* Boils *and* Excrescences *of the* Gums.

Gum boils may ariſe from cold or from external violence, &c. but moſt frequently they are the conſequence of toothach. The complaint begins with pain attending a tumor on the parts affected; by degrees the ſide of the face ſwells conſiderably; the tumor of the gum now begins to point; and if it be not opened, it burſts and gives the patient immediate relief. When the boil is owing merely to inflammation, after the matter is evacuated, the complaint goes off; but when it proceeds from a caries of a tooth, it will continue as long as the cauſe remains; the tooth therefore ought to be extracted. After the abſceſs has burſt, if the matter continue to be diſcharged, it may ſometimes be dried up by injecting ſome aſtringent liquor; but the moſt effectual method is to lay the abſceſs fully open, and to heal it from the bottom by doſſils of lint. Sometimes abſceſſes occur of a more obſtinate nature, owing to a carious ſtate of the jaw. In that caſe ſuppuration ought to be promoted, and the part laid open as ſoon as matter is formed; keeping the paſſage open for the diſcharge, being the only means for affecting a cure.

Excrescences of various degrees of firmneſs ſometimes grow upon the gums. Some are ſoft and fungous, while others are of a warty nature. In general they are not attended with pain. They frequently originate from caries of the teeth, or of their ſockets; in which caſe the removal of the ſpoiled teeth, and the ſubſequent exfoliation of the carious part of the jaw, will often accompliſh a cure. But when this does not happen, the tumor ſhould be removed as ſoon as it becomes troubleſome, otherwiſe there may be danger of its ending in cancer. The removal may be effected by a ligature or knife, according as the tumor may have a narrow or broad baſis. It is ſometimes neceſſary to uſe a ſpeculum oris to keep the mouth open. After the tumor is extirpated, the wound ſhould be allowed to bleed freely, to prevent ſubſequent inflammation. When the hæmorrhagy proceeds too far, it ſhould be reſtrained by the application of ſpirit of wine, or tincture of myrrh, or ſolution of alum, &c. and ſhould theſe prove unſucceſsful, the lunar cauſtic will ſeldom fail of having the deſired effect. No dreſſings can be applied; but for ſome days after the operation, the mouth ſhould be frequently waſhed with a warm emollient decoction; and the cure will be afterwards promoted by the application of ſome gently aſtringent liquor, as port wine, tincture of roſes, &c.

Sect. VI. *Of* Abscesses, &c. *in the* Antrum Maxillare.

This diſeaſe is *known* by a pain and uneaſineſs beginning in the cheek, and extending upwards to the eyes, noſe, and ears, together with a ſwelling, which in the latter ſtages of the diſeaſe tends to a point, moſt frequently in the cheek. Sometimes a diſcharge enſues between the roots of the back-teeth, when they happen to penetrate the antrum. Sometimes a diſcharge of matter from the noſtrils takes place, particularly when the patient lies on the ſide oppoſite to the tumor. The diſeaſe may ariſe from cold, or whatever produces inflammation in general; but the moſt common cauſes are violent fits of the toothach, occaſioning exceſſive pain and inflammation of the membranes of the noſe and antrum.

The *cure* is performed by giving a free diſcharge to the contents of the tumor; and this is done in two ways; either by extracting one of the two anterior great molares, which are ſituated under the antrum, and making a perforation with a round trocar (Pl. 25. fig. 39.) through the bottom of the ſocket; if this has not been already perforated by the fangs of the tooth or eroded, in which caſe the matter will paſs out immediately after the extraction: or the perforation may be made by the inſtrument repreſented in fig. 50. through that part of the antrum which projects outwardly over the molares. As moſt people wiſh to avoid the pulling of a tooth, when it does not appear to be abſolutely neceſſary, the perforation is commonly made in the way laſt mentioned. Some authors, however, object to this, as not giving a ſufficiently depending opening to the matter. As ſoon as the matter is diſcharged, a plug may be introduced into the perforation, which may be removed frequently to allow the matter to paſs out, and to admit aſtringent ſolutions of bark, &c. to be occaſionally thrown into the cavity of the antrum. In this way a cure is obtained, if the bones be ſound; but if they are carious, it is impoſſible to expect a cure till the diſeaſed portions of the bone exfoliate and be removed. When cloated blood is formed in the antrum, it is to be removed in the ſame manner. Sometimes the tumor of the cheek is owing to a ſwelling of the bones, and no matter is found in the antrum: in that caſe the operation does harm. No external application has yet been diſcovered for removing ſuch a ſwelling, though a long-continued courſe of mercury has been found to be of ſome ſervice.

Sect. VII. *Of* Ranula.

This is a tumor under the tongue, moſt frequently owing to an obſtruction in one of the ſalivary ducts. Sometimes it contains matter like the ſynovia of the joints, ſometimes a fatty matter, now and then ſtony concretions, but moſt commonly a fluid like ſaliva. It often acquires ſuch a ſize as to prevent ſucking in infants, or maſtication and ſpeech in adults. When the perſon attempts to ſpeak, he only makes a croaking noiſe: hence the name of the diſeaſe.

The beſt *mode of treatment* is to lay the tumor fully open by means of a ſcalpel or large lancet, to evacuate its contents completely, and then to waſh the cavity with any mild fluid, as milk and water. If the ſore be difficult to heal, tincture of bark or other aſtringents may be uſed. When the tumor is obſerved to be filled with a fatty or any other firm ſubſtance, it ought to be removed entirely. The only application neceſſary in the time of the cure, is the frequent injection of milk and water, or any other mild fluid, by means of a ſyringe.

Sect. VIII. Ulcers *in the* Mouth.

When ulcers of the mouth ariſe from a general affection of the ſyſtem, this muſt be removed before a cure can be expected. When they originate from ſharp points in the teeth, theſe are to be filed off, and ſome aſtringent ſolution taken occaſionally into the mouth. Notwithſtanding theſe and other remedies, the ſore ſometimes becomes worſe, diſcharging a thin fetid ſanies, attended with much pain, and putting on every appearance of cancer. In this ſituation *extirpation* is the only thing that can effect a cure. If the ſore be only ſuperficial, it may pretty readily be extirpated; but when deep-ſeated, it may ſometimes be neceſſary to cut through the whole ſubſtance of the cheek, and heal the ſore by the hare-lip ſuture. When the tongue is the ſubject of

operation, the operator ought to be ready to take up the bleeding veſſels by the tenaculum or the needle. Along with ligature, it may be neceſſary to uſe aſtringent gargles, or a mixture of vitriolic acid in water. If theſe fail, the potential or even actual cautery muſt be uſed.

Sect. IX. Division *of the* Frænum Linguæ.

Sometimes the frænum linguæ extends to the point of the tongue, and tying it down; whereas, in the natural ſtate, it ends about one-fourth of an inch farther back. When this is the caſe, it is to be divided, guarding againſt wounding the neighbouring veſſels, or the ends of the ſalivary ducts. The *diviſion* may be made with a common ſcalpel, but ſtill better with a pair of very ſharp ſciſſars with blunt points.

The child being laid acroſs the nurſe's knee, the ſurgeon ſhould open the mouth, and raiſe the tongue with the two firſt fingers of the one hand, while with the other he introduces the ſciſſars, and divides the frænum in the middle, and as far back as is neceſſary.

Sect. X. *Of* Enlargement *of the* Tonsils *and* Uvula.

The tonsils ſometimes grow ſo large and hard as to become incurable, and even to threaten ſuffocation. The tumors here have been commonly conſidered as to be of a ſcirrhous nature; but they are neither attended with ſhooting pain, nor are they apt to degenerate into cancer; neither do ſwellings return after the tonſils have been extirpated: hence they ought not to be removed till by their ſize they impede deglutition or reſpiration; but whenever they do this, they may be removed with ſafety. The only proper method of removing them is that by ligatures, which are not only void of danger, but ſeldom fail to perform a cure. If the baſe of the tonſil be ſmaller than the top, the ligature is to be uſed as for polypi in the throat; but however broad the baſe of it may be, much difficulty will ſeldom occur in fixing it, for the ſwelling is always very prominent. In diſeaſes of this kind both tonſils are generally affected; but if the removal of one of them forms a ſufficient paſſage for the food, the other may be allowed to remain. When, however, it is neceſſary to extirpate them both, the inflammatory ſymptoms produced by the extirpation of the firſt ſhould be allowed to ſubſide before any attempt be made to remove the other.

When the form of the tonſils happens to be conical, ſo that the ligature would be apt to ſlip over their extremities, Mr. Cheſelden has recommended a needle (fig. 45.) with an eye near the point: a double ligature being put into the eye, the inſtrument is to be puſhed through the centre of the baſe of the tumor, and the ligature being laid hold of by a hook and pulled forwards, the inſtrument is to be withdrawn; then it is to be divided, and ſo tied that each part may ſurround one half of the tumor. This method however is ſcarcely ever found to be neceſſary.

Enlargements of the uvula, from inflammation or from other cauſes, may generally be removed by the frequent uſe of aſtringent gargles, as of ſtrong infuſions of red roſe-leaves or of Peruvian bark. But when theſe fail, and the enlargement is ſo conſiderable as to give great uneaſineſs by impeding deglutition, irritating the throat, and ſo cauſing cough, retching, and vomiting, extirpation is the only thing upon which any dependence can be placed. *Exciſion* is the readieſt method when the uvula is only elongated; but when the ſize is conſiderable, dangerous hæmorrhagies ſometimes attend this method; on which account a ligature is preferable. The operation may be readily performed by thoſe of the common kind; ſome prefer the curved probe-pointed biſtoury.

In *performing the operation*, the ſpeculum oris (fig. 46. in Pl. 25.) is neceſſary to keep the mouth ſufficiently open, and the uvula ſhould be laid hold of by a pair of forceps or a ſmall hook, ſo as to keep it firm, and prevent it from falling into the throat. After the operation, if the bleeding be conſiderable, it may be checked by aſtringent gargles, or by touching the part with lunar cauſtic; but this will ſeldom be neceſſary.

When a *ligature* is to be employed, it may be readily done according to the method recommended in the extirpation of polypi. A double canula with a ligature may be paſſed through the noſe, or the ligature may be applied according to Cheſelden's method in extirpation of the tonſils.

Sect. XI. *Of* Scarifying *and* Fomenting *the* Throat.

In inflammatory affections of the throat, the means commonly employed are gargles, fomentations, ſcarification, or top-bleeding. Gargles are uſeful for cleaning the fauces from thick mucus or other ſordes; they may likewiſe be uſeful in caſes of ulceration. In relaxation of the parts, they are employed to advantage when made of aſtringent materials. Fomentations may be of ſome uſe when externally applied; but the ſteam of water, &c. drawn into the throat, by means of that excellent invention *Mudge's* inhaler, is preferable. Sometimes it is neceſſary to draw blood from the part affected: Here recourſe may be had to ſcarifying with a common lancet, the tongue being depreſſed with a ſpatula. It may be ſtill more readily done by the ſcarificator (fig. 47.) After a ſufficient number of punctures have been made, the flow of blood may be promoted by the patient's frequently applying warm water to the punctures. When abſceſs forms, notwithſtanding the uſe of theſe remedies, the matter may be diſcharged with the ſcarificator already mentioned.

CHAP. XVII. Of the DISEASES of the EAR.

Sometimes a *thin membrane* is ſpread over the mouth of the external paſſage, while at other times a conſiderable part of the paſſage is *filled up* with a fleſhy looking ſubſtance, occaſioning deafneſs. When the firſt circumſtance occurs, the ſkin is eaſily divided by a ſimple inciſion, and the accretion of its ſides may be prevented by a doſſil of lint or a bit of bougie inſerted between the edges of the wound, and daily cleaned and returned till the part be rendered callous.

When the other cauſe is preſent, the inciſion muſt be continued conſiderably deeper, till the reſiſtance be removed, or till the inſtrument reach near to the membrane of the tympanum, when the operator ſhould deſiſt, leſt the membrane ſhould be wounded; then the ſame kind of treatment may be followed as in the former caſe. The proper time for performing the operation is when children uſually begin to ſpeak; for previous to this the patient may be too weakly to bear it, and after this ſpeech would be impeded.

Sometimes the meatus externus is entirely wanting in the temporal bone. For this an opening through the maſtoid proceſs has been propoſed; but the operation has not been performed, at leaſt in this country.

Children ſometimes puſh *hard bodies* into the ear, or different kinds of *inſects* occaſionally creep into it, ſo as to cauſe conſiderable uneaſineſs. Subſtances lying near the outer end of the paſſage may generally be extracted by the ſmall forceps repreſented in Pl. II. fig. 48.; but round, hard bodies ſituated deeper in the paſſage are more readily removed by a crooked probe. When inſects are deep ſeated in the ear, they ought firſt to be killed, by filling the paſſage with oil, or any other

fluid which proves noxious to them, without hurting the tympanum. They may then be wafhed out by injecting warm water frequently by means of a fyringe.

Wax is one of the moft frequent caufes of deafnefs, and it may be readily detected by looking into the ear in a clear funfhine.

Various methods have been propofed for removing wax from the ear; but one, not inferior to any, is to throw in frequently, by means of a common or bag fyringe fome warm milk and water, or water in which a little foap has been diffolved. Affiftance may likewife be given here, by ufing along with the injection a blunt probe or fine hair pencil, by which the bottom of the paffage may be cleared out. After the wax is removed, the patient ought to guard againft the effects of cold by introducing a little wool for fome time into the meatus. When deafnefs is owing to a *deficiency of wax* in the ear, a little oil of almonds, or even oils of a hotter nature, or foap, or galbanum, &c. have been of fervice.

Purulent matter is now and then formed in the ears of adults, but oftener in thofe of children. Sometimes it is produced by ulcers fituated in the lining of the meatus, or upon the membrane of the tympanum. It feems to be merely a local affection, and does not, as many have fuppofed, originate from morbid humours of the fyftem. The remedies beft calculated for removing it are fuch as are of a moderately aftringent nature, as a weak folution of faccharum faturni. A little of this may be dropped in two or three times a-day, but it is ftill better to ufe a fyringe. If the difcharge has continued long, it may be proper, in addition to the other applications, to keep open a fmall blifter for fome time in the neck, arm, or wherever it may be thought moft convenient.

In fcrophulous habits, *fuppurations* fometimes occur in the neighbourhood of the ear, and penetrate into the external paffage, or into the tympanum itfelf; after which it is not unufual for the fmall bones of the ear to lofe their connecting membrane, and to be difcharged along with the matter, and for caries to enfue in the tympanum; in confequence of which a high degree of deafnefs is produced, which can never be removed. In fuch a fituation little elfe can be attempted than to preferve the parts clean and free from fmell, which is readily done by injecting a little warm milk and water morning and evening by means of a fyringe. If this be neglected, the matter from the carious bones is apt to become offenfive; and it commonly continues till the difeafed parts are either diffolved and difcharged, or probably during the life of the patient.

Befides the affections which may arife in the meatus externus, and may be the caufe of deafnefs, others may occur in or about the *meatus internus*, or Euftachian Tube, which may have in part the fame effect, though by no means in the fame degree. Inflammation and its confequences may originate in the cavity of the tube, or fwellings or ulcers in the throat may affect it fo as to caufe fome degree of deafnefs. When this is the cafe, it is practicable to introduce a pipe, Pl. 25. fig. 50. crooked at the extremity, through the mouth or nofe, and then to inject into the mouth of the euftachian tube any mild fluid which may be thought fitteft for the purpofe, though no great dependence is to be placed upon the attempt.

It fometimes happens, particularly in old people, that, from expofure to a ftream of cold air, the tympanum becomes affected, and a noife is heard by the patient like the rufhing of water. In other cafes the patient is incapable of accurately diftinguifhing the words of fome perfons fpeaking in a loud tone of voice; or, in mixed companies, he hears only a confufion of founds. Complaints of this kind frequently originate from a relaxation of the foft parts of the tympanum; and though a complete cure is not very frequently performed, yet confiderable advantage is fometimes derived from the ufe of hot ftimulating oils, and from keeping the part warm at the fame time with a little wool. When deafnefs arifes from affections of this nature, fome affiftance may be derived from collecting the found, fo as to make a ftronger impreffion upon the internal ear. A variety of inftruments have been invented for this purpofe. Some ufe a well known convoluted tube called an ear-trumpet; others a fort of cup (fig. 49.) which is concealed under the hair, and fixed to the head with ftraps.

CHAP. XVIII. Of the WRY NECK.

Wry neck may be owing to different caufes; as contraction of the fkin in confequence of burns, or other kinds of fores; relaxation of the mufcles of one fide of the neck, particularly the maftoid, while thofe of the other fide continue to act with vigour; preternatural contraction of the mufcles of one fide of the neck, the others having their ufual power; or, a bend in the vertebræ of the neck.

When the difeafe is owing to a contraction of the fkin, this is to be divided through the whole of the contracted part, guarding againft cutting the external jugular vein. When the contraction of the maftoid mufcle is the caufe of the difeafe, the mufcle fhould be divided by gentle ftrokes, fo as to run no rifk of wounding the great veffels fituated under it. When an incifion is made either with a view to divide the mufcle or the fkin, the head is afterwards, by means of a machine (Pl. 25. fig. 52.), to be kept in a proper pofture during the cure, until new granulations form and fill up the empty fpace. When the difeafe is merely owing to a curve of the bones of the neck, the fame kind of machinery may be ufeful with that recommended for cure in the other parts of the fpine. But fometimes the difeafe arifes from an affection of the bones of a more ferious nature. Here the difeafe in the vertebræ commonly begins with a flight pain, which gradually becomes worfe, and the head is turned over to the found fide. As the difeafe becomes worfe, a fulnefs can be obferved very painful to the touch; and moving the head becomes fo diftreffing as to be almoft impracticable. The only method which has been found to be effectual in this cafe, is the infertion of a pea-iffue on each fide of the tumor, and retaining it till the pain and ftiffnefs are entirely removed.

CHAP. XIX. Of BRONCHOTOMY and ŒSOPHAGOTOMY.

1. The operation of bronchotomy is an incifion made in the trachea, to make way for air into the lungs, when refpiration is obftructed to fuch a degree that life is in danger. If the patient's breathing be already ftopped, the operation ought to be done with the greateft expedition; ufing any inftrument which will moft readily make an opening in the trachea, as the delay of a few moments will often put a period to the perfon's exiftence. Experience has fhown, indeed, that in by much the greater number of cafes, by a total ftoppage of refpiration for only five or fix minutes, life is irrecoverably deftroyed.

In performing the operation, where, from the nature of the cafe, fufficient time is allowed, the patient is to be laid on his back upon a table, and properly fecured by affiftants. A longitudinal incifion is to be made, about an inch and an half long, through the fkin and cellular fubftance; beginning at the under edge of the thyroid cartilage; the fterno-hyoid and thyroid mufcles are then to be feparated; the thyroid gland is to be avoided as much as poffible, on account of its vafcu-

larity. As ſoon as the trachea is laid bare, the bleeding-veſſels, to prevent coughing, are to be ſecured; then, with a common lancet, a puncture is to be made as high as may ſeem practicable between two rings of the trachea, of ſuch a ſize as to admit the introduction of a double canula (fig. 51.) large enough to allow the patient to breathe freely, and of ſuch a length as neither to be in danger of ſlipping out, nor of irritating the back part of the trachea. Such a canula has long been recommended by Doctor Monro in his courſe of ſurgery. Previous to the introduction, the canula may be put through ſeveral plies of linen compreſs; or theſe may be firſt ſlit half way down, and applied ſo that any of them may be removed and replaced at pleaſure. This double canula is to be fixed by a ſtrap round the neck; and when mucus obſtructs the paſſage of the inſtrument, the inner tube can be withdrawn, cleared, and readily replaced; while the patient is, during this time, breathing through the outer one; and by means of a ſcrew the tubes can be regulated according to the motions of the trachea. After the canula is fixed, it ought to be covered with a piece of muſlin or crape, to prevent the admiſſion of duſt, inſects, &c. As ſoon as the cauſes inducing ſuffocation are removed, the canula is to be withdrawn, and the ſkin immediately brought over the orifice, and retained there by a ſlip of adheſive plaſter.

2. By ŒSOPHAGOTOMY is underſtood the cutting open the œſophagus, to allow ſubſtances ſticking in it, and which cannot be extracted otherwiſe, to be removed. It is only to be done, however, in caſes of the moſt extreme danger, as it is attended with much hazard; and there are only two inſtances yet on record of its having been performed with ſucceſs, though there are ſeveral inſtances of wounds in the œſophagus being healed. The operation may be rendered neceſſary, where obſtructions of the œſophagus become ſo complete as to prevent the paſſage of nouriſhment into the ſtomach, or of air into the lungs. But it is evident, that when the obſtructing cauſe is in the under end of the œſophagus, any inciſion becomes uſeleſs.

In performing the operation, the patient is to be ſecured in the ſame manner as for bronchotomy, and an inciſion made through the ſkin and cellular ſubſtance as directly oppoſite as poſſible to the part obſtructed. If it be done with a view to remove an obſtruction, the muſcles over the trachea are to be pulled to one ſide, and the trachea to the other, by means of a blunt hook; by which the œſophagus will be brought into view. If the obſtructed part now come in ſight, the inciſion is to be made directly upon the obſtructing body, which is to be extracted by a pair of ſmall forceps; but if the obſtruction happen to be farther down than we can with ſafety have acceſs to the œſophagus, the inciſion is to be enlarged as much as poſſible, that the forceps may be able to reach and extract it. When the operation is performed, the wound will be difficult to heal, as the ſides of it will be frequently ſeparated by the action of deglutition. On this account as great a degree of abſtinence as poſſible is to be adviſed; and nothing but nouriſhing liquids, in ſmall quantities, are to be allowed. The patient ſhould be prevented from moving his neck; and the wound is to be healed as ſoon as poſſible by the ſame methods which are uſed with wounds in other parts of the body. On the other hand, if the operation has been done for the purpoſe of conveying nouriſhment into the ſtomach, when the patient was diſtreſſed by a tumor either in the œſophagus itſelf or in ſome of the neighbouring parts, it will be neceſſary to keep the wound open during the continuance of the tumor, or the life of the patient.

CHAP. XX. OF SORE NIPPLES.

WOMEN are more generally affected with ſore nipples in ſuckling their firſt child than at any period afterwards. This may in ſome meaſure, be owing to the ſmallneſs of the nipples; but very often it ariſes from their being unaccuſtomed to the irritation of ſucking. In ſome caſes, the nipples are ſo flat, and ſo much ſunk in the break, as to render it difficult for the child to lay hold of them. Here aſſiſtance can ſometimes be given, by the mother preſſing back the prominent part of the breaſt, ſo as to make the nipple project between two of her fingers. Should this be inſufficient, the nipple may be made to project by applying to it a ſtout child ſeveral months old: but when this cannot be done, breaſt-glaſſes may anſwer the ſame purpoſe. By applying theſe to the nipple, and ſucking out the air, the child will commonly be enabled to lay hold of it.

The nipples at this time are liable to *excoriations*, cracks, or chops; which, though not attended with a formidable appearance, are frequently more diſtreſſing than large ulcers. Aſtringent applications are moſt to be depended upon in ſuch complaints; or port wine, brandy properly diluted, or lime-water; all of which ought to be applied warm. After bathing the parts with any of theſe, the nipple ſhould be covered with ſpermaceti ointment; the firſt of which is conſidered as beſt. Even a little ſoft pomatum frequently rubbed upon the part, and covered with a ſoft linen rag, is ſometimes found to give conſiderable relief. But the nipple ſhould be perfectly cleared of theſe applications before the child is laid to the breaſt.

CHAP. XXI. OF PARACENTESIS OF THE THORAX.

WHEN either the action of the heart or of the lungs is impeded by fluids collected in the cavity of the pleura, a diſcharge of theſe fluids by a perforation is the only chance the patient has for relief. The fluids which collect in the pleura are, ſerum, blood, air, or pus. A collection of water or ſerum is frequently found in the thorax, combined with dropſy in other parts of the body; but the affection is often local, and it is then chiefly that advantage is to be derived from an operation. Beſides in the two great cavities of the thorax, collections of water are frequently met with in the pericardium, and are ſaid to be ſometimes diſcovered between the layers of the anterior mediaſtinum. The diſeaſe is marked by the following ſymptoms: There is a ſenſe of weight or oppreſſion in the thorax; and difficulty of breathing: the patient has frequently a more uneaſy ſenſation in one ſide than in the other; has ſudden ſtartings during ſleep, with a ſenſe of ſuffocation; is troubled with a frequent dry cough; the pulſe is ſmall and irregular; the ſkin dry, and the urine ſcanty.

With theſe ſymptoms there are commonly other marks of dropſy; and the patient ſometimes, upon any ſudden motion, is ſenſible of an undulation within the cheſt; and when the quantity of water is conſiderable, the undulation will even be heard by the byſtanders, if the body be ſmartly agitated. For this purpoſe, the patient's body ſhould be uncovered while under examination; and the ſurgeon ſhould place his hand upon the breaſt near the ſternum; then an aſſiſtant ought to raiſe the patient ſuddenly from an horizontal to an erect poſture, or to ſtand behind the patient and make ſudden jerks; when, if water be preſent, the undulation will be felt; but it is neceſſary to guard againſt being

deceived by the noife fometimes made by the contents of the ftomach.

When the water is collected in one fide only, if the difeafe be of long ftanding, for the moft part that fide is more prominent than the other. If the water be in the pericardium, the fymptoms are nearly the fame as thofe above enumerated, with this difference, that the pain is generally felt behind, and to the left fide of the fternum; and the ftroke of the heart is as if buried in water, while an undulatory motion has been faid to be felt oppofite to the anterior extremities of the third, fourth, and fifth ribs.

In the *treatment* of this difeafe, little advantage can be derived from internal remedies. Squills, cream of tartar, mercury, and digitalis, are upon fome occafions attended with advantage; but the only method from which we can expect any degree of fuccefs is the removing of the water by an operation, which fhould be performed as foon as there is reafon to expect that danger may arife from delaying it longer. The operation is done in the fame way as fhall be afterwards defcribed in the cafe of empyema.

Blood collected in the cheft is always extravafated through fome wound or rupture of the veffels of the lungs or thorax. The breathing becomes oppreffed, the motion of the heart and arteries feeble and irregular, and all thefe fymptoms are more diftreffing than collections of other fluids. As it frequently happens in cafes of this kind, that fome of the veffels of the lungs are injured, part of the blood is thrown up by coughing; which, when confiderable, gives a temporary relief to the lungs and heart; and while this is the cafe, no operation is neceffary; but whenever the action of thefe parts becomes much impeded by a great accumulation of blood, a perforation ought to be made to difcharge it. When the extravafated blood is too firmly coagulated to pafs off by a perforation, the wound ought to be made confiderably larger; and if this be infufficient, injections of warm water ought to be thrown in, and allowed to remain for fome time, to promote the diffolution of the mafs, which is afterwards to be evacuated. If the extravafation has been occafioned by a wound in the lower part of the thorax, a new perforation will be unneceffary; an enlargement of the wound will be quite fufficient. But if it be fituated in the upper part of the cavity, a perforation in the middle and lateral part of the thorax ought to be made, that the blood may be freely difcharged. In cafe of a rib being fractured, or a veffel ruptured, the incifion ought to be made as near as poffible to the part affected, to allow the blood to efcape, and loofe pieces of bones to be removed.

The difcharge of air into the cavity of the thorax produces fymptoms little lefs alarming than thofe proceeding from the effufion of blood. In general they are, oppreffion in breathing; a tightnefs of the breaft, attended with pain; inability to breathe in the recumbent pofture; a flufhing and fwelling of the face; a feeble, and at laft an irregular pulfe: the extremities become cold, and cold fweats break out on the forehead. With thefe fymptoms there is frequently a fwelling over the external parts of the body, by air getting from the ruptured lungs into the common cellular fubftance; and all thefe complaints increafing, the patient, if not quickly relieved, foon dies; fometimes in a few hours, with marks of fuffocation.

Air may be produced in the cavity of the thorax by wounds in the lungs, by mortification generating air in any of the thoracic vifcera, by erofion of ulcers, by laceration in confequence of fracture in any of the bones of the thorax.

We diftinguifh this from other collections by the fudden oppreffion in breathing, by the flufhing of the face, by no blood being thrown up, and by the emphyfematous fwelling of the cheft and other parts, which has a crackling noife upon being preffed.

The treatment of this complaint confifts in making fmall punctures in the affected part of the fkin, fo as to allow the air to efcape from the cellular fubftance; and if the air fhall have fpread to diftant parts of the body, it will efcape moft readily by fuch openings. But if this give no relief to the oppreffed breathing, paracentefis ought to be performed. In former times, patients labouring under fuch fymptoms were almoft conftantly left to their fate. Within thefe few years, however, fome cafes have occurred where the patients have been completely relieved by an operation being performed. This is done in the fame way as in the evacuation of other fluids.

Purulent matter is more frequently collected in the thorax than any other fluid: it is much more frequently formed, however, than confined there. As the matter is ufually fpit up as faft as it is generated, in the diffections of thofe who have died of this fpecies of confumption, much extravafated pus is rarely found in the cavity of the thorax, though a great portion of the lungs be deftroyed. Cafes not unfrequently occur, however, which require the operation; and thefe may be diftinguifhed by the following fymptoms: the patient at firft generally complains of a fixed pain in fome part of the thorax, attended with heat, quick pulfe, and other fymptoms of inflammation; refpiration becomes oppreffed; he is unable to lie on the found fide; or, if both fides be affected, can only lie on his back; has a conftantly tickling cough, clammy fweats, frequent rigors or fhiverings. If thefe fymptoms be attended with an enlargement of the affected fide, or with a foft œdematous fulnefs there, and, along with thefe, if there be a fenfible undulation of a fluid, it may be concluded that a collection of matter is formed. The matter is commonly firft formed in the fubftance of the lungs, and is afterwards difcharged into the cavity of the pleura, though in many inftances large quantities of purulent matter have been found to originate from an inflamed ftate of the pleura.

The operation ought to be performed as foon as there is evidence of the collection being the caufe of the oppreffed breathing, and that there are no figns of this being relieved by expectoration. The operation ought to be done upon the part where the collection is fuppofed to be fituated; and this may be known by the feat of the previous pain, and perhaps by the matter being diftinguifhed between two of the ribs. If no matter flow, it is probably feated in the fubftance of the lungs; but even in this cafe, fuch an opening may be ufeful, by taking off the fupport, and giving the abfcefs an opportunity of burfting. If the undulation of the fluid be general, the operation is to be performed in the following manner: the patient is to be laid in an horizontal pofture, with the affected fide inclining a little over a table. An incifion is then to be made with a fcalpel through the fkin and cellular fubftance, between the fixth and feventh ribs, and half way between the fpine and fternum, from one to two inches in length, and in the direction of the ribs. The mufcles are then to be cut through, keeping as near as poffible to the upper edge of the inferior rib to avoid wounding the intercoftal veffels and nerves. As there is no occafion for the bottom of the wound being of the fame length with the external incifion, it may be gradually contracted, fo as at laft to be only about the half. The pleura being now expofed, is to be divided by flight fcratches, taking the affiftance of a furrowed probe to prevent the lungs from being injured, in cafe they fhould be found adhering to the ribs. If the contrary takes place, the fluid will rufh out immediately upon a fmall opening being made into the cavity of the thorax; but if an adhefion appear,

and if it be flight, which may be known by the introduction of a blunt probe, as much of it may probably be feparated as to allow the fluid to efcape. In cafe it be confiderable, the incifion is either to be continued a little nearer to the fternum, or an attempt made in fome other part. After the fluid is obferved to flow, it will be proper to introduce a filver canula, fig. 69. at the opening; by which means it will run more readily off, or can be more eafily ftopped in cafe the patient become faint. If the quantity of fluid be not confiderable, it may generally be drawn off at once; but if it be great, partial evacuations ought to be made at different intervals, as circumftances may direct.

The canula therefore fhould be fo formed, that by means of a ftrap put round the body of the patient, it can be readily fecured. Its mouth is to be fhut by means of a cork. A pledget of emollient ointment is to be laid over the wound; and the whole being fixed by a napkin and fcapulary bandage, the patient fhould be laid to reft. The remainder may be drawn off, probably in a day or two, or as foon as it is fuppofed the patient can bear it. After the fluid is carried off, the canula is to be withdrawn and the wound healed; or in cafe the operator be afraid of bad effects being produced upon the lungs by irritation from the canula, though of this there will be little danger, as the lungs will generally be out of its reach, the fkin may be fo drawn back before the firft incifion is made as afterwards to ferve the purpofe of a valve. And for fome days after the operation, the incifion in the integuments may be brought oppofite to that in the pleura, to allow the matter to run off, or to produce a radical cure by exciting a certain degree of inflammation over the lungs and infide of the thorax.

After the matter is evacuated, the wound ought to be kept open a confiderable time for the purpofe of difcharging the matter as faft as it is collected. If the wound be apt to heal up too foon, which will be known by the fymptoms of oppreffion being renewed, it will be proper to keep the paffage open by tents, or to intrroduce a bougie or filver canula a few hours occafionally, till the fource of the matter be dried up; which, however, feldom happens for a confiderable time, and frequently never. By attending to this circumftance, the patient may enjoy good health; whereas, by the neglect of it, a repetition of the firft operation would foon be neceffary.

CHAP. XXII. Of PARACENTESIS of the ABDOMEN.

This operation is an opening made into the abdomen, in order to empty any quantity of extravafated water collected in that fpecies of dropfy called the *afcites*.

A fluid in the cavity of the abdomen is difcovered by the fwelling which it produces; by a fenfe of tightnefs in the part affected; by laborious and difficult breathing, efpecially when in the horizontal pofture; but particularly by a fenfe of fluctuation being communicated to the fingers placed on one fide of the abdomen, while the fwelling is forcibly ftruck on the oppofite fide. There is befides much thirft, a dry fkin, fcantinefs of urine, &c. Whatever may be the influence of diuretics and other evacuations in the cure of general dropfical affections, they are rarely ferviceable in local difeafes of this kind, and even the operation of tapping feldom cures the diftemper; but it commonly gives the patient eafe for the prefent time, and is attended with very little pain.

Upon the fuppofition that nothing forbids the extraction of the water, the manner of operating is this: having placed the patient in a horizontal fituation, as beft fuited to prevent fainting, and to allow the water to run freely off, the part to be perforated ought to be marked with ink; and the moft approved part for the operation feems to be at a point lying at nearly an equal diftance between the umbelicus and the centre of the fpine of the os ilium, this being moft out of the way of any of the vifcera, and fufficiently depending to allow the water to efcape; and as the fpleen is lefs frequently enlarged than the liver, the left fide is generally preferred. Various means have been ufed for applying an equal preffure in this operation. Some apply preffure by the hands of affiftants; others ufe a broad piece of flannel, or other kinds of cloth, flit a certain way from each end; then the ends are drawn by affiftants till fufficient preffure is made. Broad belts are ufed by fome practitioners; but one of the beft contrivances for this purpofe is the bandage invented by the late Dr. Monro. Till of late years, a puncture was firft made with a lancet, then a trocar of the common round form with a triangular point, was conftantly ufed: but the entrance of this inftrument being always attended with difficulty and pain, a flat trocar is now employed; and that invented by Mr. Andree (Plate 25. fig. 56.) feems the beft which has yet appeared. The bandage being now applied and drawn a little tight, the part to be punctured is to project a little over the edge of the bed. The operator fixes the head of the trocar in the palm, while the fore finger directs the point of the inftrument. He is then to pufh it forwards till he is fatisfied, by the want of refiftance, that the end of the canula has reached the cavity of the abdomen. The perforator is now to be withdrawn, and the water allowed to flow as long as any of it can be taken off, the bandage being from time to time pulled to favour the difcharge. But if the patient become faint, a ftop for a few minutes fhould be put to the difcharge every now and then, by placing the point of the finger upon the mouth of the canula. If any of the vifcera happen to ftop the flow of the water before the fwelling is much diminifhed, a blunt probe is to be introduced, but bent at the end, left it flip into the cavity of the abdomen. When the ferum is thick and gelatinous, it may fometimes be neceffary to introduce a larger trocar than the one firft employed. When the water does not flow, becaufe it is collected into cifts, the canula is to be withdrawn, and the wound covered with a pledget of fimple ointment. The operation may then be renewed immediately, or on the following day, upon the oppofite fide of the abdomen, or in the moft depending part of the tumor, in whatever part of the abdomen it may be placed.

During the operation it is neceffary to keep up a preffure on the abdomen, otherwife the patient will be apt to fall into faintings from the weight on the great veffels of the abdomen being taken off, and the finking of the diaphragm fucceeding, in confequence of which more blood flows into the inferior veffels than ufual, the fuperior ones are left too empty, and thus the regular progrefs of the circulation is interrupted. To obviate this, the preffure muft not only be made during the operation, but be afterwards continued. As to the dreffing, it has been already mentioned, that the wound may be covered with a pledget of fimple ointment; but between the fkin and the roller fome recommend a piece of flannel dipped in brandy or fpirit of wine to be applied. The bandaging in this manner may even have fome effect in preventing a return of the diforder. When the water again collects, the operation fhould be repeated whenever the fwelling has acquired a confiderable fize: and though this operation does not always effect an abfolute cure, yet it fometimes preferves life a great many years, and even a comfortable one, efpecially if the waters have been long collected.

After the operation, practitioners advise the abdomen to be frequently rubbed with astringent spirituous applications. This cannot be done for the first two days after the operation, as it would then be improper to remove the bandages; but after that time, they may be removed daily, for about a quarter of an hour; and camphorated spirit of wine, or other applications which may have a similar effect, may be applied with strong friction over the abdomen, the body being kept during this period in the horizontal situation, and the bandage applied immediately after the friction is finished.

Sometimes, instead of water, we find air contained in the abdomen; and the inflation is of two kinds: first, that in which the air is contained in the intestines; in which case the patient has frequent explosions of wind, with a swelling of the belly frequently unequal. Secondly, where the air is collected in the cavity of the abdomen; and here the swelling is more equal, without any considerable emission of air. In both varieties of the disease the swelling is more tense than where water is contained, and the belly sounds when struck, and affords to the touch and pressure nearly the same sensation as is received from a bladder filled with air. Of these two disorders the former is by much the most common. Many extensive practitioners have never met with an instance of true abdominal tympanites. A few well-authenticated cases, however, have occurred, where the air was collected between the containing and contained parts of the abdomen. In some of them the air was found to have escaped by a small hole in the intestines, from which it has been supposed that the other cases were of the same nature. When the symptoms become urgent, there is as much necessity for discharging the air as for drawing off the water in cases of dropsy. The pressure and perforation are to be made in the same manner as directed for ascites, with this difference only, that a trocar of the very smallest size ought to be used; for by it the air can be as easily discharged, and the wound will heal more readily than when a large opening is made. After the air has been extracted, the treatment ought to be nearly the same as that recommended in cases of ascites.

CHAP. XXIII. Of HERNIÆ.

Sect. I. *Of* Herniæ *in general.*

The name of *hernia* might with propriety be applied to every swelling occasioned by the dislodgment of parts from those boundaries within which, in a state of health, they are contained; but the general acceptation of the term implies a tumor produced by the protrusion of some part or parts from the cavity of the abdomen.

The parts in which herniæ usually appear are the groin, scrotum, labia pudendi, the upper and fore part of the thigh, the umbilicus, and different points between the interstices of the abdominal muscles. If the situation of such tumors be various, the viscera which produce them are still more so; instances having occurred of the stomach, uterus, liver, spleen, and bladder, being found to form their contents. But a part of the intestinal canal, or a portion of the omentum, are from experience known to be the most frequent cause of their formation.

From these circumstances of situation and contents, all the different appellations are derived by which herniæ are distinguished. Thus they are termed *inguinal, scrotal, femoral, umbilical,* and *ventral;* from their appearing in the groin, scrotum, thigh, navel, or belly. When the tumor is confined to the groin, the hernia is said to be incomplete, and is termed *bubonocele*; but when the swelling reaches down to the bottom of the scrotum, the rupture is then supposed to be complete, and the disease obtains the name of *scrotal rupture,* or *oschiocele.*

Of these disorders the inguinal hernia is by much the most frequent; next to that is the femoral. The umbilical is seldom observed in men, or even in women who have not born children.

The causes which tend to the production of hernia in its more usual form are these:

1. The containing parts of the abdomen we know to be elastic and compressible; whatever, therefore, tends to produce a diminution of capacity in the cavity of the abdomen, must occasion a proportional degree of risk of some of the contained parts being pushed from their natural situations. Violent coughing, crying, laughter, or great bodily exertion, are attended with more or less contraction of the abdominal muscles, and particularly of the diaphragm; and as the contraction of these muscles must always diminish the abdominal cavity, these causes therefore are frequently found to be productive of hernia.

2. Falls, in consequence of the derangement they produce in the abdominal viscera, from the sudden and violent shock with which they are often attended, are not unfrequently the immediate causes of hernia.

3. Persons of a preternatural laxity of frame are very liable to herniæ. The containing parts of the abdomen, from the want of sufficient tone and firmness, are unable in such people to resist on all occasions the weight of the different viscera; and they are therefore more particularly exposed to disorders of this kind on the slightest application of any of the causes already mentioned.

4. Sprains are apt to induce a laxity of the part injured; and have therefore a similar influence in inducing herniæ with general laxity.

5. It has been observed that the people of those countries where oil is much used as an article of diet, are particularly liable to herniæ.

In whatever parts the parietes of the abdomen happen to be weakest, these various causes will most readily operate in producing herniæ; and accordingly we find, that descents of the bowels usually occur only in such parts.

In whatever situation a protrusion of any portion of the intestines occurs, except in the case of the hernia congenita, as all the viscera are contained within the peritonæum, a portion of that membrane, it is evident, must be carried down together with the parts protruded; and in every such instance, it is this portion of the peritonæum which goes down along with the gut, that is termed the *hernial sac.* The size of this sac is various in different subjects, and in different stages of the same disorder. On the first appearance of the disease, it is commonly of no very considerable size, as such swellings seldom acquire any great bulk at once: but by repeated descents of the bowels, it comes to be pushed lower and lower, till in some instances its bulk becomes very considerable indeed; and when in this advanced period of the disorder the sac happens to be laid open, it is found to contain either large quantities of omentum or intestine, and frequently large portions of each. As the peritonæum has this property in common with many other parts of the body, of thickening according to the degree of any gradual extension applied to it, so in many instances the thickness and firmness of the hernial sac are often really astonishing.

All the bad symptoms which are found to occur in herniæ, proceed, as may be readily supposed, either from obstruction to the passage of the fæces when the intestinal canal forms the tumor, or from a stoppage of circulation occasioned by stricture on the prolapsed parts: so that the

attending fymptoms, it is evident, will be always more or lefs hazardous according to the nature of the parts fo protruded.

Thus, when omentum alone forms the fubftance of hernial fwellings, as that organ does not appear to be fo immediately neceffary for life as many of the other vifcera, fuch tumors accordingly are not fo frequently productive of bad confequences, at leaft they are feldom in any degree fo hazardous as when a part of the alimentary canal is either protruded by itfelf or along with omentum.

Although this, however, is in general the cafe, yet it does fometimes happen, that even an omental rupture is productive of no fmall degree of danger. When a ftricture fo complete upon it occurs as to occafion a ftoppage of circulation in the protruded part, mortification with all its bad confequences muft be the certain event: and befides, the connection between the omentum, ftomach, and other vifcera, is fuch, that a fudden defcent of any confiderable portion of the former fometimes brings on vomiting, hickup, and other troublefome fymptoms: and laftly, although a rupture containing omentum only might not of itfelf produce any thing bad; yet as the paffage through which the omentum has flipped muft of neceffity continue open fo long as that vifcus remains protruded, and as that circumftance alone muft, fo long as it continues, render it more eafy for a portion of gut likewife to get down, this of itfelf is a fufficient reafon for entitling even this fpecies of hernia to the ferious attention of practitioners.

But whatever the contents of fuch fwellings may be, as their remaining in fome inftances for a confiderable length of time without being productive of any bad fymptoms, muft proceed entirely from the circulation continuing to go freely on, notwithftanding the derangement of parts; fo, whenever a ftricture occurs up the protruded vifcera, fufficient to produce either a ftoppage of the circulation, or of the fæcal contents of the alimentary canal, when a portion of gut forms the difeafe, the following in general are the fymptoms which accrue.

An elaftic colourlefs fwelling is obferved at the part affected; a flight pain is felt not only in the fwelling itfelf, but, if part of the alimentary canal is down, an univerfal uneafinefs is perceived over the whole abdomen; and this pain is always rendered worfe by coughing, fneezing, or any violent exertion. The patient complains of naufea; frequent retching; can get no difcharge by ftool; becomes hot and reftlefs; and the pulfe is commonly found quick and hard. When the fwelling is formed entirely by a portion of gut, if no fæces be contained in it, it has a fmooth, equal furface; and is eafily compreffible, but inftantly returns to its former fize on the preffure being removed: but, in gut-ruptures of long ftanding, where hard fæces have collected in the protruded bowels, confiderable inequalities are detected. When again the tumor is compofed both of gut and omentum, its appearance is always unequal, it feels foft and fomewhat like dough, and of courfe is not fo elaftic as when part of the inteftinal tube only is down; for although, like the other, it is compreffible, it does not fo readily regain its former dimenfions on the preffure being taken off.

It will be readily fuppofed, that the fymptoms we have defcribed never can happen from the prefence of omentum *only*: for although ftricture produced on a portion of omentum, even when no part of the inteftinal tube is down, does now and then occafion a good deal of diftrefs, fuch as pain in the part, ficknefs, vomiting, and twitching pains through the whole belly; yet no obftruction of the gut ever occurs from this, and of courfe none of the fymptoms ever prove fo alarming as when any part of gut is affected. If the fymptoms defcribed as being produced by a ftrangulated gut, are not obviated by a removal of the ftricture which produced them, the naufea and retching terminate in frequent vomitings, firft of a bilious, and afterwards of a more fetid matter; the belly becomes tenfe; the pain turns more violent; a diftreffing convulfive hickup comes on; the fever, which before was not apparently of much confequence, now becomes very formidable; and a total want of reft, with a very difagreeable ftate of anxiety, continues through the whole courfe of the complaint. Thefe fymptoms having gone on with violence for fome time, the patient is at laft commonly relieved on a fudden from all manner of pain; and then he flatters himfelf that all danger is over. But inftead of that, the pulfe, from having been hard and frequent, becomes languid and interrupted; cold fweat breaks out over the whole body, but efpecially on the extremities; the eyes acquire a kind of languor; the tenfenefs of the abdomen fubfides, and the fwelling of the part affected difappears; the teguments covering the parts, which before were either of a natural appearance, or had fomewhat of a reddifh inflamed caft, now acquire a livid hue, and a windy crepitous feel is diftinguifhable all over the courfe of the fwelling. If the protruded parts have not of themfelves gone entirely up, their return is now in general eafily effected by a fmall degree of preffure, and the patient then difcharges freely by ftool; but the cold fweats increafing, the hickup turns more violently, and death itfelf is at laft ufhered in by its ufual forerunners, fubtultus tendinum, and other convulfive twitchings.

Thefe are the ordinary fymptoms of what is termed a *ftrangulated* or *incarcerated gut-hernia*: that is, when the parts protruded become fo affected by ftricture as to produce pain; and do not either return to their natural fituations on the patient's getting into a horizontal pofture, or cannot even be immediately replaced by the hands of a practitioner.

In whatever fituation a ftrangulated hernia occurs, the only rational method of cure, it is evident, muft confift in the removal of that ftricture which prevents the return of the protruded parts. It is that ftricture which ought to be confidered as the caufe of all the mifchief; and unlefs it be removed, nothing effectual can be done for the relief of the patient.

Various methods have been attempted by practitioners for the removal of ftricture in thefe diforders; all of which may be comprehended under two general heads.

1. Such as effect a reduction of the protruded parts, without the interpofition of incifion or any chirurgical operation properly fo called; and,

2. A divifion of the parts producing the ftricture, fo as to admit of a replacement of the deranged vifcera, conftituting what is termed the *operation for the hernia*.

The remedies to be employed for accomplifhing the firft of thefe are, a proper pofture of the patient, with the manual affiftance of a practitioner; blood-letting, ftimulating clyfters, opiates, the warm bath, and proper applications to the tumor itfelf. If thefe fail, there is then no other means of cure left but the operation of dividing the integuments, and replacing the vifcera.

As foon as the affiftance of a practitioner is defired for the removal of fymptoms in cafes of hernia, the firft circumftance requiring his attention is the placing of his patient in fuch a pofture as will moft probably favour the return of the protruded parts. Placing the patient's feet over the fhoulders of another perfon, while his body is allowed to hang downwards, and caufing him to be a good deal jolted about, has on fome occafions anfwered when other means have failed.

The furgeon fhould at the fame time endeavour to affift the

return of the bowels by means of gentle preſſure with his hands and fingers. In the inguinal or ſcrotal hernia, this preſſure ſhould be made obliquely upwards and outwards to correſpond with the opening in the external oblique muſcle: in the femoral hernia it ought to be made directly upwards; in the umbilical and ventral hernia directly backwards.—The ſwelling ſhould be graſped with one hand at the bottom, while with the fingers of the other hand an attempt is made to puſh gently the contents of the tumor into their place, always obſerving that the parts laſt protruded be firſt reduced. This operation is by authors termed the *taxis*.

When the means now mentioned have failed, no remedy affords more relief than blood-letting. The quantity to be drawn ought chiefly to be determined by the ſtrength of the patient. There is ſcarcely any diſeaſe, however, where ſuch large quantities of blood can with propriety be taken from weak people. Bleeding till the patient is in a ſtate of deliquium animi, is frequently known to produce a more effectual relaxation of the muſcles than can be done by any other means. On that account it is ſometimes adviſed in caſes of hernia, and the practice is now and then attended with advantage.

As an obſtinate coſtiveneſs is commonly one of the moſt alarming ſymptoms of hernia, it has been a common practice to exhibit a variety of ſtimulating purgatives both by the mouth and anus; but they are very ſeldom of much ſervice, and in that caſe almoſt univerſally do injury, by increaſing not only the ſickneſs at ſtomach, but the tenſion and pain of the tumor. When they are to be employed, they ought to be thrown up by the anus. For this purpoſe aloes and other ſtimulating ſubſtances, but particularly tobacco-ſmoke, are employed; and although this laſt remedy, which is to be thrown in by double bellows, &c. does not always act as a purgative, it may be uſefully employed as an anodyne. Where an evacuation by ſtool is wanted, it may in general be readily procured by the injection of warm water, in which a little Caſtile ſoap is diſſolved, in the proportion of a drachm or a drachm and a half of the latter to a pound of the former. Warm bathing is another remedy greatly extolled, either by general immerſion or local application, by means of warm water put into ox-bladders covered with flannel, and laid acroſs the abdomen.

To diminiſh the ſize of the tumor, remedies of an oppoſite quality from theſe have been uſed; and though by ſome this practice has been conſidered as hazardous, yet by others, particularly by the late Dr. Monro and Mr. Benjamin Bell, more advantage has been found from cooling applications than from thoſe of a different nature. Snow, ice, or cloths dipped in a recent ſolution of ſal ammoniac in water and vinegar, or cold ſaturnine applications, or cold water and vinegar, have been employed with advantage. If, notwithſtanding theſe remedies, the diſeaſe becomes worſe, and no probability remains of ſucceſs, the diviſion of the parts producing the ſtricture can alone ſave the life of the patient.

To determine the *exact time at which to proceed to an operation*, has been conſidered as one of the niceſt points in ſurgery. In general, when every attempt has failed, and no repetition of the former remedies is likely to ſucceed, the ſurgeon ought certainly to proceed to the operation. A few hours, even when aſſiſtance has been early applied, is perhaps all the time which ought ever to be conſumed in trials of this nature. But however neceſſary this operation may be when a patient's life is in danger, as it is always attended with ſome degree of hazard, it ought never to be practiſed where ſymptoms of ſtrangulation do not exiſt.

In that kind of hernia called *chronic*, the circulation of the part forming the hernia, as well as the periſtaltic motion of ſuch parts of the alimentary canal as have been protruded, go freely and regularly on. There are many inſtances of large hernia falling down even to the bottom of the ſcrotum, and continuing there for many years, without producing any interruption to the uſual diſcharge by ſtool. All that can be done here is, to prevent any accumulation of fæces in the inteſtine, by preſcribing a proper diet, and the occaſional uſe of gentle laxatives; and obviating any inconvenience which might ariſe from the weight of the tumor, by the application of a proper truſs or ſuſpenſory bandage; to warn them of the riſk to which they are conſtantly liable, and to caution them againſt violent exerciſe, particularly leaping, and every ſudden exertion. The truſs ought to be fitted exactly to the part for which it is intended, for without the utmoſt nicety in this reſpect, it muſt always do more harm than good: for the ſole purpoſe of a bandage, in caſes of hernia, is to prevent effectually the falling down of ſuch parts as have been newly replaced. If therefore the pad or bolſter of the bandage does not bear properly againſt the opening upon which it is placed, a portion of gut may ſlip out, and be materially injured by the preſſure of the pad. Fig. 58. in Pl. 25. repreſents a truſs for an inguinal or femoral hernia of one ſide, fig. 59. a truſs for the ſame diſeaſe in both ſides, and fig. 60. a truſs for an umbilical hernia.

The circumſtances to be attended to in *performing the operation for hernia* in general are theſe. A table of convenient ſize and height being placed in a proper light, the patient muſt be ſo laid on it as to relax the diſeaſed parts as much as poſſible, and then ſecured by proper aſſiſtance. To leſſen the contents of the abdomen as much as poſſible, the bladder ought to be emptied previous to the operation. An inciſion is to be made with a common round-edged ſcalpel through the ſkin and part of the cellular ſubſtance, long enough to allow the ſtricture to be fully expoſed. The reſt of the cellular ſubſtance is then to be divided with the greateſt attention. That part of the muſcle forming the ſtricture or ring muſt next be laid diſtinctly in view. A ſmall portion of the protruding ſac muſt alſo be expoſed; after which the directory (fig. 57.) is to be paſſed between the ring and the ſac. A ſtraight probe-pointed ſcalpel is now to be introduced into the groove of the directory, and by it the ring is to be dilated till the point of the finger can be introduced. The finger is here conſidered as the ſafeſt director; for it being inſinuated into the aperture in the tendon, immediately above the protruded parts, the point of the knife is eaſily introduced upon it; and by keeping the end of the finger always a little before the knife, the opening may be enlarged to any neceſſary extent without riſk of wounding any of the contiguous parts.

By the eaſe with which the finger is introduced, the operator will be enabled to judge when the ring is ſufficiently dilated; and if the ſtrangulation was entirely in the ring, it will now be evident that every obſtacle to the reduction muſt be removed, and of conſequence that the prolapſed parts may be returned with little difficulty. If the patient be young, or, if the diſeaſe has continued a conſiderable time, ſuch a degree of inflammation frequently enſues in the neck of the ſac as to produce thickening and ſtraitneſs; ſo that, after the ſac and its contents have been entirely freed from the ſtricture of the ring, the inteſtines cannot be reduced. We judge this to be the caſe, when after the ſtricture of the ring has been removed, the parts prolapſed do not expand into their natural ſize, and farther, when they make reſiſtance when we attempt to return them. In this caſe, the neck of the ſac muſt be opened with the utmoſt caution, to avoid wounding the parts within it.

If the herniary ſac, under the ſtraitened place of its neck, be thin and tranſparent, and there is little or no reaſon to ſuſpect an adheſion of the bowels to the ſac, the beſt method, as Dr. Monro, in his publication on the Burſæ Mucoſæ, obſerves, will be to make a ſmall hole in the ſac below the ſtricture, and then to introduce a ſmall furrowed probe, and to cut cautiouſly upon it. But if the ſac be thick and dark coloured, and there is likewiſe a ſuſpicion that the bowels may adhere to it, the eaſieſt and ſafeſt manner will be to make the hole in the peritonæum above the ſtricture; then to introduce a common probe, bent near its point into a ſemicircle, with its point directed downwards through the ſtricture into the ſac; and upon the point of it to make, with great caution, another ſmall hole; after which we may either cut upon the probe, or introduce a furrowed probe, and divide the neck of the ſac.

After this, the bowels are to be returned by preſſure upon the ſac, without opening it farther; and the ſides of the wound in the ſkin are to be brought together, and kept ſo by means of ſlips of adheſive plaſter, though ſtitches made at the diſtance of a finger-breadth from each other will exclude the air, and prevent the return of the bowels more effectually. Over theſe are to be laid ſeveral folds of charpie, and the whole is to be ſecured by a bandage adapted to the nature of the part.

The patient, upon being carried to bed, ſhould be ſo placed as to have the part upon which the operation was performed higher than the reſt of his body, or at leaſt as high as the ſituation of the part operated upon will allow, in order to prevent a return of the diſeaſe. After the operation, opiates are particularly uſeful, and ought to be repeated as circumſtances may require. It is likewiſe neceſſary that the patient be kept cool. In plethoric habits, blood-letting is proper, together with a rigid attention to low diet. A frequent uſe of clyſters and gentle laxatives, to keep the belly moderately open, ought not to be neglected. When the conſtitution has been previouſly much reduced, inſtead of blood-letting and a low diet, a nouriſhing regimen is neceſſary. The dreſſings ought not to be removed till the third or fourth day after the operation, when the ſides of the wound will be found almoſt adhering together; and if attention be paid to the ſubſequent treatment, the ſore will be generally healed in two or three weeks. As ſoon as the wound is firmly cicatrized, a truſs ought to be properly fitted to the part, and ſhould never, on any future period of life, be laid aſide.

When the hernia is of *long ſtanding*, and when there is reaſon to think *adheſions* have taken place between the ſac and bowels, or that *mortification* has already begun, or that ſome filaments run acroſs the ſac and prevent the reduction, or that there is water in the ſac, or that the gut is in danger of being entangled from a part of the omentum being down, a different method of operating becomes neceſſary.

The patient is to be placed as already directed. The operator is to graſp the tumor with one hand, ſo as to make the ſkin tenſe on the fore part of it, while with the ſcalpel in the other he divides the ſkin from one end of the tumor to the other. The cellular ſubſtance is by gentle ſtrokes to be divided, till not only the ring, but the whole length of the ſac, is laid bare. An opening is now, in the moſt cautious manner, to be made into the ſac by ſlight ſcratches, to avoid hurting any of its contents.

In making this perforation, which is conſidered as the niceſt part of the operation, conſiderable aſſiſtance is obtained from the uſe of the ſmall directory, upon the point of which the fibres of the ſac are to be ſucceſſively raiſed and divided till an opening is made. The opening is to be enlarged till it admit the fore-finger of the left hand, which ſerves as a directory for conducting the ſtraight probe-pointed ſcalpel with which the ſac is to be divided through its whole length.

The ſac being laid fully open, the parts contained in it ought to be examined with the niceſt attention, to diſcover whether they are all ſound or not; and if, upon an attentive inſpection, it is found that they are not evidently in a gangrenous ſtate, even although they ſeem conſiderably inflamed, they ſhould be immediately returned into the abdomen. When adheſions take place between different parts of the protruded gut, the greateſt caution is neceſſary in ſeparating them. When one part of a gut adheres ſo firmly to another as not to be ſeparated but with difficulty, it is much better to return the whole, even in that ſtate, into the abdomen, than to run the riſk of hurting the inteſtine materially by uſing much force. When adheſions occur between the hernial ſac and the gut, or between the gut and omentum, if the filaments producing the connection cannot be otherwiſe removed, as there is no great hazard in wounding the omentum, and ſtill leſs in hurting the ſac, a very ſmall portion of theſe may be diſſected, and returned with the gut into the abdomen. When the bowels cannot be reduced with eaſe, the ring is to be dilated by the blunt-pointed ſcalpel in the manner already directed. After returning the contents of the ſac into the cavity of the abdomen, it has been propoſed by ſome authors to paſs a ligature round the neck of the ſac, with a view of procuring a reunion of its ſides, ſo as to prevent a future deſcent of the bowels; and various other methods, even actual and potential cauteries, have been propoſed: but as none of them yet attempted have been found ſufficiently to anſwer the purpoſe, the only thing that can be recommended is a well made truſs.

When the bowels are actually *in a ſtate of gangrene*, as the returning of ſuch mortified parts might be attended with the very worſt conſequences, a great degree of caution is neceſſary. When the omentum is found in a mortified ſtate, as the exciſion of a portion of this ſubſtance is not attended with much riſk, it is the common practice to cut away the diſeaſed parts, and to obviate any inconvenience which might enſue from the hæmorrhagy. We are adviſed to make a ligature on the ſound parts previous to the removal of thoſe which are mortified; whilſt the ends of the ligature being left hanging out of the wound, the ſurgeon has it in his power to remove them when circumſtances appear to render it proper. Theſe ligatures on the omentum, however, are frequently productive of bad conſequences. No hæmorrhagy of any importance ever occurs from a diviſion of this membrane, even in a ſound unmortified ſtate; ſuch parts as have becom gangrenous may therefore be freely cut off, and the remaining ſound parts be afterwards, without the intervention of ligatures, ſafely introduced into the abdomen. If a veſſel of any ſize in the omentum has been divided, a ligature may be paſſed above the veſſel itſelf, and the ends left hanging out of the wound; the threads may be afterwards pulled away at pleaſure. When a rupture has been of long duration, it ſometimes happens, that from the preſſure made by the truſs, and other circumſtances, portions of the omentum are collected together into hard lumps. If theſe be ſmall, they may be returned into the abdomen without producing any inconvenience; but if from their bulk and hardneſs they are likely to do miſchief, they ought to be cut off. When part of the omentum is to be removed, it ought to be previouſly expanded and divided with ſciſſars, which will be more convenient than any other inſtrument. When again a ſmall portion of gut is found mortified, we are to endeavour, by means of a needle-ligature, to connect the ſound part of the gut immediately above the mortified ſpot to the wound in the abdomen already made. By this means, when the mortified part ſeparates, or perhaps

what is better, when it has been immediately cut out, the fæces are difcharged by the wound; and there are different inftances where, after fuch a difcharge has continued for fome time, the wound has entirely healed.

But when the mortified portion of gut is of confiderable extent, and includes the whole circumference of the inteftine, all that can be done is to remove it, and to draw, by means of a ligature, the upper end of the gut towards the under, and afterwards connect them to the inner edges of the wound. This at leaft affords a chance of the ends of the gut being brought to reunite; and if unfortunately that event fhould not take place, a paffage of the fæces will ftill be fecured. All fuch mortified parts as are to be removed ought to be cut off, and the remaining found inteftine retained, before the opening in the ring can be dilated with fafety, left the gangrenous portion flip in together with the found. The parts forming a hernia being all completely replaced, when the fac in which they were contained is found thick, hard, and much enlarged, as in fuch a ftate no good fuppuration can take place, and as its prefervation cannot be in any degree ufeful, fuch parts of it as can be cut away with propriety ought to be removed. All the lateral and fore parts of the fac may be cut off with fafety; but as it is commonly firmly connected with the fpermatic veffels behind, this part of it ought not to be touched.

Sect. II. *Of* Bubonocele, *or* Inguinal *and* Scrotal Hernia.

This fpecies of hernia is formed by a protrufion of fome of the abdominal bowels through the rings of the external oblique mufcles. It is known by the general fymptoms of hernia already enumerated, and by a foft and fomewhat elaftic fwelling, beginning in the groin, and defcending by degrees into the fcrotum in men, and into the labia pudendi in women. When the hernia contains omentum only, the fwelling is both more foft, compreffible, and more unequal than when the gut alone is down; the fcrotum becomes more oblong than in the inteftinal hernia; and when the quantity of omentum is large, it is alfo much more weighty than a gut rupture of the fame fize; but frequently the tumor is compofed of both gut and omentum, and then the diftinguifhing fymptoms of each can never be fo clearly marked.

Bubonocele may be confounded with certain other difeafes; but may be diftinguifhed by the following marks which are prefent in thefe diforders, while the fymptoms of hernia are abfent: From venereal bubo, by the prefence of that incompreffible hardnefs with which all fuch fwellings are at firft attended, and by the fluidity of matter which in the fuppurative ftate is always obfervable: From hernia humeralis, or fwelling of the teftes, by the abfence of the hardened and enlarged ftate of the teftis and epidydimus, and likewife of the pain, the tumor of the tefticle being remarkably heavy in proportion to the bulk, the fpermatic procefs being commonly free from the fwelling. In the hernia humeralis alfo the inteftines are unobftructed, and the general fymptoms of hernia are wanting. From the hydrocele of the tunica vaginalis teftis, by the tumor generally feeling more fmooth to the touch than in hernia, by the fwelling here beginning in the under part of the fcrotum and afcending, by the fpermatic cord being always free and diftinct, and by a fluctuation being evident. From hydrocele of the fpermatic cord, fometimes with much difficulty, and therefore it requires here particular attention. In every cafe of tumor in the tefles. where the moft perfect certainty is not obtained, and when it is neceffary to have recourfe to an operation, the furgeon ought to proceed as in a cafe of real hernia.

The treatment of bubonocele is the fame with that already advifed in the treatment of hernia in general, only making allowance for the fituation of the difeafe. In attempting the reduction by means of the hand, the preffure fhould be obliquely upwards and outwards, correfponding with the ring of the abdominal mufcle. In performing the operation, the patient fhould be laid on a table, with his head and body almoft horizontal, whilft at the fame time his buttocks are fomewhat elevated by pillows placed beneath them. The legs hanging over the edge of the table ought to be feparated, fo as to admit the operator between them; and fhould in that fituation be firmly fecured by an affiftant on each fide, who fhould take care to keep the thighs fo far raifed as to relax all the abdominal mufcles. The parts being previoufly fhaved, an incifion muft be made with a common round-edged fcalpel through the fkin and part of the cellular fubftance, beginning at leaft an inch above the fuperior end of the tumor, and continuing it down to between two and three inches below the ring.

Although in by much the greateft proportion of hernial fwellings the fpermatic veffels lie behind the protruded parts, yet on fome occafions they have been found on the anterior part of the tumor; fo that in order to avoid the rifk of wounding them, as foon as the fkin is divided, the remainder of the operation ought to be done in the moft cautious manner, care being taken to avoid every large blood-veffel which makes its appearance. The ring muft now be laid diftinctly in view; a fmall portion of the protruding fac muft alfo be expofed; after which the directory is to be introduced between the ring and the fac, placing the point of the inftrument obliquely upwards and outwards. A blunt-pointed biftoury is now to be introduced into the groove of the directory, and by it the ring is to be dilated till the point of the finger can be introduced. The directory is now to be laid afide, and the finger ufed in place of it through the reft of the operation. After the operation is finifhed, the dreffings are to be applied, and the whole fecured by a T bandage, or fufpenfory bag, properly ftuffed with foft lint.

The patient, on being carried to bed, fhould have a pillow under the buttocks, to elevate them a little above the reft of the body, and fhould be treated in the manner which has been already directed. As foon as the wound is firmly cicatrized, a trufs ought to be properly fitted and ufed through the reft of the perfon's life. Females are liable to this fpecies of rupture as well as men; and as the opening in the external oblique mufcles is exceedingly fimilar in both fexes, the treatment of this fpecies of hernia in females is very fimilar to what is found to anfwer in men. When clyfters, blood-letting, and the other remedies formerly enumerated, fail, the fame operation of enlarging the opening in the tendon of the oblique mufcle is here equally proper as in the other fex.

As modeft women are apt to conceal diforders of this kind, they may frequently happen when the furgeon receives no information about them. Whenever, therefore, fuch fymptoms of colic occur as give reafon to fufpect the exiftence of hernia, a particular examination ought always to be made, in order, if poffible, to detect the caufe of the mifchief, from the removal of which alone a cure can be expected.

Sect. III. *Of* Hernia Congenita.

The teftes in the fœtus are, till near the time of delivery, lodged in the cavity of the abdomen. When they defcend into the fcrotum, they pufh before them a portion of the peritonæum, which afterwards forms the vaginal coat. The paffages by which they defcend are foon fhut up; but fometimes the contrary happens, and then a portion of fome of the

abdominal viſcera paſſing down, forms that ſpecies of hernia to which new-born infants are liable, termed by Haller the *hernia congenita*. The teſticle and protruded inteſtine being here in contact with one another, the tunica vaginalis teſtis forms the hernial ſac.

It has been affirmed by ſome of the lateſt writers, that hernia congenita cannot be diſtinguiſhed from that contained in the common herniary ſac; and that though there was a diſtinction, it could be of no material uſe in practice. But Dr. Monro obſerves, that a hernia congenita may be diſtinguiſhed in an adult by an evident external mark; which is, that the bowels puſh down between the ſac and the fore-part and ſides of the teſticle, ſo as often in a great meaſure to conceal it; whereas, in the common hernia, every part of the teſticle can be felt diſtinctly: and that it is of material uſe to make the diſtinction; becauſe in whatever manner we operate in hernia congenita, unleſs we take the utmoſt care to exclude the air, there will be a more violent inflammation and greater diſtreſs than in common caſes, becauſe the teſticle will partake of the inflammation.

In the *treatment* of ruptures of the *congenital kind*, little difference occurs from the management of the common ſcrotal hernia; only a truſs ought never to be applied to infants, unleſs the teſticle can be felt in the ſcrotum, after the contents of the hernia have been reduced; as it would entirely prevent the deſcent of the teſticle, which yet remains in the abdomen. If any operation has been performed, the teſticle ſhould, immediately after the bowels are reduced, be covered with the vaginal coat, and at each dreſſing care ſhould be taken that the air be excluded. In every other reſpect the treatment of congenita hernia is the ſame with that of hernia in general.

Sect. IV. *Of* Femoral *or* Crural Hernia.

The ſeat of this ſpecies of hernia is upon the upper and fore part of the thigh; the protruded bowels paſſing out at the ſame opening through which the large blood-veſſels of the thigh are tranſmitted from the abdomen, and of conſequence under that part of the tendon at the under end of the abdomen known by the name of *Poupart's* or *Fallopius's ligament*. Sometimes the bowels which protrude are ſituated immediately over the femoral veſſels, ſometimes on the outſide of theſe, but more frequently they lie upon their inner ſide. The diſeaſe is more frequent in women than in men, on account of the width of the female pelvis, and of conſequence the length and laxity of the ligament. The femoral hernia is more in danger of being confounded with inguinal hernia than with any other; the tumor, however, is deeper, and the ring of the abdominal muſcles, which lies entirely above the tumor in femoral hernia, completely ſurrounds the parts in that of the inguinal kind.

In the *treatment of femoral hernia*, when ſymptoms of ſtrangulation occur, we muſt uſe all the remedies commonly practiſed for hernia in general; only that here, in attempting to reduce the parts by the hand, the preſſure ſhould be made directly upwards. An inciſion of ſufficient length is to be made through the integuments, ſo as to allow that part of the tendon which forms the ſtricture to be laid fairly in view; and after dividing the integuments, we are cautiouſly to cut the faſcia lata of the thigh, and ſeparate any glands which may come in the way till the ſtricture and part of the ſac diſtinctly appear. The ſtricture is then to be divided, by cutting fibre after fibre ſucceſſively. The ſpermatic veſſels in the male, or round ligament in the uterus in the female, may be avoided by cutting in a direction towards the umbilicus, carefully dividing the tendon tranſverſely. Some authors, from a ſenſe of the danger attending this part of the operation, have recommended merely to dilate the paſſage, inſtead of dividing the tendon; but in ſuch a ſituation, to attempt a farther dilatation without the aſſiſtance of the knife, would probably be ſeldom attended with any advantage. After the parts are reduced, the wound is to be dreſſed as directed in the treatment of hernia in general: a piece of thin leather ſpread with ſome adheſive plaſter retains the dreſſings better, and with much more eaſe, than any other bandage.

Sect. V. *Of* other Species *of* Hernia.

In umbilical hernia the parts protruded paſs out at the umbilicus, and are commonly the inteſtines, or omentum, or both; ſometimes part of the ſtomach, the liver, and even the ſpleen, have been found in the ſac. Here, as in other ruptures, the peritonæum forms the ſac, and in recent caſes it is generally very evident; but by the ſize of its contents, or a long continuance of the diſorder, it ſometimes becomes ſo connected with the ſurrounding parts, that by many its exiſtence has been doubted, and ſometimes the ſwelling has increaſed to ſuch a degree as to burſt even the ſkin itſelf. The diſeaſe occurs moſt frequently in infancy, ſoon after birth. In the adult ſtate corpulent people are more ſubject to it than thoſe of a contrary habit: and pregnant women are particularly ſubject to it, on account of the ſize of the uterus. The diagnoſis in this diſeaſe is readily made, as the diſorder can ſcarcely be confounded with any other. If the diſeaſe be attended to in due time, a bandage properly fitted will generally effect a cure; and in ſuch ſwellings as occur in pregnancy, delivery will commonly remove the diſorder; but even in caſes of pregnant women, a bandage early applied and properly uſed will give conſiderable relief, till a cure can be obtained by delivery. In this diſeaſe the omentum is more frequently puſhed out than any other viſcus; hence umbilical herniæ in general are not productive of ſuch bad ſymptoms as uſually occur in the other kinds of rupture. When, however, the inteſtines protrude, the uſual ſymptoms of a ſtrangulated hernia are apt to be induced; and when the means uſually employed for returning the gut into the abdomen do not ſucceed, a cure it is evident muſt depend entirely on a thorough removal of the ſtricture. In performing this operation, an inciſion through the integuments is the firſt ſtep to be taken, ſo as to expoſe the ſtricture of the tendon and the neck of the ſac. The ſtricture is to be removed in the manner already deſcribed; and as the tendon completely ſurrounds the neck of the ſac, the ſtricture may be cut wherever it can be moſt readily dilated. A radical cure ſimilar to that for the other ſpecies has been propoſed, but with as little probability of ſucceſs.

Ventral rupture is a protruſion of ſome of the bowels through the interſtices of the abdominal muſcles, and is moſt frequently obſerved in ſome of the parts moſt contiguous to the linea alba. The treatment of this ſpecies of diſeaſe is exactly the ſame with that of exomphalos.

Hernia of the *bladder* of urine, though leſs frequent than that of the omentum or inteſtines, is not very uncommon. The ſituation in which it occurs is in the groin, through the abdominal ring, in the fore part of the thigh, under Poupart's ligament, ſo as to form inguinal or crural hernia. Inſtances have likewiſe occurred of the bladder being puſhed into the perinæum. Sometimes it occurs by itſelf, without any complication; at other times it is accompanied with inteſtines and omentum, both in inguinal and femoral herniæ: when complicated with bubonocele, the protruded part of the bladder is ſituated between the inteſtine and ſpermatic cord.

The uſual ſymptoms are a tumor, attended with fluctuation either in the groin, in the fore part of the thigh, or pe-

tinæum, which generally ſubſides when the patient voids urine. When the ſwelling is large, before water can be made with freedom, it is commonly neceſſary to have recourſe to preſſure, at the ſame time that the tumor, when in the groin or thigh, is as much elevated as poſſible; but when the ſwelling is ſmall, and eſpecially when no ſtricture is as yet produced, the patient generally makes water with great eaſe, and without any aſſiſtance from external preſſure. When the diſeaſe occurs without any complication, it is commonly owing to a ſuppreſſion of urine. In the diagnoſis care ought to be taken not to miſtake it for a hydrocele. In recent caſes, the part protruding may, in general, be eaſily reduced, eſpecially if we attend to the ſuppreſſion of urine, which probably gave riſe to the diſeaſe. A proper truſs ought afterwards to be worn for a conſiderable time. When the diſeaſe has been of long ſtanding, adheſion takes place between the bladder and cellular ſubſtance of the ſcrotum. In this caſe, therefore, as long as no ſymptoms occur to render the operation neceſſary, a ſuſpenſory bandage, ſo fitted as effectually to ſupport the prolapſed parts, is the only probable means of relief.

Sometimes the bladder, owing to a ſuppreſſion of urine, at other times part of the inteſtines, have been found to protrude through the vagina. In the former caſe a fluctuation of water is perceptible to the touch.

The reduction is made by laying the patient on her back with her loins ſomewhat raiſed, and preſſing with the forefinger from the vagina. Deſcents may in future be generally prevented, by evacuating the urine often, and by the uſe of a peſſary introduced into the vagina. Nearly the ſame means are employed in reducing the inteſtine when it is found to protrude.

CHAP. XXIV. Of HYDROCELE.

Every tumor formed by a collection of water might with propriety be named *hydrocele*, but the chirurgical acceptation of the term implies a watery ſwelling ſituated in the ſerotum or ſpermatic cord. Hydrocele is either anaſarcous or encyſted. In the former, the ſerum is chiefly diffuſed in the cellular ſubſtance: in the latter, the water is collected in a diſtinct bag. The ſcrotum, with its contents, are liable to both varieties of the diſeaſe; ſo is the ſpermatic cord with its coverings.

Sect. I. Anasarcous Hydrocele *of the* Scrotum.

As ſoon as water has collected in any conſiderable quantity in the ſcrotum, a ſoft, inelaſtic, colourleſs tumor is obſerved over the whole of it; impreſſions are eaſily received and obtained for ſome time: the ſkin at firſt preſerves its natural appearance, and the rugæ of the ſcrotum are not much altered; but as the ſwelling advances, they gradually diſappear, and are at laſt totally obliterated. The ſwelling, from being at firſt ſoft, and of a conſiſtence ſimilar to dough, by degrees turns more firm, and the ſkin at laſt acquires an unnatural white ſhining appearance. The tumor at length becomes large; and though originally confined to the ſcrotum, it at laſt ſpreads up the groin. The penis likewiſe becomes affected, and often ſo ſwelled and diſtorted as to excite much inconvenience and diſtreſs; and although the ſcrotum is compoſed of parts which readily admit of dilatation, the tumor ſometimes becomes ſo enormous that it burſts from one end to the other.

In the *ſurgical treatment* of this diſeaſe punctures made with the point of a lancet are moſt adviſable, as large ſcarifications, in anaſarcous habits, are ſometimes apt to produce inflammation and mortification; while ſimple punctures readily heal, and can be renewed with very little pain as frequently as may be neceſſary: and beſides, punctures are equally uſeful with the inciſions; for as the cells of the ſcrotum communicately freely, if the punctures be made fairly through the ſkin, the water drains off very readily, though not ſo ſoon as by ſcarification. Previous to the operation, beſmearing the part with ſome tough ointment of an innocent nature, and afterwards keeping it as dry as poſſible by a frequent renewal of dry ſoft linen cloths, in order to imbibe the moiſture, is here a neceſſary piece of attention. The want of this ſeems to be the cauſe of much of the miſchief which frequently enſues from operations of this kind. When ſcarifications or punctures go wrong by beginning to inflame and turn painful, &c. a cold ſolution of ſaccharum ſaturni, applied upon ſoft linen, proves moſt effectual in putting a ſtop to the farther progreſs of the inflammation, and affords moſt immediate relief to the patient in the preſent diſtreſs. Lime-water, employed in the ſame manner, proves alſo a very uſeful application. When, however, the diſorder proceeds to gain ground by a real mortification coming on, we ſhould immediately have recourſe to bark and other medicines uſually employed in ſuch affections.

Although the anaſarcous hydrocele, for the moſt part, depends upon a general dropſical tendency, ſome inſtances occur of a *local cauſe* producing a mere local dropſy of the ſcrotum. Thus, it has been known to happen from ſwellings in the groin and in the abdomen, obſtructing the paſſage of the lymphatics. When this is the caſe, if tumors producing ſuch obſtructions can be extirpated, no other means will afford ſuch effectual relief; but when they are ſo deeply ſeated as to render any attempt for removing them improper, the practice we have already pointed out of making punctures in the moſt depending part of the tumor muſt be employed with a view to palliate ſuch ſymptoms as occur. It ſometimes happens in ſuppreſſion of urine, whether ariſing from ſtrictures in the urethra or from ſtones impacted in it, that the urethra burſts, and the urine in this manner getting acceſs to the cellular texture of the ſcrotum, an anaſarcous ſwelling riſes immediately over the whole of it; nor does it commonly diminiſh till the cauſe by which it is produced is removed.

In order to prevent the formation of ſinuſes, which in ſuch circumſtances will otherwiſe be apt to occur, an inciſion ſhould be made into the tumor, and carried to ſuch a depth as is ſufficient for reaching the wound in the urethra. In this manner a free vent will not only be given to the urine already diffuſed, but the farther collection of it may probably be prevented. If a ſtone impacted in the urethra be found to be the cauſe of effuſion, it ſhould be cut out; and, if the obſtruction be produced by ſtrictures in the urethra, they muſt be removed by a proper uſe of bougies. The cauſe being thus removed, if the habit of body of the patient is good, and untainted with any venereal or other general affection, by dreſſing the ſore properly with ſoft eaſy applications, the opening into the urethra will probably heal, and a complete cure will in this manner be obtained. But when theſe ailments are complicated with any general affection, particularly with old venereal complaints, it frequently happens that neither mercury nor any other medicine has much influence in removing them.

Sect. II. Hydrocele *of the* Tunica Vaginalis Testis.

In the healthy ſtate of the body, a ſmall quantity of aqueous fluid is exhaled for lubricating the ſurface of the teſticle, the ſuperfluous part of which is abſorbed by veſſels ppointed for that purpoſe. When the ſecretion of this auid is either morbidly increaſed, or its abſorption diminiſhed, a preternatural collection of water is formed in the

cavity of the vaginal coat, and hydrocele of the vaginal coat produced.

The ſymptoms are, a fulneſs at firſt obſerved about the inferior parts of the teſticle, and moſt remarkable when the patient is erect, becoming gradually more tenſe as the diſeaſe advances; the tumor by degrees changing from the globular to the pyramidical form; no degree of preſſure making the ſwelling diſappear at any period of the diſeaſe. In the early part of the diſeaſe therefore, if it be not combined with hernia, or with a hydrocele of the cord, the ſpermatic proceſs may be diſtinctly felt, becauſe the ſwelling does not extend beyond the ſcrotum. In its more advanced ſtate, it cannot be diſtinguiſhed: the weight of the tumor now drags the ſkin of the neighbouring parts ſo much as to cauſe the penis almoſt to diſappear; and in this ſtate of the diſeaſe the teſticle cannot be felt without much difficulty. On a minute examination, a hardneſs is always to be felt along that part of the ſcrotum where the teſticle is ſituated; and at this point preſſure excites ſome uneaſineſs. Fluctuation of a fluid may in general be diſtinguiſhed through the whole courſe of the diſeaſe. In late ſtages, however, the appearance of a fluid is not very evident.

The tranſparency of the tumor has been generally ſuppoſed to be the principal criterion of this ſpecies of the diſorder; but this muſt depend upon the nature of the contents, or thickneſs of the ſac; ſo that, though the tranſparency of the tumor is a certain ſign of the exiſtence of water, its opacity cannot upon any account be conſidered as an indication of its abſence. Through the whole courſe of the diſeaſe the tumor is not attended with pain, but ſome uneaſineſs is commonly felt in the back by the weight of the ſwelling of the ſpermatic cord. This is more particularly the caſe when a ſuſpenſory bandage is not uſed.

In the *radical cure* of hydrocele, in whatever way it is attempted, ſome degree of fever and inflammation will take place. Under the circumſtances mentioned in the prognoſis, the operation, if properly performed, is generally attended with the moſt complete ſucceſs. But if the patient be very old, infirm, and diſeaſed, an operation may be attended with ſuch a degree of inflammation, and conſequent ſuppuration, as to be in danger of deſtroying a conſtitution already greatly impaired, and therefore ought not to be performed.

Various methods have been propoſed for the cure of hydrocele, all of which may be reduced to two general heads: ſuch as have in view only a temporary relief, and which is therefore termed the palliative cure; and ſuch as are meant to effect a radical cure. When the tumor has become ſo large as to be inconvenient from its ſize, an evacuation of the water by ſurgical means becomes neceſſary. In this caſe, if the patient either refuſes to ſubmit to the operation for a radical cure, or if his ſtate of health render that operation improper, the palliative treatment, or a mere evacuation of the water by puncture, is the only means which can be employed.

A lancet-pointed trocar was many years ago recommended for drawing off the water in this manner by the preſent Dr. Monro; and ſince that time it has in an improved ſtate (Pl. 25. fig. 61.), been recommended by Mr. Andree; another (fig. 62.) has been propoſed by Mr. Bell. With any of theſe an opening may be made into the tunica vaginalis with ſafety.

The operator with one hand ſhould graſp the tumor behind, to preſs the contained fluid to the anterior and under part of it. If a round trocar is to be uſed, a puncture with a lancet ſhould be made where the trocar is to enter; but where a flat trocar is to be employed, the aſſiſtance of the lancet is unneceſſary.

As ſoon as the inſtrument has pierced the vaginal coat, the ſtilette ſhould be withdrawn, and the canula left in the ciſt. The water will now run off; and if the tumor be not uncommonly large, it may be all drawn off at once; but as the ſudden diſcharge of it, by taking off the ſupport, might be in danger of rupturing ſome of the veſſels, it ſhould be diſcharged by ſlow degrees. When the whole is evacuated, a piece of adheſive plaſter ſhould be immediately applied to the orifice; and a compreſs of ſoft linen being laid over the ſcrotum, the whole ſhould be firmly ſupported with a ſuſpenſory bag or a T bandage. The patient in this ſtate being laid in bed, all kind of uneaſineſs is in a few minutes commonly gone, and he is able to follow his ordinary buſineſs without interruption.

The intention of every means now in uſe for the radical cure of this ſpecies of the diſeaſe, is to induce ſuch a degree of inflammation on the parts in which it is ſeated as may obliterate entirely the cavity of the tunica vaginalis, by making it adhere to the ſurface of the teſticle. The means at preſent generally employed for effecting a cure are, exciſion of the tunica vaginalis; the application of cauſtic; the uſe of a ſeton; a ſimple inciſion of the ſac; and the injecting of acrid liquors into the tunica vaginalis, after drawing off the fluid which it contained. The method of cure, by the *removal of the vaginal coat*, is, firſt, to lay open the vaginal coat, and then to cut it away by different ſnips of a pair of ſciſſars. The ſac being removed, the parts are to be dreſſed and treated in the ſame manner as in the operation where ſimple inciſion is uſed.

The cure by cauſtic is attempted in the following manner: the ſcrotum being ſhaved, a piece of common paſte cauſtic, properly ſecured with adheſive plaſter, is applied, of about a finger's breadth, the whole length of the tumor; and if, on removing the cauſtic, it has not penetrated into the vaginal coat, an opening is made in it with a ſcalpel, ſo as to evacuate the contents, lay bare the teſticle, and admit of proper dreſſings. But Mr. Elſe, one of the lateſt writers in favour of the method of cure by cauſtic ſays, that there is no neceſſity for ſuch an extenſive application of cauſtic as many have recommended; that an eſchar of the ſize of a ſhilling is ſufficient; that this may be always fully obtained by the application of cauſtic paſte of the ſize of a ſixpence, which is to be laid on the anterior and under part of the ſcrotum, and to be properly ſecured by plaſter, in order to prevent it from ſpreading. The cauſtic commonly produces all its effects in five or ſix hours, and may then be removed. At this time digeſtives, or an emollient poultice, muſt be applied over the ſcrotum, and the whole ſuſpended with a bandage. Inflammation, Mr. Elſe obſerves, is ſoon induced over the whole tunica vaginalis; and the febrile ſymptoms which ſucceed, he adviſes to be kept moderate by blood-letting, injections, emollient poultices, and a low regimen. In a few days the eſchar of the ſcrotum ſeparates, and comes away; and in a gradual manner, in the courſe of four, five, or ſix weeks, the whole tunica vaginalis comes off, when the wound for the moſt part ſoon heals, and a complete cure is obtained.

Where it is intended to treat hydrocele by means of a ſeton, it may be done in the following manner: an opening is made with a ſcalpel, or the ſharp-pointed biſtoury, in the ſuperior part of the tumor, large enough to admit with eaſe a thick cord of common white ſewing ſilk. A director, with an eye at one end, in which the cord is inſerted, is introduced at this opening; and its farther extremity being carried down to the moſt depending part of the tumor, an opening is there made, of about half an inch in length, by cutting open the director with the biſtoury; the director being now drawn till a ſufficient quantity of ſilk is left hanging out below, the ope-

ration is in this manner finifhed. Another very fimple method of introducing a feton is by means of a filver canula and perforator.

In the operation for a radical cure by *incifion*, the patient being laid upon a table of convenient height, and properly fecured by affiftants, with the fcrotum lying nearly on the edge of the table, the operator with one hand fhould grafp the tumor behind, fo as to keep it firm and make it fomewhat tenfe anteriorly: with a common round-edged fcalpel in the other hand, he fhould now divide the external integuments by one continued incifion from the upper to the under end of the tumor. An opening is next to be made in the vaginal coat with a large lancet, or a fharp pointed biftoury, at the upper end of the firft incifion. This opening fhould be of fuch a fize as freely to receive the finger of the operator, which is to conduct a blunt pointed biftoury, fo as to divide the fac down to its bottom, which is confidered as being of advantage, by preventing partial adhefions and the rifk of a return of the difeafe.

The incifion being completed, the tefticle is now brought fully into view; and if the tunica vaginalis be found, the dreffing may be finifhed immediately. But if the fac be difeafed, it is to be removed, which may be readily accomplifhed by a fcalpel or biftoury.

When the hydrocele, as fometimes happens, affects both fides at the fame time, if, when the operation is done on one fide, an opening be made into the vaginal coat of the oppofite fide, at the upper part through the feptum fcroti, and the incifion carried down to the bottom of the tumor, the cift can be equally well laid open. the water as completely evacuated, and a return of the difeafe as much prevented, as when the operation is done in the ufual manner, and at different times.

In whichever way the incifion is made, if the tefticle be found, the wound ought to be quickly dreffed; for it is found, that on this much of the fuccefs of the operation depends. For if the vaginal coat be merely applied to the tefticle, or united by futures, as fome have advifed, partial adhefions are apt to take place, before a degree of inflammation is produced over the whole fufficient for making a complete cure. In this manner cavities are left, which either fill with pus during the cure, and require to be laid open, or they afterwards give rife to collections of water, and thereby occafion a return of the difeafe. The practice of ftuffing the cavity of the fore with dreffings is alfo a frequent caufe of mifchief, by exciting too great a degree of inflammation in the part. But when the dreffings are properly managed, fymptoms of violence almoft never occur. The lateft authors advife, that in dreffing the parts after the operation, two pieces of lint or foft old linen are to be dipped in oil, or in a liniment of wax and oil, and then, by the help of a probe, are to be inferted into the bottom of the fac on each fide of the tefticle, leaving a fufficient quantity of the pledgets hanging out of the wound, fo as to admit of being eafily withdrawn at the firft or fecond dreffing. The edges of the wound are next to be dreffed with pledgets of cerate, and the ends of the oiled pledgets turned over on each fide. Several pieces of foft lint are then to be laid over the wound, and thefe fhould be more or lefs numerous in proportion to the heat of the feafon. A comprefs of linen is now to be laid over the whole, and the dreffings fupported by a T bandage or fufpenfory bag properly fitted. The patient is then to be carried to bed; an anodyne fhould be given, efpecially if there be much pain; and he ought to be advifed to lie as much as poffible upon his back for a few days after the operation.

In the third or fourth day after the operation, all the dreffings, except thofe between the tefticle and tunica vaginalis, are to be removed; and if this cannot be done readily, as the parts are otherwife apt to become uneafy, a fponge dipped in warm water fhould be applied. On fome occafions, at the firft dreffing, and always at the fecond or third, the pledgets inferted between the tunica vaginalis come away; and whenever this happens, they fhould be renewed. It is alfo proper to renew them daily for the firft fourteen or fifteen days after the operation; not however of the fame depth as the firft, for during the latter part of the cure they need only to be inferted as far as to prevent the divided edges of the tunica vaginalis from adhering to the tefticle, before the adhefive procefs has taken place in the parts more deeply feated. Particular attention however is neceffary to this part of the treatment; for when the difeafe returns, it has been found to be chiefly owing to the edges of the vaginal coat being allowed to adhere to the tefticle, before adhefion had taken place between the deeper parts.

A complete adhefion of the two coats of the tefticle, the tunica vaginalis, and tunica albuginea, takes place moft frequently about the third week after the operation. Previous to this time, inflammation continuing gradually to increafe, the tumor becomes larger till it acquire fomewhat of the fize of a fwelled tefticle from gonorrhœa; but after this period it gradually fubfides, and the fore produced by the incifion, and now reduced to a line, heals in fome time between the fourth and eighth week, according to the habit of body, age of the patient, and other circumftances.

Having thus given an account of the methods ufually employed in the cure of hydrocele, we fhall now make a few obfervations on the *comparative advantages* of the three laft. From the teftimony of many authors of credit, it is evident, that any of thefe methods, in moft inftances, prove effectual; but every practitioner being apt to be prejudiced in favour of a particular method, he generally continues to follow that mode and no other; and finding it commonly fucceed, he by degrees perfuades himfelf, that other methods of cure, with which he has not had fuch opportunities of becoming acquainted, are liable to objections, which thofe who have practifed them do not find to be the cafe. The refult of Mr. B. Bell's obfervations upon this fubject is, that although all the three modes of operating, by cauftic, the feton, and fimple incifion, are perhaps equally capable of producing a radical cure; yet, that of the three, the latter, viz. the mode by the fimple incifion, is liable to feweft objections, and effects a cure, both with leaft trouble to the operator, and leaft rifk to the patient: and of the other two, the treatment by cauftic appears to be the beft. He has feen all the three produce troublefome fymptoms, fuch as, pain and tenfion of the abdomen, inflammation, and fever; but hefitates not to fay, that the feton is more frequently productive of thefe effects than any of the other methods.

Befides the methods already mentioned, another has been lately revived, viz. the injecting of irritating liquors into the vaginal coat of the tefticle. This method is particularly defcribed by a Monfieur Lambert of the laft century, and may be of much older date for any thing which is known to the contrary. From fome caufe or other it feems to have been entirely laid afide till about the middle of the prefent century, when it was practifed by Mr. Monro (afterwards a phyfician-general in the Weft Indies), under the fanction of the late Dr. Monro, and favourably received and followed by fome of the firft furgeons of this place. But in general, though the cure appeared complete, the difeafe returned.

The preference is ufually given to wine, and commonly that is fomewhat diluted; but where no pain is excited by the injection, the liquor fhould be difcharged, and a ftronger

one uſed. For where no pain takes place, a cure is not to be expected.

The following is the moſt approved method of performing the operation: the operator ſhould be provided with a flat trocar and canula, and with a bag of reſina elaſtica, fitted with a ſtop-cock and pipe, which ought exactly to ſuit the canula.

The patient being laid in an horizontal poſture, either upon a bed or a table, the water ſhould be drawn entirely off from the tumor by a flat trocar paſſed into the under and fore part of it. The operator ſecuring the canula with the one hand, is with the other to paſs the tube of the injection-bag fairly through it, and with gentle preſſure to force in as much of the liquid as may reach the whole ſurface of the vaginal coat, as well as the whole ſurface of the teſticle. The bag ſhould now be removed, leaving the tube within the canula of the trocar, ſo that by turning the ſtop-cock the injection may be retained in the cavity of the tumor. The canula of the trocar ought ſtill to be kept fixed, otherwiſe it might recede, by which the liquid would inſinuate into the cellular ſubſtance of the ſcrotum. The liquor ſhould likewiſe be brought into contact with every part of the cavity; and after remaining about four, or at moſt five, minutes in the ſac, it ſhould be entirely diſcharged through the canula of the trocar, after withdrawing the tube of the elaſtic bag.

Sometimes intenſe pain is felt immediately after the liquor is thrown in. When this is the caſe, it ſhould be diſcharged as ſoon as it has paſſed over the different parts of the tunica vaginalis. Some recommend a repetition of the ſame kind of injection immediately after the firſt has been diſcharged, and to be retained for the ſame period, though this is not commonly practiſed.

The whole of the injection ſhould be completely diſcharged, after which the ſcrotum ſhould be covered with a pledget of cerate, a compreſs being applied over it, and retained with a ſuſpenſory bag. The patient ought to be in bed for ſeveral days, and ſupport the ſcrotum in the bandage by means of a ſmall pillow.

Though it is difficult to aſcertain the proportion of thoſe who are cured by the method of injections, and though it is to be regretted that hitherto the diſeaſe is found to return in a great proportion of thoſe upon whom this operation has been performed; yet, on account of the facility with which it can be done, the comparatively ſmall pain with which it is attended, the quickneſs of the cure, and chiefly becauſe it does not, in caſe of a return of the diſeaſe, preclude the future operation of inciſion, it appears a method which, in all probability, will be more and more adopted into practice.

Sect. III. *Of* Hydrocele *of the* Spermatic Cord.

Anasarcous hydrocele of the ſpermatic cord ſometimes accompanies aſcites, and at other times it is found to be confined to the cellular ſubſtance in or about the ſpermatic cord. The cauſes of this diſeaſe may be, obſtructions in the lymphatics leading from the part in conſequence of ſcirrhous affections of the abdominal viſcera, or the preſſure of a truſs applied for the cure of hernia.

When the affection is connected with anaſarca in other parts, it is then ſo evident as to require no deſcription. When it is local, it is attended with a colourleſs tumor in the courſe of the ſpermatic cord, ſoft and inelaſtic to the touch, and unaccompanied with fluctuation. In an erect poſition of the body it is of an oblong figure; but when the body is recumbent, it is flatter and ſomewhat round. Generally it is no longer than that part of the cord which lies in the groin, though ſometimes it extends as far as the teſticle, and even ſtretches the ſcrotum to an uncommon ſize; an inſtance of which is related by Mr. Pott, who from a ſwelling of this kind diſcharged eleven Engliſh pints at once. By preſſure a great part of the ſwelling can always be made to recede into the abdomen. It inſtantly, however, returns to its former ſituation on the preſſure being withdrawn.

When the tumor is connected with general anaſarca of the ſyſtem, it can only be cured along with the reſt of the diſeaſe; but when the ſwelling is local, the remedy is alſo to be locally applied. An inciſion is to be made of ſuch a ſize as may be ſufficient for diſcharging the whole of the water; in the performance of which, attention is neceſſary to guard againſt hurting the ſpermatic veſſels. The contents of the tumor being diſcharged, the ſore is to be treated like any other ſimple wound.

Encyſted hydrocele of the ſpermatic cord ſometimes begins in the upper, but generally at the lower part of the ſpermatic cord. On its firſt appearence it is ſo ſmall as to give little or no trouble; hence it is ſeldom particularly attended to till it has acquired a conſiderable ſize. By degrees it extends as far as the abdominal muſcles, and ſometimes reaches to the bottom of the ſcrotum; and to a perſon unacquainted with the appearance of the diſorder may be miſtaken for a hydrocele of the tunica vaginalis. But here the tumor is always above the teſticle, which is diſtinctly felt below; and even in the advanced ſtate of the diſeaſe the teſticle is found in the back part of it perfectly unconnected with the ſwelling; whereas in the advanced ſtages of hydrocele in the vaginal coat, although ſome hardneſs is diſcovered where the tunica vaginalis adheres to the teſticle, yet when the ſwelling is great the teſticle cannot be diſtinctly felt. In the encyſted hydrocele of the cord, the figure and ſize of the penis is little altered; whereas, in caſes of common hydrocele, the penis frequently diſappears almoſt entirely. In other reſpects the two diſeaſes are nearly ſimilar. It ſometimes happens that the water is contained in two diſtinct cells. In that caſe the tumor is ſomewhat puckered up, or diminiſhed in its diameter. A ſimilar appearance alſo occurs, when this variety of the diſeaſe is connected with hydrocele of the tunica vaginalis, which ſometimes takes place.

The only other tumors with which this one may be confounded are, the anaſarcous hydrocele of the ſpermatic cord, and a real hernia. But in neither of theſe is the fluctuation of a fluid perceptible, and to the touch they are both ſoft and inelaſtic; whereas, in this variety of hydrocele, the tumor has a ſpringy feel, and a fluctuation is ſenſible to the touch; and in both the one and the other the ſwelling recedes ſomewhat upon preſſure, which it never does here.

From hernia it is chiefly diſtinguiſhed by the tumor beginning ſome way down the cord. In hernia the tumor turns leſs when the patient is in an horizontal poſture, and is conſiderably affected by coughing and ſneezing: but this kind of hydrocele is not altered in ſize by any ſuch circumſtances, nor has it the common ſymptoms which attend a hernia.

Infants are frequently ſubject to this diſeaſe, as well as to an anaſarcous ſwelling of the cord, and an œdematous tumor of the ſcrotum. But here the complaint is ſeldom permanent; for in moſt inſtances it readily yields to gentle friction, with any ſtimulating or aſtringent application, as a ſtrong ſolution of ſal ammoniac in vinegar, &c. But in adults, the ciſt, in every variety of encyſted hydrocele, becomes ſo firm as not to be affected by external applications; ſo that when the tumor becomes large, it is neceſſary to uſe means for producing either a palliative or radical cure, in the ſame manner as is done for a hydrocele in the vaginal coat.

Sect. IV. *Of* Hæmatocele Scroti.

We ſhall mention in this place the diſeaſe called *hæmatocele ſcroti*, which is occaſioned by blood extravaſated in the inner ſubſtance of the ſcrotum, in the tunica vaginalis, or in the ſpermatic cord; but the uſual ſituation is in the tunica vaginalis teſtis.

Tumors of this kind may be produced by any thing which ruptures the blood veſſels of the part, but they are commonly the conſequence of external violence. In the tunica vaginalis this diſorder may be produced by the point of a trocar or of a lancet in tapping for hydrocele. In ſuch a caſe, we are commonly informed of the accident by blood being diſcharged along with the water; though ſometimes it does not appear till the whole of the water is evacuated, and then a tumor of a conſiderable ſize ſuddenly takes place. Sometimes it happens where the quantity of water has been ſo uncommonly great that the ſudden diſcharge of it, by taking away the ſupport which the veſſels have been accuſtomed to receive, has been the cauſe of their rupture; and it ſeems certain, that whenever a tumor is produced either in the ſcrotum or cord ſuddenly after the water of a hydrocele has been evacuated by tapping, that it is entirely owing to an extravaſation of blood.

In the ſpermatic cord injuries of the ſame kind will be attended with a ſimilar effect upon the veſſels of the ſac containing the water. The diſtinction between blood and water in the ſubſtance of the ſcrotum is readily made by the colour; for where the diſeaſe is produced by blood, it forms a real eſchymoſis. The tumor feels heavier in the tunica vaginalis when filled with blood than where it is filled merely with water; the treatment is nearly the ſame with that in hydrocele. In the commencement of the anaſarcous or diffuſed hæmatocele, when produced from ſlight external violence, the application of ſtimulating or aſtringent fluids will ſometimes diſcuſs it; but if this prove ineffectual, the tumor is to be laid open, and treated exactly as was directed for hydrocele; only if a ruptured veſſel be diſcovered, it muſt be ſecured by ligature. In like manner, all collections of blood either in the vaginal coat or ſpermatic cord are to be laid open, and treated as in hydrocele. If bleeding veſſels appear, they are to be ſecured. Sometimes, however, theſe cannot be detected; an oozing takes place which it is difficult to reſtrain, even by the uſe of bark, vitriolic acid, and other means generally employed in ſuch caſes. It has been uniformly found, that local remedies prove chiefly uſeful here, particularly the application of ardent ſpirits, æther, or tincture of myrrh, to the ſurface of the ſore. Pledgets of ſoft lint, ſoaked in one or other of theſe, not only ſerve to check the diſcharge of blood, but in general tend to promote the formation of good matter.

CHAP. XXV. Of VARICOCELE, CIRCOCELE, SPERMATOCELE, and PNEUMATOCELE.

Varicocele is a preternatural diſtenſion of the veins of the ſcrotum, which in this ſtate form a tumor of hard knotty inequalities, ſeldom painful, and generally attended with no inconvenience excepting what ariſes from its bulk. *Circocele* is ſimilar in its nature to the former, but ſituated in the ſpermatic cord, extending from the abdominal ring to the ſuperior part of the ſcrotum, and produced by a varicoſe ſtate of the ſpermatic vein. Both of theſe diſorders are occaſionally produced by obſtruction in the veins; but are moſt frequently owing to a relaxed ſtate of theſe veſſels; to which we may add, that on account of the ſmallneſs of the correſponding artery, they are not ſufficiently affected by its influence. The tumor produced by theſe diſorders is ſometimes ſo large as to appear like a hernia or hydrocele; but we diſtinguiſh it from theſe by the touch, for varicoſe veins are like worms filled with elaſtic matter. We have another mark upon which we can ſtill more depend: the tumor in the erect poſture of the body is much increaſed, while in the horizontal ſituation it almoſt entirely diſappears.

Another diſorder is obſerved by late authors, where a collection of blood is ſometimes found within the tunica albuginea teſtis, and is ſuppoſed to be a kind of hæmatocele, or more probably varicocele. Sometimes the collection is ſo conſiderable, that a fluctuation reſembling that of an hydrocele of the vaginal coat of the teſticle is obſervable. When this is miſtaken for hydrocele, and an opening is made into it with a trocar, a diſcharge is produced of a duſky-coloured blood, ſomewhat reſembling thin chocolate: but though the tumor may be diminiſhed by the evacuation thus obtained, yet the alteration is inconſiderable; nor is the patient ever relieved, but on the contrary made worſe by ſuch an operation. Caſtration, after this, becomes neceſſary; but even this has been found ineffectual: ſo that the patient had better be adviſed to truſt to nature, aſſiſted by a proper ſuſpenſory bandage, than to ſuffer the attempt of a radical cure; for it has been obſerved, that in ſome inſtances they have remained ſtationary for many years, whereas they never fail to become much worſe by any attempt to evacuate the fluid.

When tumors, or the preſſure of a truſs, has been the cauſe of ſuch complaints, a proper attention to theſe ought to be the firſt attempt towards a cure. But when a relaxed ſtate of the veins is ſuſpected, we ought to recommend a ſuſpenſory bandage, an horizontal poſture, the cold bath, and the application of a ſolution of alum and other aſtringents. By a proper exhibition of theſe, the diſeaſe may at leaſt be prevented from increaſing, ſo as to render any operation unneceſſary.

By *ſpermatocele* is underſtood a morbid diſtenſion of the vas deferens and epidydimis. The diſeaſe may ariſe from tumors, ſtricture, or inflammation about the vas deferens, or its termination in the penis; but more probably from inflammation there. When an inflammatory diſpoſition is diſcovered, general and topical blood-letting, gentle laxatives, a low cooling diet, and reſt of body, will commonly be found the beſt remedies. When tumors are found to preſs upon the vas deferens, they ought either to be brought to a ſtate of ſuppuration, or entirely extirpated, if that can be properly effected. If the diſeaſe proceed from a venereal cauſe, nothing can be ſo uſeful as a courſe of mercury properly directed.

By *pneumatocele* is underſtood a diſtenſion of the ſcrotum from a collection of air. The principal cauſe of this diſeaſe, which rarely happens, is wounds in the lungs, by which air paſſes through the common cellular ſubſtance into the ſcrotum; but from whatever cauſe the tumor is produced, the diſeaſe is to be treated by making ſmall punctures with the point of a lancet, as in the caſe of anaſarcous ſwellings formed by water.

CHAP. XXVI. Of SARCOCELE, or SCIRRHOUS TESTICLE.

Sarcocele implies a fleſhy, enlarged ſtate of the teſticle, much firmer and harder to the touch than is obſerved in hernia humeralis or inflamed teſticle.

The ſymptoms vary exceedingly in different patients; but the following are the moſt general: The firſt ſymptom is commonly a ſmall enlargement, without much pain, and no diſcoloration of the part. The tumor becomes gradually larger, and the hardneſs increaſes; but for a conſiderable time the

furface remains fmooth; and when the conftitution is otherwife good, the diforder will fometimes remain in this fituation for a confiderable number of years; and in a few rare inftances, by a moderate diet, keeping the belly open, fufpending the tumor properly, and avoiding violent exercife, or any thing which may confiderably increafe the impetus of the blood, the diforder has not only been prevented from increafing, but has in a gradual manner difappeared entirely. More commonly, however, the tumor increafes in fize, and becomes ragged and unequal on its furface. Smart and fevere fhooting pains are frequently felt through its fubftance. Sometimes ferum is extravafated in the vaginal coat, or matter is collected in different parts of the tumor. The fcrotum, now much diftended, burfts, and thin, fetid, bloody matter difcharging, the difeafe terminates in an ulcerated cancer of the worft kind.

The fpermatic cord is commonly unaffected till the tumor has acquired a confiderable fize, and generally not till collections of matter have been formed. After this, from being at firft only flightly fwelled, it gradually increafes in hardnefs and bulk; after which it becomes very painful, knotty, or unequal through its whole extent. The difcharge from the fcrotum ftill continues; but although the matter increafes in quantity, the fize of the tumor is not thereby diminifhed, but, on the contrary, continually increafes; the edges of the fore become hard, livid, and retorted, and fungous excrefcences pufh out from every part of it; the health of the patient becomes entirely deftroyed, and he is at laft carried off in great mifery.

Hernia humeralis produced by venereal infection has been confidered, by fome authors, as a frequent caufe of the worft kind of fcirrhous tefticle; but the fact is very much otherwife; and fuch an idea has this bad tendency, that it prevents the perfeverance in the ufe of fuch remedies as might have removed the difeafe without the neceffity of extirpation.

Another caufe mentioned by authors as producing fcirrhus of the tefticle, is the hydrocele of the vaginal coat; but though farcocele is frequently combined with this difeafe, there is every reafon to think that the primary diforder was in the tefticle itfelf, and that the water is only a confequence of the other complaint. When the hydrocele happens to be the original difeafe, the tefticle is alfo found frequently altered in its appearance. It is here paler than in its natural ftate. It is fometimes diminifhed, but more frequently enlarged. The enlargement however is foft, harmlefs, and free from pain; and in fuch a fituation fhould never be extirpated. To this point particular attention ought to be paid, otherwife we run the rifk of committing a miftake, into which practitioners have been too frequently led—the extirpation of a tefticle which ought to have been faved. To keep free of this error, we ought to attend to the following circumftances.

When the difeafe begins in the tefticle itfelf, efpecially in the body or glandular part, or when it becomes hard and enlarged previous to any collection of water in the vaginal coat, it is to be confidered as of a different nature from that in which an enlargement of the part fucceeds to a collection of water; or if, upon evacuating the water, the tefticle be found hardened, enlarged, and attended with pain and other marks of fcirrhus, efpecially if the furface be unequal or ulcerated, extirpation ought certainly to be performed. The fymptoms above mentioned fometimes, though rarely, begin in the epidydimis. In fuch cafes, however, extirpation will feldom be advifable, as there is here always a fufpicion of a venereal affection; and then we ought by all means to try the remedies commonly ufed in fuch difeafes. In the prognofis, we attend to the age and habit of the body, as well as to the ftate of the difeafe and length of time it has continued.

When the patient is young and the conftitution unbroken, we may always hope for a cure, although the fymptoms fhould be very confiderable; whereas, in old infirm people, and in habits attended with an emaciated look, with indigeftion, and other fymptoms of obftructed vifcera, whatever ftate the difeafe may be in, there will be but a fmall chance of fuccefs.

If the difeafe has fubfifted for a long time without confiderably increafing in fize, we may reafonably think it is of a milder nature than where it has made a rapid progrefs. As long as the tefticle is only hard and free from the formation of matter, we may expect a favourable event; but where collections of matter have already formed, either in the fubftance or upon the furface of the tefticle, there is no other chance of faving the patient than by means of extirpation. Previous to this, however, we are to attend to the ftate of the fpermatic cord; for were any of it left in a difeafed ftate, little advantage could be derived from extirpation; nor ought the operation ever to be performed but where we can reach the whole of the difeafed parts. We are not to be prevented from performing it though the cord fhould be confiderably enlarged, providing it do not evidently partake of the difeafe of the tefticle; for the cord is generally fomewhat enlarged in the difeafed ftate of the tefticle; but this enlargement is for the moft part merely either a varicofe ftate of the veins, or a watery difpofition of the cellular fubftance.

But fuppofing no obftacle to the operation, the method of doing it may be this. The parts being previoufly fhaved, the patient is to be laid upon a fquare table of about three feet four inches high, letting his legs hang down; which, as well as the reft of his body, muft be held firm by affiftants; or, he may be laid acrofs a bed in the fame manner. Then with a knife the incifion is to be begun above the rings of the abdominal mufcles, that there may be room afterwards to fecure the veffels; then carrying it through the membrana adipofa, it muft be continued downward to the bottom of the fcrotum. A firm, waxed, flat ligature, compofed of fmall threads, is next, by means of a curved needle, to be paffed round the fpermatic cord, at leaft an inch above the difeafed part, or as near the abdominal ring as poffible; after which the veffels are to be fecured by a running knot, and divided about a quarter or half an inch below the ligature. The cord and tefticle are then to be removed from the furrounding parts by diffecting from above downwards, and no inftrument is better for this purpofe than the common fcalpel. After the difeafed parts are removed, the knot upon the cord muft be flackened to difcover the fpermatic arteries and veins; both of which, by means of the tenaculum or a common forceps, are to be taken up. The ligature upon the fpermatic cord is now to be left loofe, fo as to act as a tourniquet if a hæmorrhagy fhould enfue; nor is there more occafion for leaving the ligature tied than for leaving a tourniquet firmly applied to one of the extremities after amputation; befides, where patients have fuffered fuch pain as is fometimes mentioned by authors, it has been found to be owing to the tightnefs of the ligature rather than to any other caufe. In dividing the ligatures of the blood-veffels at the extremities of the cord, they muft be left of fuch a length without the wound as to be readily removed, however much the cord may retract in the time of the cure.

In feparating the tefticle, a confiderable hæmorrhagy fometimes enfues from the divifion of the fcrotal arteries. In fuch a cafe, they ought always to be fixed with ligatures before proceeding in the operation. The parts being removed, and the blood-veffels fecured, the wound is to be cured, if poffible, by the firft intention; and for this purpofe the fides of the fcrotum are to be brought together in the moft accurate manner, beginning at the under end, and fecuring the parts by

adhesive plaster as we proceed upwards, and in such a way that the sides of the sore may be kept properly together. About two inches of the ligatures of the cord are to be left out, and this part of the wound treated in the same manner as the rest; the whole to be secured by a compress of linen and a T bandage.

The patient should now be laid to rest, and an opiate administered; and if, upon the second or third day, any inflammatory symptoms ensue, they are to be removed by methods commonly employed upon these occasions; as, topical blood-letting, gentle laxatives, and keeping the part constantly moist with a solution of sugar of lead. The dressings ought not to be allowed to shift, else the cure will be greatly retarded. They are to be examined about four or five days after the operation; and if nothing material has happened, they may be allowed to remain two or three days longer, by which time generally the ligature can be readily removed; and the wound will be healed by the first intention, excepting some small opening in the skin, more especially where the ligatures were placed. These are to be drawn together by adhesive straps, and dressed in the same manner as formerly. In this way, if the patient be otherwise healthy, a cure may be expected in little more than a fortnight.

The method of dressing most frequently practised is to apply a quantity of soft lint to the sore, and then a compress of linen over it, and to secure the whole with a T bandage or a suspensory bag. The patient is then laid to rest, and an opiate given. The sore is not to be touched till a free suppuration takes place, which will commonly be about the fifth or sixth day, and then the dressings are to be removed, and renewed from time to time; once every two days, or oftener, as the quantity of matter may render it necessary. Sometimes after the operation the patient complains of pain in the sore, and of tension and uneasiness in the belly. In such a case, warm fomentations should be applied to the abdomen, and the sore covered with an emollient poultice, and this repeated as often as may be necessary.

CHAP. XXVII. Of the STONE.

Sect. I. *Of* Stone *in the* Bladder.

A variety of causes have been assigned as tending to the formation of calculi in the bladder of urine; as, a decomposition of a superabundant quantity of earthy matter from the blood, on account of a sedentary life; certain articles of diet or drink, containing a greater quantity of earthy matter than others; a continued use of solid food without a sufficient quantity of drink; the peculiar action of absorbent vessels; the particular structure of the kidney; the nature of the different excretory vessels; the time the urine may remain in the kidney; the habit of retaining the water in the bladder; particles of blood getting into the kidney or bladder, and attracting the stony matter so as to form a nucleus. A certain change of the vessels of the kidney forming the urine has by some been considered as a more probable cause than any of the former. The formation of calculus sometimes begins in the kidneys, at other times in the bladder.

After a calculus has begun to be formed, it sometimes acquires a great size in a few months from the first obvious symptoms; but sometimes it remains in the bladder for many years without arriving at any considerable size.

The symptoms commonly come on gradually, and bear some kind of proportion to the size and inequalities of the stone. One of the first commonly taken notice of is an uneasy sensation at the point of the urethra, which for some time is perceptible only upon making water, or upon using violent or jolting exercise. This sensation gradually increases; and there is along with it a frequent desire to make water, which is commonly voided in small quantities, and sometimes only in drops. When running in a full stream, it often suddenly stops, though the patient is conscious that a considerable quantity still remains, and feels a strong inclination to void it. If the stone be large, the patient has a constant dull pain about the neck of the bladder, and frequent desire of going to stool. The urine is generally of a limpid colour; but it is frequently thick, depositing a mucous sediment, and when the disease is violent it is often tinged with blood. All these complaints are greatly increased by exercise, especially by riding on horseback; and from a long continuance of pain, the patient's health by degrees becomes much impaired, and unless effectual means are employed for removing the cause of the disorder, death alone puts an end to his misery.

We are rendered certain of the existence of calculus when small pieces of stone are frequently passed along with the urine. When this does not occur, we cannot be certain that the symptoms do not arise from an ulcer or tumor in the body or neck of the bladder, or from the pressure of tumors in the neighbouring parts. In doubtful cases, however, we have one mark by which we can judge with certainty, and that is by means of sounding.

This is performed by introducing an instrument called a *sound* (Pl. 26. fig. 65.) formed of steel finely polished, and having the natural curvature of the urethra. The patient is to be laid upon a table or across a bed, with his shoulders raised upon a pillow, to bring the stone to the neck of the bladder, and his thighs a little elevated and separated from each other. A sound adapted to the size of the urethra is to be chosen; and previous to the introduction it is to be laid in warm water till it be of the heat of the body, and then wiped and rubbed over with bland oil, butter, or axunge. The surgeon lays hold of the penis with his left hand, while with his right he introduces the sound with its concave side towards the abdomen. He is now with his left hand to draw the penis gently forward upon the instrument, which is to be gradually pushed into the bladder. If any difficulty occur about the neck of the bladder, this may be obviated by introducing the finger into the anus, and raising the point of the instrument; or the same purpose is more readily answered by depressing the handle of the sound. If still it does not pass with ease, much force ought by no means to be used, lest the instrument perforate the membranous part of the urethra.

As soon as the instrument enters the bladder, if it happen at once to touch the stone, a tremulous motion will be communicated to the fingers of the operator, and the business of sounding is then accomplished, the nature of the disease being now ascertained. Great care, however, is here always necessary, as a few particles of sand, or a hardened state of the bladder, have sometimes communicated the same sensation. If the stone be not soon discovered, the instrument is to be moved in all directions; and should the operator be still unsuccessful, one of the fingers of the left hand is to be introduced into the rectum, so as to raise that part of the bladder in which a stone may probably be concealed. If even this attempt prove ineffectual, the body of the patient is to be put into different positions, and perhaps one of the best is depressing the shoulders and raising the pelvis. By this means a stone may generally be felt, providing it is not contained in a cyst, which very rarely happens. If after all these different attempts the surgeon should fail in discovering the stone, the instrument is to be withdrawn; and if symptoms of stone be strongly marked, and it appear that neither scirrhus nor inflammation, which might give rise to these symptoms, do

exiſt, a ſecond or even a third trial is to be made on the following days.

Various *lithontriptics* have been recommended for diſſolving the ſtone in the bladder; ſuch as lime water, cauſtic alkali, ſoap, &c. but none of them can be conveyed in ſuch a ſtate into the bladder as to be much depended upon, as they undergo the greateſt change in the courſe of the circulation. To obviate theſe changes, it has been recommended to inject certain fluids of this claſs through the urethra into the bladder; but this has not been attended with any material advantages, and has generally been found to do injury to the bladder. The only effectual method of removing ſtones from the bladder is by means of a chirurgical operation; the ſucceſs of which depends much upon the dexterity of the ſurgeon, as well as on the conſtitution of the patient.

When the conſtitution has been ſo much impaired that the patient complains greatly of ſickneſs and oppreſſion at ſtomach, with nauſea and an inclination to vomit, eſpecially upon taking food; when he has likewiſe a conſtant thirſt, and the pulſe is as high as a hundred ſtrokes in the minute—an operation is improper till theſe ſymptoms are removed. The operation is improper alſo when the patient labours under a ſevere fit of the ſtone; for then inflammation of the bladder is apt to enſue to ſuch a degree as to produce ſuppuration. By frequent attacks and continuance of theſe fits, the coats of the bladder are apt to be thickened and greatly contracted. This laſt circumſtance may be known by the introduction of the ſound; for then it will ſtop after getting paſt the ſphincter of the bladder, and cannot be puſhed farther without conſiderable force, and at the ſame time giving the patient the moſt exquiſite pain. Nor ought the operation to be performed when the bladder is ulcerated, eſpecially where the patient is old and much debilitated, and where the diſcharge of matter is great.

Children more readily recover from the operation of lithotomy than adults; and old people from the age of fifty-five to that of ſeventy, whoſe conſtitutions have not been broken, are in leſs danger than thoſe in the full vigour of life, probably owing to inflammatory ſymptoms being more apt to proceed to a dangerous length in the extremes of age than at the middle period of life. When the conſtitution, however, is not much impaired by the continuance of the diſeaſe, the operation may be undertaken with a probable degree of ſucceſs almoſt at any period of the patient's life.

Several methods have been recommended for performing this operation; but there are only two which can be practiſed with any propriety. One is, where the operation is to be performed immediately above the pubes, in that part of the bladder which is not covered with peritonæum: the other, where it is done in the perinæum, by laying open the neck and lateral part of the bladder, ſo as to allow of the extraction of the ſtone.

In performing the *high operation*, the bladder muſt be in a diſtended ſtate, ſo as to make it riſe above the oſſa pubis, to allow an inciſion to be made into that part of it which is uncovered by the peritonæum, and thereby to prevent the abdomen from being opened or its contents expoſed. Some days, or even weeks, previous to the operation, the patient ought to be deſired to retain his urine as long as he can, ſo as to diſtend the bladder till it can hold at leaſt a pound and a half, when the perſon is an adult and of an ordinary ſize; or the penis may be tied up to allow the urine to collect. As theſe methods may be attended with great diſtreſs, ſome prefer diſtending the bladder by injecting warm water by ſlow degrees till the bladder is ſufficiently full, which may be eaſily known by relaxing the abdominal muſcles and feeling above the pubes.

The patient is then to be laid upon a table of convenient height, with the pelvis higher than the ſhoulders, that the parts may be fully on the ſtretch, and to prevent the bowels from preſſing upon the bladder. The legs and arms are to be properly held by aſſiſtants. An inciſion is to be made through the ſkin, in the very middle of the under and fore part of the abdomen, from ſome way under the umbilicus to the ſymphyſis pubes. The cellular ſubſtance, the tendon of the oblique muſcles, the muſculi recti and pyramidales, are now to be ſeparated; and it is better to make this ſeparation from the pubes upwards, ſo as to be in no danger of cutting into the abdomen. The ſurface of the bladder will now appear uncovered by the peritonæum. Then the operator, with a common ſcalpel, or an abſceſs lancet, or, what is better, with a concave ſharp-pointed knife, makes a perforation into the moſt prominent part of the bladder, till the fore-finger of the left hand can be introduced. The ligature is now to be removed from the penis; then with a probe-pointed biſtoury, making the finger ſerve as a conductor, the wound is to be made ſufficiently large for the extraction of the calculus, taking particular care, however, not to carry the inciſion ſo high as to cut the peritonæum. This part of the operation being finiſhed, the ſtone is to be extracted with the finger; or if that be impracticable, the forceps are to be employed. Should it unfortunately happen that the ſtone is broken in the extraction, the pieces are to be removed entirely by the fingers rather than by ſcoops, which were ſometimes uſed. The edges of the wound in the integuments are now to be drawn together by means of the twiſted ſuture, leaving about an inch and a half immediately above the pubes for the diſcharge of any urine which may be there evacuated. The patient is to be laid in bed, with the pelvis ſtill kept higher than the ſhoulders. Gentle laxatives are to be occaſionally given, and the antiphlogiſtic plan ſtrictly adhered to.

The advantages of this method are, that larger ſtones can be extracted by this than by the lateral operation, and that fiſtulous ſores are leſs apt to enſue. The diſadvantages are, the danger of opening or wounding the peritonæum, and thereby expoſing the abdominal bowels; the frequent occurrence of inflammation about the beginning of the urethra, ſo as to occaſion the urine to be diffuſed in the cellular ſubſtance on the outſide of the bladder, and thereby producing ſinuſes difficult to cure; the extreme difficulty of healing the wound, eſpecially in bad conſtitutions; and, laſtly, the ſmall number of patients, after the age of thirty, who have been found to recover from this operation.

Frere Jacques, a French prieſt, was the inventor of the lateral operation; and Profeſſor Rau of Holland improved upon his method, by making a groove in the ſtaff. The celebrated Cheſeldon uſed the lateral method of cutting, as it is now with a few alterations generally practiſed. We ſhall attempt to deſcribe the different ſteps of this operation in its preſent improved ſtate.

The manner of *preparing the patient* depends upon a variety of circumſtances. If he be plethoric, a few ounces of blood ſhould be taken away, and at proper intervals the bowels ought to be emptied by any gentle laxative which will not gripe. The diet ſhould conſiſt of light food for ſome time previous to the operation. If the pain be violent, opium is neceſſary. Sometimes it is relieved by keeping the patient in bed with the pelvis raiſed, ſo as to remove the ſtone from the neck of the bladder. He ought not to ſit up, or take any exerciſe, in the time of preparation. The warm bath ought to be uſed two or three times, and the patient ſhould remain in it half an hour at each time. A laxative ought to be given on the day preceding the operation, and an injection a few hours before it is performed. The patient ought to drink plentifully

of ſome diluent liquor, and to retain the urine ſeveral hours previous to the operation. If this cannot be readily affected, a ſlight compreſſion, by means of a ligature, may be made upon the penis, ſo as to have the bladder ſufficiently diſtended, that there may be no danger of the poſterior ſurface being hurt by the end of the gorget. The perinæum and parts about the anus ſhould be well ſhaved.

A table ſomewhat more than three feet in height, and of ſufficient ſtrength, is now to be firmly placed, and properly covered with blankets, pillows, &c. Upon this the patient is to be laid and properly ſecured; and for this purpoſe there ought to be two pieces of broad firm tape, each about five feet in length, which are to be doubled, and a nooſe formed upon them. A nooſe is then to be put upon each wriſt, and the patient deſired to lay hold of the middle of his foot upon the outſide. One end of the ligature is to go round the hand and foot, and the other round the ankle and hand, and croſs again, ſo as to repeat the returns in the reverſe way. A running knot is then to be tied, by which the hand and foot will be properly ſecured. The buttocks are then to be made to project an inch or two over the table, and to be raiſed conſiderably higher than the ſhoulders by a couple or more pillows, and one ought to be put under his head.

The operator is now to introduce a grooved ſtaff (fig. 66.) of proportionable ſize, and open to the very end, through the urethra into the bladder; and having again fully ſatiſfied himſelf of the exiſtence of a ſtone, he inclines the ſtaff, if the ſurgeon be right-handed, obliquely over the right groin, ſo that the convex part of the ſtaff may be felt in the perinæum on the left ſide of the raphe. He then fixes it, and delivers it to his aſſiſtant, who is to hold it with his right hand, deſiring him to preſs it gently, in order to make the ſulcus of the ſtaff project in the direction in which he received it. With his left hand the ſame aſſiſtant is to raiſe and ſupport the ſcrotum.

The thighs of the patient being ſufficiently ſeparated by the aſſiſtants, and the ſurgeon being ſeated upon a chair of a proper height, and in a convenient light, he makes an inciſion with a common convex-edged ſcalpel through the ſkin and cellular ſubſtance, immediately below the ſymphyſis of the oſſa pubis, which is a little below the ſcrotum, and where the crus penis and bulb of the urethra meet, and on the left ſide of the raphe, and continues it in a ſlanting direction downwards and outwards to the ſpace between the anus and tuberoſity of the iſchium, ending ſomewhat lower than the baſis of that proceſs, by which a cut will be made of three or four inches in length. This inciſion ought not to be ſhorter than is here directed, otherwiſe there will not be room for the reſt of the operation. As ſoon as the integuments are thus divided, he ought to introduce two of the fingers of the left hand. With one he keeps back the lip of the wound next the raphe, and with the other he preſſes down the rectum. He ought likewiſe particularly to guard againſt cutting the crures of the penis, which he can readily feel, and ſeparate at their under part with one of the fingers. He next makes a ſecond inciſion almoſt in the ſame direction with the firſt, but rather nearer to the raphe and anus, by which he preſerves the trunk of the arteria pudica. By this inciſion he divides the tranſverſalis penis, and as much of the levator ani and cellular ſubſtance within theſe as will make the proſtate gland perceptible to the finger. If any conſiderable veſſel be cut, it is immediately to be ſecured, though this is ſeldom neceſſary. After this he will have a view of the membranous part of the urethra, which is diſtinguiſhed from that covered by the bulb by being very thin. He is now to ſearch for the groove of the ſtaff with the fore finger of his left hand, the point of which he preſſes along from the bulb of the urethra to the proſtate gland, which ſurrounds the neck of the bladder. He keeps it there; and turning the edge of the knife upwards, he cuts upon the groove of the ſtaff, and freely divides the membranous part of the urethra, from the proſtate gland to the bulb of the urethra, till the ſtaff can be felt perfectly bare, and that there is room to admit the point of the finger; and as the finger aſſiſts in keeping the parts ſtretched, and effectually prevents the rectum from being hurt, the inciſion into the urethra may be made with perfect eaſe and ſafety.

The next part of the operation, viz. dividing the proſtate gland and neck of the bladder, might, by a dexterous operator, be ſafely performed with a common ſcalpel, with the edge turned the oppoſite way. But to guard againſt accidents, a more convenient inſtrument, called the *cutting gorget* (fig. 67.), is now in general uſe. It was originally invented by Mr. Hawkins of London, and ſince his time has undergone various alterations. Fig. 68. is a double gorget invented by Dr. Monro. The inner plate, which is blunt, is made to ſlip forwards to protect the back part of the bladder. The membranous part of the urethra being now divided, and the forefinger ſtill retained in its place, the point of the gorget, previouſly fitted to the groove, is to be directed along the nail of the finger, which will ſerve to conduct it into the groove of the ſtaff; and as this is one of the niceſt parts of the operation, the moſt particular attention is here required that the point of the gorget be diſtinctly heard to rub in the bare groove, and that nothing is interpoſed.

In the introduction of the gorget into the bladder, if the aſſiſtant could be depended upon, the ſtaff might be allowed to remain in his hand: the operator, however, generally chooſes to manage it himſelf. He now riſes from his ſeat, takes the ſtaff from the aſſiſtant, raiſes it to near a right angle, and preſſes the concave part againſt the ſymphyſis of the oſſa pubes; ſatisfies himſelf again that the point or beak is in the groove, and then puſhes on the gorget, following the direction of the groove till the beak ſlip from the point of the ſtaff into the bladder. The gorget is not to be puſhed farther than this, otherwiſe it may wound the oppoſite ſide of the bladder, &c.

The gorget having now entered the bladder, which is readily known by the diſcharge of urine from the wound, the ſtaff is to be withdrawn, and the finger introduced along the gorget to ſearch for the ſtone, which, when felt, will point out the direction to be given to the forceps; at any rate, the introduction of the finger ſerves to dilate the wound in the bladder; and this being done, a pair of forceps (fig. 69.) of a proper ſize, and with their blades as nearly together as their form will allow, are to be introduced, and the gorget withdrawn ſlowly, and in the ſame direction in which it entered, ſo as to prevent it from injuring the parts in its return. After the forceps are introduced, and paſſed till they meet with a gentle reſiſtance, but no farther, the handles ought to be depreſſed till they are ſomewhat in an horizontal direction, as this will moſt correſpond with the fundus of the bladder. One blade of the forceps is to be turned towards the ſymphyſis of the pubes to defend the ſoft parts there, the other of conſequence will guard the return. After they have diſtinctly touched the ſtone, by moving them a little in various directions, they are then to be opened, and the ſtone laid hold of, which may generally be done with conſiderable eaſe. It frequently happens, however, that when the ſtone is ſmall, it is not readily felt with the forceps; and inſtances may happen, where the under and back part of the bladder may be ſo depreſſed as to conceal the ſtone. In ſuch a ſituation, nothing will more readily bring it in the way of the forceps than to introduce the finger into the rectum, and elevate this part of the bladder. Straight forceps are generally uſed; crooked

ones, in ſome very rare caſes, however, may be neceſſary, and therefore the ſurgeon ought to be provided with them.

After the forceps has laid hold of the ſtone, if it be ſmall and properly placed, it may readily be extracted; but if, on the contrary, the handles of the forceps are now obſerved to be greatly expanded, it is certain the ſtone is improperly fixed, or that it is remarkably large: in either caſe it ſhould not be held faſt, but allowed to move into the moſt favourable ſituation; or the finger is then to be introduced ſo as to place it properly for extraction. If this cannot be done with the finger, it ought to be allowed to ſlip out of the forceps, in order to get it more properly fixed; and as the moſt common form of the ſtone is flat and oval, or ſomewhat like a flattened egg, the forceps ſhould have hold of the ſmalleſt diameter, while an end preſents to the neck of the inſtrument. The ſtone ſhould be graſped with no greater firmneſs than is merely ſufficient to bring it fairly out. It ſhould be extracted in a ſlow and gradual manner.

When a ſtone is broken in the bladder, all the larger pieces are to be extracted by the forceps, which are to be introduced by means of the finger ſerving as a director. The ſmaller parts are to be removed by means of a ſcoop (fig. 70.), or probably the finger may be more convenient; and as the leaſt particle allowed to remain, or which is not waſhed off by the urine, may ſerve as the nucleus of another ſtone, a large quantity of water, properly warmed, is to be injected by a bag and pipe, or by a ſyringe; and for this purpoſe the body of the patient ſhould approach at leaſt to an upright poſture; and to give the particles of ſtone an opportunity of collecting near the inciſion of the bladder, the wound may be ſtopped for a little after the injection is thrown in.

When a ſtone is extracted of a regular, firm, and rough ſurface, it ſeldom happens that any others remain in the bladder. On the contrary, when it is of an irregular ſhape, and ſmooth and poliſhed, particularly in certain places, with impreſſions formed upon it, there is the greateſt probability of others remaining. There are exceptions, however, to theſe rules; and therefore the operator, inſtead of truſting to them, ſhould introduce his finger, which will anſwer the purpoſe without any other ſearcher.

If, after the operation, any conſiderable artery bleeds much, it is to be taken up with a ligature: but if this be impracticable, the hæmorrhagy ought to be ſtopped by means of preſſure, and for this purpoſe a firm roller introduced at the wound anſwers ſufficiently: and to prevent any ſtoppage to the diſcharge of urine, a ſilver canula, covered with caddis, and duſted over with ſtyptic powder, may be introduced into the wound with advantage.

Sometimes it happens that a conſiderable quantity of blood, inſtead of paſſing off by the wound, is collected in the cavity of the bladder, and may produce very dangerous ſymptoms. To prevent this as much as poſſible, immediately upon the operation being finiſhed, the patient's pelvis ſhould be made conſiderably lower than the reſt of his body; by which means the wound will be kept in a depending poſture, and the blood will eſcape more readily by the wound. But if it be found that blood is ſtill lodged in the cavity of the bladder, it muſt be immediately extracted.

As ſoon as the bleeding is ſtopped, the patient is to be untied, a piece of dry ſoft charpie put between the lips of the wound, and often renewed, and the thighs brought together. He is then to be laid in a bed, in ſuch a way that the pelvis may be conſiderably lower than the reſt of the body, to give a favourable direction to any blood which may afterwards flow from the wound. A conſiderable doſe of laudanum is now to be given. From thirty to fifty drops for an adult will commonly be neceſſary. From this period, unleſs the ſtone has been large and difficult to extract, the patient commonly falls aſleep, or at leaſt lies quiet for a few hours; but afterwards generally begins to complain of pain in the under part of the abdomen. Anodynes are now to be given both by the mouth and anus, and warm fomentations, by means of flannels or bladders filled with warm water, are to be applied to the region of the bladder, as the affection ſeems to be of the ſpaſmodic kind.

If by a continuance of theſe remedies the pain abates, no anxiety needs be entertained concerning it; but if it increaſe, and eſpecially if the abdomen become hard and ſwelled, and the pulſe full and quick, and theſe ſymptoms become gradually worſe, great danger is to be apprehended, as they moſt commonly take place in conſequence of inflammation. In this ſituation, as much blood ought to be taken as the patient can bear. A large injection of warm water and oil, or linſeed tea, ſhould be given every ſix or ſeven hours, and the fomentations continued at the abdomen. If the ſymptoms continue to grow worſe, the patient ſhould be immediately put into the ſemicupium or half-bath.

By a proper continuance of theſe means, with a low diet and plenty of diluent drink, the above ſymptoms may frequently be removed. The reverſe, however, is ſometimes the caſe. The wound becomes ſloughy and ill-conditioned; all the ſymptoms, in ſpite of every effort, continue to increaſe, and ſoon terminate in death.

But where matters end favourably, the wound by degrees puts on a better appearance; the urine paſſes almoſt from the beginning by the urethra (moſt frequently, however, it is diſcharged by the wound for the firſt two or three weeks); the pain in the abdomen gradually abates, the feveriſh ſymptoms are ſoon removed, a complete cicatrix is formed, and the wound is ſometimes cured in a month; though upon other occaſions three will be neceſſary. But it muſt depend greatly on the nature of the conſtitution.

Excoriation of the buttocks may be prevented by placing a ſheet under them ſeveral times doubled, the breadth to be eighteen or twenty inches, and to be all rolled up, except the part which is to be laid under the patient, the reſt of the roll to be by his ſide, which is to be unrolled as the nurſe draws the wet part from under him. If, after the uſe of this, excoriations ſhould ſtill happen, the part may be waſhed with cold water; or the parts round the wound, after being well dried, may be rubbed with any tough ſimple ointment.

In patients of a debilitated conſtitution incontinence of urine frequently occurs after this operation. In general, this is removed as the patient acquires ſtrength. Nouriſhing diet, cold bath, the bark, and other tonics, are of much ſervice here; but where theſe are afterwards found ineffectual, inſtruments for compreſſing the penis, or others for receiving the urine, have been found uſeful; and are now made in ſuch a convenient way as to allow them to be conſtantly uſed ſo long as they may be found neceſſary.

An operation for ſtone in the bladder is much ſeldomer required *in women* than in men, on account of the ſhortneſs of the urethra in the former allowing a readier paſſage for the ſmall calculi which gets into, or are formed in, the bladder. It is likewiſe in women more ſimple, and of courſe more readily performed. It might be done in the ſame manner as in the male, but there would be the greateſt probability of wounding the vagina. In a few caſes, the operation has been performed from the vagina itſelf; but it is by no means adviſeable, as ſtones would not only be extracted with greater difficulty, but, on account of the thinneſs of the parts, the urine would moſt probably form a fiſtulous opening, and a

communication be maintained between the bladder and vagina; or cicatrices here might be attended with great inconvenience in child-labour.

In the method commonly practised, the patient being placed and secured in the same manner as in the operation upon the male, the operator introduces a short grooved staff, slightly curved (fig. 71.), into the bladder; then by means of the common gorget already mentioned, with its point passed along the groove of the staff, he lays open the whole of the urethra and the neck of the bladder. The staff is now to be removed, the finger introduced upon the gorget, and to feel for the stone, which is to be removed as already directed for the operation on the male subject. Where incontinence of urine occurs after the wound is healed, a pessary is to be used within the vagina, or a sponge applied, or a tin machine to receive the urine.

Sect. II. *Of* Stones *in the* Kidneys.

The symptoms of stone in the kidneys are, pain in the region of the kidneys, sickness, and vomiting, the urine sometimes mixed with blood, at other times with mucus or even purulent matter; but the same symptoms are often induced by other causes, especially from inflammation and suppuration of the kidney. Nephritic complaints have frequently subsisted for a long time, where stones have been blamed as being the cause of them; and yet upon dissection purulent matter alone has been detected. From this circumstance, as well as from the great depth of the parts and the large size of the blood-vessels of the kidney, the operation of nephrotomy could not be performed; but with the greatest uncertainty and most imminent danger, and is therefore never attempted. A few cases indeed have appeared where inflammation induced by a stone in the kidney terminated in abscess, and the stones were taken out; but it was not till they had worked their way out of the kidneys into the cellular substance, so that it only remained to open the abscess and extract them; but otherwise the operation is never to be thought of.

Sect. III. *Of* Stones *in the* Urethra.

Those who are troubled with calculous complaints frequently pass small stones along with their urine; and when these are angular or of considerable size, they sometimes stick, and give much uneasiness. The symptoms are at first pain, then inflammation and swelling, attended with a partial, or total suppression of urine, which, if long neglected, is apt to terminate in a rupture of the urethra, when the urine will be discharged into the neighbouring parts. The greatest attention is therefore necessary to get the stone extracted as soon as possible.

When a stone is in the urethra, unless it be of a large size, or has been long impacted, and the inflammation great, attempts ought to be made with the fingers to push it out; but previous to this, the penis should be relaxed as much as possible, so as to remove a certain degree of spasm which the presence of stone here probably creates. Blood ought to be drawn by general or local means, according as the patient may be of a plethoric or emaciated habit. He should be immersed in a warm bath, and get a full dose of laudanum, and warm oil ought also to be thrown into the urethra. After these remedies have relaxed the parts as much as may be, the extraction is to be attempted.

For this purpose certain instruments have been contrived, particularly a tube containing a pair of elastic forceps (Pl. 26, fig. 72.), to be introduced into the urethra so as to lay hold of the stone. In some cases they certainly might answer the purpose, but they have not been found very useful; and as they may increase the irritation already present in the urethra, they are seldom, if ever, employed. Instead of them, the surgeon uses gentle pressure on the penis to push the stone outwards; and as calculi larger than a field bean have sometimes been passed by the urethra, an operation ought not to be performed till gentler means have been persisted in for some time. When these means have failed, an incision ought to be made immediately upon the stone, which is then to be removed by a probe, or with a pair of small forceps. When a stone is lodged near the neck of the bladder, after the patient has been placed and secured in the same manner as for the lateral operation, while an assistant supports the scrotum and penis, the operator introduces a finger oiled into the anus, to support the stone in its place, and prevent it from slipping into the bladder. An incision is then to be made, and the stone turned out. The after-treatment will be nearly the same as that after the operation of lithotomy.

When, again, a stone has advanced further in the urethra, the best method is to draw the skin strongly forwards or backwards, and then to cut upon it and turn it out, when the skin will slide back so as to cover the wound, and prevent the urine from passing through it; and by this means it will generally heal by the first intention. If part of the urine pass through the wound, and insinuate into the cellular substance, an attempt is to be made with the hand to press it back. If that prove insufficient, a cut is to be made through the skin opposite to the incision of the urethra; but this will seldom be found necessary. If a stone is fixed near the point of the urethra, it may be removed with a pair of forceps; or, if this fail, the urethra is to be dilated with a scalpel; and if this also be insufficient, an incision is to be made as above directed. When the cure is nearly completed, a tube formed of silver or elastic gum, or a hollow bougie, may be used to keep the urethra of a proper size.

The worst part of the urethra for a stone to stick in is that immediately behind the scrotum; for then the urine is apt to pass by the incision into the cellular substance of the scrotum, so as to occasion large swellings there. To prevent this, a stone so situated, ought, if possible, to be pushed forwards with the fingers; or if this be impracticable, it should be pushed back into the perinæum by means of a staff. If both methods fail, a cut is to be made at the under part of the scrotum, which is to be well supported, and at one side of the septum, and continued upwards till the stone is felt, when an incision is to be made into the urethra, and the stone extracted as before directed.

CHAP. XXVIII. Of INCONTINENCE and SUPPRESSION of URINE.

Incontinence of urine may arise from various causes, as, from a loss of power in the sphincter of the bladder, while the natural tone of that organ remains unimpaired; or from irritation about the neck of the bladder, produced by the frictions of stones contained in it; or from a laceration of parts by the operation of lithotomy: or from the pressure of the uterus in a state of pregnancy.

When the disease is owing to a want of tone in the sphincter, the cure is very difficult, because the constitution in general is frequently affected. The most useful remedies are tonics, especially Peruvian bark, chalybeate waters, and the cold bath, both generally and locally applied. Cold substances applied to the perinæum are perhaps of greater service than any thing else, as cloths wet with vinegar and cold water, or

with a ſtrong ſolution of ſaccharum ſaturni in vinegar; but the beſt method of applying cold is to daſh water immediately from the fountain upon the anus and perinæum. When it ariſes from the irritation of ſtones in the bladder, opiates and mucilaginous liquors plentifully uſed frequently give great relief. When incontinence of urine is owing to a laceration of parts in performing the operation of lithotomy, the diſeaſe is nearly of the ſame nature as that from the cauſe firſt mentioned, and therefore the ſame remedies are of ſervice. When theſe remedies fail in either of the caſes, compreſſion of the urethra prevents any inconvenience ariſing from the conſtant dripping of the urine; and for this purpoſe an inſtrument termed *jugum penis* (Pl. 26. fig. 73.) is applied to the penis; or, to preſs againſt the urethra of the female, peſſaries (fig. 74.) are contrived, which are made in ſuch a way as to be introduced into the vagina, and there to preſs upon the urethra. They are ſometimes made of ſponge, but thoſe of cork or box wood well poliſhed are more generally preferred. A ſmall bottle made of elaſtic gum, and open at both ends for the paſſage of the menſtrual diſcharge, anſwers the purpoſe equally well. Certain caſes however occur where preſſure upon the urethra is improper, eſpecially where there is a conſtant deſire to paſs water; and here much relief is obtained from the uſe of receivers, which are now ſuited to both ſexes.

We ſhall here treat only of that ſpecies of ſuppreſſion of urine where the urine is collected in the bladder, but from ſome obſtructing cauſe is prevented from being diſcharged. It ariſes from a variety of cauſes.

When it ariſes from a *want of tone* in the body of the bladder, it is often connected with palſy of the lower extremities; it is frequently owing alſo to retaining urine too long. The catheter, in this caſe, is commonly an effectual remedy, and ought to be employed as ſoon as the ſuppreſſion is evidently formed, and repeated from time to time, till the tone of the ſyſtem is recovered by the uſe of proper remedies. The method of introducing the catheter is the ſame with that already directed for ſounding for the ſtone. Fig. 75. a catheter for the male, fig. 76. one for the female.

When the affection ariſes *from ſpaſm* about the neck of the bladder, opiates, warm water thrown into the rectum, and afterwards the warm bath, are the beſt means of producing relief. When it proceeds from ſcirrhus of the proſtate gland, or from other tumors, or from obſtructions of the urethra in conſequence of gonorrhœa, the treatment to be afterwards deſcribed will be found beſt ſuited for ſuch complaints. When the ſuppreſſion ariſes from the preſſure of the uterus in the latter months of pregnancy, change of poſture is ſometimes found to have ſome effect; but if this fail, immediate relief can commonly be given by the introduction of the catheter, which in women is for the moſt part readily done.

Suppreſſion of urine *from inflammation affecting the neck of the bladder* is one of the moſt alarming varieties of the diſeaſe, as it produces pain, and ſuch a degree of ſwelling in the parts as to render the introduction of the catheter inadmiſſible. It may ariſe from the matter in gonorrhœa paſſing backwards along the courſe of the urethra. An improper uſe of injections has likewiſe frequently produced this ſpecies of the diſeaſe. The treatment is nearly the ſame as for inflammatory complaints in other parts of the body. Blood-letting ſhould be employed, and particularly leeches ſhould be applied to the perinæum. Opiates ought to be given in large doſes. Injections of warm water ſhould be frequently thrown up the rectum, and the whole body ſhould be immerſed in the warm bath. If theſe means be properly uſed, they will very ſeldom fail of ſucceſs; but when they do not prove effectual, when the bladder becomes painfully diſtended, and when every attempt to introduce the catheter has failed, nothing is to be depended upon but a puncture made into the body of the bladder, in order to diſcharge the water contained in it.

Various methods have been propoſed for effecting this operation. *Puncturing the bladder* above the pubes has been recommended by many reſpectable authors. The following is the method of doing it: a lancet-pointed trocar, about two inches long, is to be at once introduced through the integuments, about an inch and a half above the pubes, into the body of the bladder. The ſtilette is to be removed as ſoon as the water begins to flow through a groove formed in it, and the urine allowed to flow through the canula, which is ſecured to the body by means of a bandage. A cork is to be fitted to the canula, that the urine may paſs off at intervals only. The canula is to be retained till the cauſe which produced the obſtruction is ſo far removed that the patient can diſcharge the urine in the natural way. It ought to be removed every three or four days, and cleared from the ſordes which adheres to it, otherwiſe it ſoon becomes covered with a calculus cruſt, which renders the extraction exceedingly difficult. On theſe occaſions a firm probe, of ſufficient length, ought to be paſſed through it into the bladder, upon which it may again be eaſily returned as ſoon as it is properly cleaned.

This method of puncturing the bladder is not altogether free from objections: the bladder being ſuſpended for a long time on the canula, its tone is ſometimes deſtroyed; and if it happen to ſlip off the canula, the operation muſt be repeated; beſides, the urine may be diffuſed in the ſurrounding cellular ſubſtance.

When the bladder is to be *punctured from the perinæum*, the trocar, which ought to be longer than the one for puncturing above the pubes, is to be introduced at a little diſtance from the rapha perinæi, and then paſſed into the body of the bladder, a little to the upper and outſide of the proſtate gland, carrying the point of the inſtrument a little upwards, to avoid wounding the ends of the ureter or ſeminal veſſels. Puncturing from the anus, or the vagina in females, are attended with ſo many inconveniences that they ought never to be attempted.

CHAP. XXIX. DISEASES OF THE PENIS.

SECT. I. *Of* OBSTRUCTIONS *of the* URETHRA.

OBSTRUCTIONS of the urethra frequently occur after repeated or ſevere attacks of the venereal diſeaſe. They may be owing to caruncles or fleſhy excreſcences in the urethra; to tumors in the lining membrane, or parts contiguous to the urethra, in conſequence of inflammation; to ſpaſmodic affections of the urethra; or to ſtrictures properly ſo called.

Till of late years almoſt every inſtance of obſtruction in the urethra has been attributed to *caruncles*, but their occurrence is much leſs frequent than was formerly imagined. They are rarely found except near the point of the urethra. They are conſidered to be nearly of the ſame nature with the warts which grow upon the prepuce or root of the glans in venereal caſes. Tumors obſtructing the paſſage in the urine may be occaſioned either immediately by inflammation, or in conſequence of old ſores within the urethra; or tumors, from whatever cauſe, may be ſeated in the corpora cavernoſa contiguous to the urethra, and may preſs upon it in ſuch a manner as to cauſe an adheſion of its ſides, and thereby produce ſtoppage of the urine. Spaſmodic ſtrictures of the urethra ſometimes ariſe from ſtone in the bladder. Sometimes in gonorrhœa there is ſuch a degree of contraction that neither ſtaff nor

bougie can enter. This variety of obſtruction is known by its coming on ſuddenly, and going off ſometimes almoſt completely in the ſpace of a few hours. Of the permanent ſtricture, or ſtricture properly ſo called, Mr. Hunter obſerves, that in moſt of the caſes of this kind which he has ſeen the diſeaſe extends no farther in breadth than if the part had been ſurrounded with a piece of packthread. He has however ſeen the urethra irregularly contracted for above an inch in length, owing to its coats or internal membrane being irregularly thickened and forming a winding canal. He farther obſerves, that a ſtricture does not ariſe, in all caſes, from an equal contraction of the urethra all round; but in ſome, from a contraction of one ſide, which throws the paſſage to the oppoſite ſide, and often makes it difficult to paſs the bougie. In ſome few caſes, he ſays there are more ſtrictures than one; he has ſeen half a dozen in one urethra, and finds that the bulbous part is much more ſubject to ſtrictures than the whole of the urethra beſides; that they are ſometimes on this ſide of the bulb, but very ſeldom beyond it; and that they are often ſlow in forming, it being frequently years from the time they are perceived before they become very troubleſome. Contrary to the opinion of others, Mr. Hunter doubts very much if the ſtricture commonly, or even ever, ariſes from the effects of the venereal diſeaſe, or the method of cure; for ſtrictures are common to other paſſages, and ſometimes happen in the urethra where no venereal complaint had ever been.

When obſtructions are occaſioned by caruncles in the urethra, bougies ſhould be introduced rubbed over with bland oil until a reſiſtance is met with. When a bougie cannot be introduced far enough, one with a ſmaller point is to be uſed, but not till the day following, leſt the part be too much irritated. They ought not to be allowed to remain long at firſt, particularly when they occaſion a conſiderable degree of pain.

When ſuppreſſion of urine ariſes from *ſwellings in or about the urethra*, in conſequence of inflammation, an attempt ſhould be made to diſcuſs theſe immediately, or bring them into a ſtate of ſuppuration, and diſcharge the pus as ſoon as it is formed. But when the nature of the tumor is ſuch as not to terminate in either of theſe ways, extirpation of the diſeaſed parts, when this is found practicable, is the only probable means of relief. Bougies ſhould at the ſame time be uſed to aſſiſt in the cure.

When *ſpaſmodic affections* are preſent in the urethra, the remedies to be employed are, warm emollients, as rubbing the part with warm oil; anodynes, as opium given by the mouth, but more eſpecially by the anus; blood-letting in plethoric habits, and this to be generally and locally applied; bliſters put to the penis or perinæum; electricity, after plethora has been removed. Some caſes may be treated with bougies; but where the diſeaſe is purely ſpaſmodical, they are generally found to be hurtful; though in other caſes, when the violence of the diſeaſe is ſo far removed, if they can be introduced, they are of ſervice, by relieving any obſtructions which may remain after the remedies above mentioned have been exhibited. Coſtiveneſs ought likewiſe to be guarded againſt. The permanent ſtricture is to be cured by bougies.

Bougies act ſolely by preſſure, and by dilating the part; hence they ſhould be ſo large as to fill the paſſage, and ſufficiently flexible to be eaſily introduced. Bougies when properly made, can ſometimes be kept in for ſix or eight hours together; but the length of time proper for their retention muſt depend much upon the feelings of the patient. At all times when they give much pain they ought to be removed, and not introduced again till the part is in a ſtate fit for receiving them. They ſhould be gradually increaſed in their ſize, till the paſſage returns to its natural dimenſions. They ought to be continued for ſome time after, till it appear that there is no danger of a return of the complaint.

Sect. II. *Of* Phymosis *and* Paraphymosis.

In *phymoſis* the prepuce is thickened, and contracted before the glans, ſo that it cannot be readily drawn behind it. In ſome people there is a conſtitutional phymoſis from the natural ſtraightneſs of the prepuce. Sometimes it ariſes from the matter ſecreted by the odoriferous glands at the root of the glans being confined and becoming acrid; ſometimes from an anaſarcous ſwelling of the ſcrotum and penis; but moſt frequently from venereal virus.

The cure muſt depend upon the nature of the cauſe producing the diſeaſe. If the ſymptoms be inflammatory and of no long continuance, fomenting the parts frequently with warm emollient decoctions, or bathing them in warm milk, and then applying emollient poultices, or keeping the diſeaſed parts conſtantly moiſt with a cold aſtringent ſolution, and turning the penis upwards and ſupporting it againſt the belly, commonly give relief. If the inflammation has ariſen from a venereal cauſe, part of the fluid ought frequently to be injected, by means of a ſyringe, between the prepuce and glans, ſo as to waſh off any matter which may there be concealed; but if the inflammation ſtill continues to increaſe, blood-letting is neceſſary, both general and local. The veins of the penis are ſometimes adviſed to be opened with a lancet; but this is unſafe on account of the nerves. Leeches may be applied; but care muſt be taken, in venereal caſes, leſt the bites of theſe animals, by abſorbing venereal matter, turn into chancres. Along with the remedies already adviſed, gentle laxatives, low diet, and abſtinence, ought to be preſcribed. But if, after due perſeverance in theſe means, it is found that they have had little effect in removing the diſorder, or perhaps that the ſymptoms are conſtantly increaſing, and that chancres are confined under the prepuce; in that caſe it is neceſſary to *ſlit open the prepuce*, which is beſt done by a ſharp-pointed biſtoury, concealed in a grooved directory, Pl. 26. fig. 78. This is to be introduced between the prepuce and glans, till the director is found by the finger to have reached the upper or back part of the prepuce. The operator is now to keep the director firm with one hand, while with the other he puſhes forward the knife, till its point paſſes through the prepuce; then drawing the inſtrument towards him, he cuts the prepuce through its whole length.

The operation being performed, the parts are to be waſhed and cleaned with warm water, and the ſore dreſſed with a little ſoft lint, and a compreſs of linen laid over it. The whole may be retained by a ſmall bag properly adapted, and ſecured by two ſtraps to a bandage put round the body. This bag may be left open at the under end, to allow the patient to make water, without removing the dreſſings; but if this be found impracticable, the dreſſings may be removed with little inconvenience. If the glans be much inflamed and excoriated, care ſhould be taken to inſert lint ſpread with emollient ointment between the glans and prepuce, otherwiſe troubleſome adheſions are apt to enſue. It is evident, that when this diſeaſe is of the venereal kind, the ſore will not readily heal till the poiſon be eradicated from the conſtitution.

In ſome caſes of phymoſis the preputium is ſo remarkably long, and the contraction ſo much confined to the point, that a circular inciſion is preferable to a longitudinal one; and it is eaſily effected, by ſeparating ſuch a portion as may be found neceſſary of the whole circumference of the prepuce. The dreſſings in this caſe are the ſame as when the prepuce is ſlit open.

Paraphymoſis is the reverſe of phymoſis, being formed by a

retraction of the prepuce, producing ftricture behind the glans of the penis. Like the former difeafe, it arifes moft frequently from a venereal infection, but may be produced from whatever preternaturally enlarges the glans or conftricts the prepuce.

In the incipient ftate, the patient may generally be relieved by the furgeon pufhing the glans gently back with his thumbs, while with his fingers he brings the prepuce gradually forward. But a more effectual method than this is to inclofe the glans with one of the hands, and prefs gently on all fides, by which the fluids forming the enlargement will be pufhed into the body of the penis behind the ftricture. If this method be perfevered in for a confiderable time, it will generally be found to anfwer the purpofe: but fhould it prove ineffectual, we may try the effects of cold applications; and the beft feem to be thofe of the faturnine kind. When the penis is evidently much fwelled and inflamed, the patient fhould be kept cool, gentle laxatives and low diet fhould be prefcribed, and a number of leeches applied to the penis. Should the difeafe ftill continue to increafe, and an œdematous fwelling appear about the under part of the prepuce, an operation is neceffary to prevent a mortification from taking place in the glans. An incifion is to be made on each fide of the penis immediately behind the glans, fo large as completely to divide the ftricture. The wound ought to be allowed to bleed freely: after which a pledget fpread with fimple ointment is to be applied, and an emollient poultice laid over the whole.

Sect. III. *Of an* Incomplete Urethra.

In children, efpecially males, the urethra is fometimes incomplete, ending before it reaches the ufual place of termination. Sometimes it does fo without any external opening, at other times it opens at a diftance from the common termination. In the firft cafe, a fmall trocar is to be introduced in the direction the urethra ought to take, till the urine be difcharged; after which, the paffage is to be kept open by the ufe of bougies, till the fides be rendered callous and an opening preferved. In the other cafe, as the opening which is already found affords a temporary paffage for the urine, it will be better to delay doing any operation till the patient be farther advanced in life, when it is to be performed as in the former cafe.

After the operation, a piece of flexible catheter may be introduced, as well for the purpofe of rendering the paffage free and callous, as for carrying off the water till a cure is made.

Sect. IV. *Of* Amputating *the* Penis.

This operation is found neceffary in certain difeafes which will not yield to other remedies; as in cafes of mortification and cancer. The following is the method of performing it:

A circular incifion is firft to be made through the found fkin a little beyond the difeafed parts; the fkin is then to be drawn back by an affiftant, and the body of the penis divided by one ftroke of the knife, immediately at the edge of the retracted fkin. The principal arteries, which are two or three on each fide, are next to be fecured by ligatures; and if an oozing of blood ftill continue, the furface of the fore ought to be dufted with fome ftyptic powder. To allow the patient to make water, a filver canula (Pl. 26. fig. 79.) is to be introduced into the urethra, and retained there by two fmall ligatures fixed to the fide of the canula, their other extremities being faftened to a bandage put round the body. The wound is to be dreffed with foft lint, kept in its place by a piece of linen previoufly perforated for the introduction of the canula The dreffings are to be kept on by a narrow roller paffed a few times round the penis, which, by gently compreffing the penis upon the inftrument, will effectually prevent any farther difcharge of blood. The after-treatment of the fore fhould be fimilar to wounds in other parts of the body. But it will not be neceffary to make any farther compreffion of the penis upon the canula, as the difcharge of blood will, previous to this time, be entirely ftopped. The tube is to be allowed to remain in the urethra during the whole time of the cure.

Before any operation of this kind is attempted, the furgeon ought to examine attentively, whether the difeafe be in the penis itfelf, or only in the fkin, as the prepuce alone is frequently fo much enlarged and otherwife difeafed as to give caufe for fufpicion that the glans and body of the penis are likewife affected. This precaution is the more neceffary, as feveral inftances have occurred where the glans and body of the penis have been removed, and, after the operation, have been found perfectly found. Previous to amputation, therefore, where there is any caufe for fufpicion, the prepuce fhould be flit open, and the glans examined, fo as to avoid amputating more than what is abfolutely difeafed.

It fometimes happens that the frænum of the penis is fo fhort as to give confiderable uneafinefs in time of an erection. When this is the cafe, it may be fafely divided by a pair of fciffars, or by a fharp-pointed biftoury, and the wound dreffed with a little charpie.

Sect. V. *Of* Fistula *in* Perinæo.

The term implies a finuous ulcer in the perinæum, commonly communicating with the urethra, bnt fometimes opening into the bladder. The fame term is alfo applied to fimilar fores opening into the fcrotum, or into any part of the penis.

The difeafe may arife from wounds in the bladder, and of the urethra, from external violence; from a laceration of parts when performing the operation of lithotomy; from incifion into the urethra for the extraction of calculi impacted there; from finufes producing matter capable of corroding the membranous part of the urethra; from fuppuration in the perinæum in confequence of inflammation; from the urine paffing through an opening in the urethra into the perinæum or other neighbouring parts, and rendering the edges of the fore callous; and moft frequently the difeafe is occafioned by venereal complaints.

In the *treatment* of this difeafe, when it is the confequence of a general affection of the fyftem, a removal of the primary diforder is neceffary before a cure can be attempted. When the complaint is of a local nature, a fimple incifion into the finus is all that is neceffary; and for this purpofe a ftaff is to be introduced into the urethra, fo as to pafs the opening at which the urine is difcharged. A probe, or a fmall director is now to be paffed at the external opening of the fore till it reach the ftaff; and cutting upon it, the finus is to be laid open through its whole length till it terminate either in the urethra, or, if neceffary, in the bladder itfelf When more openings than one are prefent, they are to be treated in the fame manner; and if the finufes are found to be remarkably hard, the removal of a fmall portion of the difeafed part will expedite the cure, though the confequent inflammation and fuppuration will render this feldom neceffary. After the operation, the wound is to be dreffed with pledgets of emollient ointment, fo as to allow it to fill up completely from its bot-

tom. The whole is to be covered with a pledget of emollient ointment; and proper compreffes being applied over it, the dreffings are to be fupported by a T bandage.

If fymptoms of inflammation be violent, an emollient poultice is to be applied in the courfe of twenty-four hours after the operation; and as foon as free fuppuration is formed, light eafy dreffings are to be ufed till the fore is completely healed.

CHAP. XXX. DISEASES ABOUT THE ANUS.

SECT. I. *Of* HÆMORRHOIDS *or* PILES.

THE treatment of piles has been already confidered under the article MEDICINE; but it fometimes happens, that although the means mentioned there have been employed, the difeafe becomes fo violent as to require the affiftance of the furgeon. Where the difcharge of blood is fo great as to endanger the life of the patient, we ought to attempt to ftop it either by compreffion, or by fecuring the bleeding veffels by a ligature; and here the tenaculum is preferable to the needle, becaufe, when the latter is ufed, a portion of the rectum is apt to be included in the ligature. When piles arrive at fuch a fize as to obftruct the paffage of the fæces, or to produce great irritation, the removal of them by the knife or by ligature becomes neceffary. The firft of thefe may be ufed when their fize is of fuch a nature as not to threaten a dangerous hæmorrhagy; but when this is the cafe, they ought to be removed by ligature, the manner of applying which has been confidered under the treatment of *polypi*. The dreffings are to be of a fimple nature.

SECT. II. *Of* CONDYLOMATOUS EXCRESCENCES, *&c.* *of the* ANUS.

EXCRESCENCES are fometimes produced about the anus, which from their figure get the name of *fici, criftæ*, &c.; but they are all of the fame nature, and to be cured by the fame means. They fometimes grow within the gut itfelf, but more frequently are fituated at the verge of the anus. They vary confiderably in their colour, figure, and confiftence. Sometimes they are only one or two in number, but commonly all the fkin about the anus becomes covered with them. They vary in fize from that of ordinary warts to that of fplit garden beans. They feem originally to be productions of the fkin, though at laft they fometimes proceed as deep as the mufcles. They frequently remain long without producing much uneafinefs. When this is the cafe, they ought not to be touched; but fometimes they become fo troublefome as to render their removal neceffary.

The fofter kinds can frequently be removed by rubbing them often with gentle efcharotics, as crude fal ammoniac, or pulvis fabinæ; but the harder kinds are to be removed chiefly by lunar cauftic, or by the knife; the latter of which is greatly preferable, and may be done with the utmoft fafety.

The fores are afterwards to be treated like wounds produced by any other caufe. If cauftic is to be ufed, care ought to be taken that it do not injure the rectum.

SECT. III. *Of* FISTULA IN ANO.

THE fiftula in ano is a finuous ulcer in the neighbourhood of the rectum. When it opens externally, and has likewife a communication with the gut, it is termed a *complete fiftula*; but if it has no communication with the rectum, it is called *incomplete*. When the ulcer communicates with the gut, but has no external opening, it is named an *internal* or *occult fiftula*. It is likewife diftinguifhed into fimple and compound. The firft is where one or more finufes communicate with the internal ulcer, but where the parts in the neighbourhood are found. The compound fiftula is where the parts through which the finus runs are hard and fwelled, or where the ulcer communicates with the bladder, vagina, os facrum, and other contiguous parts.

The caufes producing the difeafe may be whatever tends to form matter about the anus, piles, condylomatous tumors, hardened fæces, or any caufe which produces irritation and inflammation, fo as to end in fuppuration. As foon as a fwelling about the anus appears to terminate in fuppuration, every thing ought to be done which can accelerate the formation of matter. A proper degree of heat, warm poultices, fomentations, and the fteams of warm water, are the means beft fuited for this purpofe; and as foon as matter is formed, it ought to be difcharged by a free incifion in the loweft part of the tumor. Much depends upon the proper treatment here; for if the opening be made too fmall, or if long delayed, the matter gets into the loofe cellular fubftance, and inftead of producing one, produces many finufes, and thefe fometimes running to a great depth. The parts ought then to be covered with foft lint fpread with mild ointment, and an emollient poultice kept conftantly over the whole. By this any remaining hardnefs will be removed, the cavity will fill up like impofthumous tumors in other parts, and a complete cure will in general foon be made.

It more frequently happens, however, that the practitioner is not called in till the abfcefs has burft of itfelf, and till matter has infinuated into the furrounding cellular fubftance, and formed one or more real fiftulæ.

The firft thing to be done now is to difcover the real *courfe of the different finufes*, and the probe is the beft inftrument for this purpofe. If there be openings in the external furface, there is commonly little difficulty in this. If they run along the perinæum or the mufcles, the probe will generally detect them. If they follow the direction of the gut, the beft method is to introduce the fore finger oiled into the rectum, while the probe is entered at the external orifice. If there be a communication between the gut and the finus, the probe may be made to pafs till its point is felt by the finger in the the rectum. We difcover with certainty if a finus communicate with the gut, when air or fæces are difcharged, or when any mild fluid injected returns by the anus.

After the courfe of the finus has been difcovered, the method of cure is next to be confidered. Aftringent or efcharotic injections, preffure, and fetons, are infupportable, on account of the violent pain which they produce. The only method therefore of bringing on a proper degree of inflammation is a free incifion along the whole courfe of the finus. The courfe of the different finufes having been previoufly difcovered, a laxative ought to be given on the day preceding this operation, and a clyfter an hour or two before performing it. The patient is to be placed with his back towards a window, while his body leans upon a bed, table, or chair. The finger of the furgeon is to be rubbed over with oil, and introduced into the rectum. The end of a crooked probe-pointed biftoury (fig. 100.) is then to be paffed into the fiftula, and pufhed againft the finger in the rectum, if the fiftula be complete. But in cafes of incomplete fiftulæ, the point of the inftrument muft be made to perforate the gut before it can reach the finger. Some make the perforation with a fharp-pointed biftoury, which can be made to flip along the fide of a probe-pointed one, as at fig. 101. After the biftoury has reached the cavity of the rectum, the point of it is then to be brought out at the

anus, and a cut made downwards to lay the finus completely open. In this operation the fphincter ani mufcle is commonly cut, if the finus be high; but no inconvenience is found to arife from this circumftance. It fometimes, though rarely, happens, that the finus goes beyond the reach of the finger, and even as high as the upper end of the facrum. The only thing which can be done in this cafe is to cut as high as the finger can go, fo as to give a free and eafy vent to the matter.

Some practitioners, with a view to prevent troublefome hæmorrhagies, and others to free the patient from the dread of the knife, have propofed to open the finufes by means of ligature (Pl. 26. fig. 82.). By introducing one end of a piece of filver or leaden wire into the finus, then bringing it out at the anus, and twifting the ends together, the contained parts may be fo compreffed as to produce a complete divifion of them. But this is both more painful and tedious than the fcalpel, and appears to be by no means neceffary.

When the prefence of an *occult fiftula* is fufpected, its exiftence ought firft to be fully afcertained, by examining whether the matter which is paffed by ftool proceeds from an ulcer in the bowels or from an abfcefs at the fide of the anus. It is difcovered by matter from the bowels being mixed with the fæces, and no pain about the anus. In occult fiftula, a hardnefs, fwelling, and difcoloration, are obferved upon fome fpot near the anus, and there is a fenfation of confiderable pain upon preffure being made upon it. The operation in this is the fame with that in the other two varieties of the diforder; only that an opening is previoufly to be made, by a lancet or fcalpel, in that fpot where the matter appears to be lodged. By this the fore will be reduced to a complete fiftula, and the reft of the operation will be eafily performed.

In this manner the different finufes are to be operated upon, when in a fimple ftate; but in thofe of a *compound nature*, where the parts in the vicinity of the fores have been feparated from each other by an effufion of matter into the cellular fubftance, and where all the under end of the rectum has, in fome rare cafes, been attached from the furrounding parts, two modes of operating have been recommended; either to remove a confiderable portion of the external integuments, fo as to give free vent to the matter; or to extirpate all the lower end of the rectum which is found to be detached from the furrounding parts. But from the pain and fubfequent diftrefs which they occafion, thefe methods are judicioufly laid afide. All that is neceffary to be done here is to lay the detached portion of gut completely open, as in cafes of fimple fiftulæ; but if this be infufficient for allowing the gut to apply properly to the contiguous parts, another incifion fhould be made on the oppofite fide. If the neighbouring bones be found found, and the conftitution in other refpects be unimpaired, a complete cure will probably be obtained.

The matter fometimes infinuates itfelf between the fkin and mufcles of the perinæum, or of the hip. When this is obferved, the fac produced by it fhould be laid open from one end to the other by one or more incifions as circumftances may require. Sometimes, from neglect or improper treatment, the matter collected does not find a proper outlet, and then the parts moft contiguous to it inflame, become painful, and gradually acquire fuch a morbid callofity as to put on a fcirrhous appearance. In fuch cafes a cure may be effected by giving free vent to the matter, preventing every future collection, and inducing and preferving a fuppuration in the fubftance of the parts chiefly affected. To accomplifh this laft circumftance, however, it may fometimes be neceffary not only to lay the finufes freely open, but to cut in upon the obdurated parts.

The different finufes having been laid open, care muft be taken to apply the neceffary dreffings. Upon this much of the fuccefs attending the operation depends. Dry lint, till lately, was much ufed by practitioners; but it has been found to produce fo much irritation, efpecially when too much crammed in, as to be one of the caufes of that diarrhœa which is frequently fo troublefome after operations of this kind. Inftead, therefore, of this fort of dreffing, pledgets, lint, or foft old linen fpread with any fimple ointment, are to be preferred. After the fores have been cleared from clotted blood, the pledgets are to be gently infinuated between their edges, but not to fuch a depth, or with fuch force, as to give any uneafinefs. This being done, and a comprefs of foft linen with a T bandage being applied over the whole, the patient is to be carried to bed; and the dreffings being renewed, either after every ftool, or, when thefe are not frequent, once in the twenty-four hours, the fores will generally fill up from the bottom, and will at laft cicatrize in the fame manner as wounds in any other part of the body. Sometimes, however, they acquire a foft, flabby, unhealthy afpect, and the matter difcharged from them is thin, fetid, and occafionally mixed with blood. Thefe appearances may fometimes arife from fome part of a finus having been overlooked. In this cafe advantage may follow from the part being laid completely open. But it more ufually proceeds from fome affection of the general fyftem; and till this is eradicated the fores cannot be expected to heal.

In the cure of fores in other parts of the body, practitioners have fometimes found great advantage to arife from the ufe of iffues. The fame thing is now found to be applicable here. Wherever therefore fiftulæ are of long ftanding, while any diforder exifting in the conftitution is properly attended to, practitioners recommend, that an iffue, in proportion to the quantity of the matter difcharged by the fores, fhould be immediately employed. In this way, if the bones in the neighbourhood are not difeafed, there will be reafon to expect that a complete cure will be obtained.

Sect. IV. *Of* Prolapsus Ani.

This is a protrufion of part of the rectum beyond the anus. It is often occafioned by debility of the parts, but is moft frequently owing to violent exertions made in the rectum in confequence of irritation. The reduction fhould be effected as foon as poffible; for although this part of the inteftine can bear expofure to air much longer than any of the reft, yet allowing it to remain a long time out would be attended with great uneafinefs, and probably with danger. In the reduction, the tumor ought to be fupported with the palm of one hand, while with the fingers of the other the part of the gut laft protruded is to be returned. If the gut has been long expofed previous to the reduction, venefection may become neceffary, and gentle aftringents may be applied to the part. The patient during the reduction is to be kept in a reclined pofture. As foon as the bowels are returned, a proper bandage (fig. 83.), is to be applied. Such remedies are afterwards to be exhibited as moft tend to recover the tone of the parts.

Sect. V. *Of* Imperforated Anus.

This diforder, though not frequent, now and then occurs; and when prefent, unlefs fpeedy relief be given, muft prove fatal. In fome cafes, the end of the rectum protrudes at the ufual fituation of the anus, and is only covered with the common integuments; but in others, no termination of that gut is difcoverable. Sometimes the rectum ends within an inch of the ufual feat of the anus; at others, it reaches no farther than the top of the facrum. In fome cafes it terminates in the bladder; in others, in the vagina. In the moft favourable

caſes, where the rectum protrudes, an opening may be readily made by a ſcalpel or lancet; but when no direction of this kind is met with, an inciſion is then to be made in the place where the anus is uſually ſituated, and is to be continued in the direction of the os coccygis and ſacrum, which is the courſe the inteſtine commonly takes. The finger is to be uſed as a director along it; the parts are to be cut either till fæces are obſerved, or till the inciſion has been made the length of the finger. If ſtill the fæces do not appear, a lancet-pointed trocar is to be puſhed forward upon the finger in ſuch a direction as the operator thinks will moſt probably reach the gut. An artificial anus is likewiſe to be attempted, where the gut terminates in the bladder or vagina. After the operation, the greateſt attention is neceſſary to preſerve the opening which has been made. Subſtances which irritate leaſt are the moſt uſeful; ſuch as doſſils of lint moiſtened in oil, and rolls of ſoft bougie plaſter.—We ſhall conclude this chapter with two ſhort ſections of *imperforated hymen* and *prolapſus uteri*, though they do not properly come under it.

Sect. VI. *Of an* Imperforated Hymen.

When the hymen is imperforated, the moſt troubleſome ſymptoms, at a certain period of life, may be produced by the accumulation of that fluid, which ought to be diſcharged; for then a tumor is formed, by which the moſt violent bearing-down pains are occaſioned. Theſe increaſe in ſeverity to ſuch a degree, as ſometimes to be miſtaken for labour-pains. They diſappear, however, during the intervals of the accuſtomed periods. In the treatment of this diſeaſe, all that is neceſſary is to make either a ſingle or a crucial inciſion into the obſtructing membrane, and then to prevent the accretion of its edges by doſſils of lint ſpread with ſome emollient ointment till the parts are healed.

Sect. VII. *Of* Prolapsus Uteri.

This is a falling down of the uterus, occaſioned by debility or by exceſſive ſtraining in the time of parturition. The diſorder ſeldom occurs before child-bearing, and is commonly met with in thoſe who are ſomewhat advanced in life. The parts protruding are to be reduced by gentle preſſure, while the patient is put in an horizontal poſture. Peſſaries (fig. 91. *a* and *b*) are to be employed, which ought to be made of cork or other light materials, finely poliſhed, and ſomewhat compreſſible; and none poſſeſs theſe qualities in a more perfect degree than a peſſary made of the elaſtic gum-bottle. This, or whatever elſe may be uſed to anſwer the purpoſe, is to be retained by a proper bandage till by tonic medicines the parts recover ſtrength to retain their natural ſituation.

CHAP. XXXI. Of LUXATIONS.

Sect. I. *Of* Luxations *in general.*

A bone is ſaid to be *luxated* when that part of it forming a joint is moved out of its place. When the bone is forced entirely out of its cavity, the luxation is termed *complete*; when this is not the caſe, it is *partial* or *incomplete*. When there is alſo a wound of the ſoft parts communicating with the joint, it is called a *compound*, and when there is no wound, a *ſimple luxation*.

The common ſymptoms of a diſlocated bone are, inability to move the injured limb; pain, tenſion, deformity in the part affected; and ſometimes inflammation, ſubſultus tendinum, and fever: and theſe three laſt are greateſt in partial diſlocations. The ſwelling which firſt appears is always inflammatory; but afterwards a ſecondary ſwelling comes on, ſeemingly œdematous, and probably owing to the preſſure of the lymphatics by the diſlocated bone.

In judging of the practicability of reducing a luxation, we ought to attend to its nature and extent, the other circumſtances with which it may be complicated, and the length of time which it has continued. When a bone is only partially diſlocated, it is evident that it may be reduced with much more eaſe and certainty than where it is completely diſplaced. It is evident alſo that fracture attending diſlocation muſt render reduction much more difficult and uncertain. Indeed, when both the bones forming the joint are broken, there is the greateſt hazard of its remaining ſtiff during life, even when the greateſt attention has been paid. Luxated bones are moſt eaſily reduced immediately after they are diſplaced; the difficulty indeed of reducing them is generally proportional to the time that has intervened ſince the accident happened. When a bone has been ſome time lodged among the contiguous muſcles, it forms a ſocket for itſelf, and is firmly graſped by the ſurrounding ſoft parts. The cavity, too, from which it was diſlodged may be partially filled with ſome of the ſurrounding ſoft parts, or at leaſt diminiſhed by the conſtant action of the contiguous muſcles on its cartilaginous brim. Diſſections, however, ſhow, that inſpiſſated ſynovia does not, as was formerly ſuppoſed, fill up this cavity. In delicate conſtitutions and advanced periods of life, when the muſcles give little reſiſtance, diſlocations are more eaſily reduced than in the vigour of youth or in robuſt conſtitutions.

In the treatment, we ought, 1. To reduce the diſlocation with as much eaſe and expedition as poſſible; 2. Retain the bone in its ſituation till the parts have recovered their tone; and, 3. Obviate all uneaſy ſymptoms.

1. When the ſurrounding ſkin and muſcles are much contuſed and inflamed, we ſhould endeavour to remove the inflammation by local bleeding, ſaturnine applications, and laying the limb in an eaſy poſture, before we attempt to reduce the bone, as conſiderable injury may be done by ſtretching a limb while the parts ſurrounding the joint are inflamed. The upper part of the limb ſhould be kept ſteady while the ſurgeon endeavours to replace the under bone, which alone is commonly diſplaced. This is not eaſily done; for the contractile power of the muſcles acts ſtrongly againſt every attempt, and not only draws it beyond the contiguous bone againſt which it ſhould be placed, but frequenly forces it out of its natural ſituation, and fixes it firmly in ſome neighbouring cavity, from which it is with difficulty removed. To prevent this reſiſtance as much as poſſible, the muſcles ought to be put into a ſtate of relaxation. If this is properly done, the force neceſſary for reducing a luxated bone may generally be obtained from aſſiſtants alone; ſometimes, however, machinery is required, and various inſtruments have been invented for this purpoſe. Freke's machine is the moſt generally uſed. The force ought always to be applied in a gradual manner, and to the diſlocated bone alone, and not to any more diſtant parts of the limb. After the end of the diſlocated bone is brought into a line with that to which it is oppoſed, the reduction is eaſily completed either by the action of the muſcles alone, or, if that is not ſufficient, by gentle preſſure.

2. After the reduction there is ſeldom any difficulty in retaining the bone in its place, unleſs it has often been diſlocated before. All that is neceſſary is to place the limb in a relaxed poſture, and to ſupport the bone with a bandage till the parts have recovered their tone

3. The moſt urgent ſymptoms which accompany diſloca-

tions are, pain, inflammation, and swelling. These usually abate soon after the reduction. If any degree of inflammation remain, the use of leeches is the best remedy.

When dislocated bones are accompanied with fracture near the joint, the fracture must be allowed to heal before reduction be attempted. This, however, is not always necessary in very small bones, as those of the fingers. When the fracture is at a distance from the joint, the dislocation may generally be reduced immediately. Compound luxations are to be treated nearly as compound fractures. After the bone is replaced, leeches should be applied to abate the inflammation; after which the sore should be dressed with Goulard's cerate, or any other mild ointment, and the pain moderated by opiates and a low regimen: care ought also to be taken that no matter lodge about the joint. When luxations are produced by tumors or collections of matter in the neighbourhood of the joints, they may be considered as incurable: when they proceed from too great a relaxation of the ligaments and tendons of the joint, the bone can hardly be prevented from being now and then displaced; but the inconvenience may be somewhat obviated by supporting the limb with a proper bandage, by the use of the cold bath, and by electricity.

Sect. II. Luxations *of the* Bones *of the* Head *and* Neck.

If the bones of the cranium be separated by external injury, all that can well be done is, to support the parts by a bandage, to prevent inflammation, to keep the patient quiet, and in a proper posture during the cure. The bones of the nose are seldom luxated without fracture: when they are, the injury is easily discovered by the touch. When one of the bones is driven inwards, it may be raised and reduced by pushing a tube of a proper size, and covered with soft lint, into the nostril; which may be afterwards retained till there is no danger of the bone being again displaced. If the bone be luxated outwards, it may be reduced by the fingers, and retained by a double-headed roller. The *lower jaw* is luxated most frequently when the mouth is opened widely; it can only take place forwards and downwards, which are least surrounded by the neighbouring parts: both sides are generally luxated at once; and in that case the mouth is opened wide, the chin thrown forwards and towards the breast. When only one side is dislocated, the mouth is distorted, and widest on the sound side of the jaw, which is drawn a little towards the contrary side. The patient should be seated, and his head supported. The surgeon should push his thumbs, protected by a covering of strong leather, as far as possible between the jaws, and then with his fingers, applied on the outside of the angle of the jaw, endeavour to bring it forward till it move a little from its situation. He should then press it forcibly down, and the condyles will immediately slip into their place. The thumbs ought to be instantly withdrawn, as the patient is apt to bite them involuntarily. The patient should for some time avoid much speaking or opening his mouth wide.

When *the head is luxated*, it commonly falls forwards on the breast, the patient is instantly deprived of sense and motion, and soon dies if the luxation be not quickly reduced. In reducing the luxation, the patient should be placed on the ground, and supported by an assistant: the surgeon standing behind should gradually pull up the head, while the shoulders are pressed down by the assistant till the bones are brought into their place, which is known by a sudden crack or noise: if the patient be not dead, he immediately recovers his faculties, at least in some measure. He should then be put to bed with his head elevated and retained in one posture. He should lose a quantity of blood, and live for some time on a low diet.

Sect. III. Luxations *of the* Spine, Os Coccygis, Clavicle, *and* Ribs.

The vertebræ are sometimes partially, but hardly ever completely, dislocated without fracture. When they occur high up, they are attended with the same symptoms as dislocation of the head: when farther down, besides distortion of the spine, paralysis ensues of every part of the body situated under the luxated bone; there is commonly also either a total suppression of urine, or it is discharged involuntarily together with the fæces. As luxations of this kind are generally owing to falls or violent blows, the displaced vertebra is driven either forwards or to one side; it is therefore very difficult to reduce it. The best, as well as the simplest method, is to lay the patient on his face over a cylindrical body, as a large cask, and at the same time to attempt to replace the bone with the fingers. If the bone be very much displaced, there is very little reason to hope for success. The *os coccygis* is more liable to dislocation than any other part of the spine. It is sometimes forced outwards in laborious births. This is discovered by the great pain which is felt at the connection of the os coccygis with the sacrum, and by the bone appearing to be displaced when examined. It may generally be easily reduced by pressure with the fingers. The best support afterwards is a compress, with the T bandage. When the coccyx is luxated inwardly, the patient complains of severe pain, tenesmus, and a sense of fulness in the rectum; the fæces are passed with difficulty, and in some cases a suppression of urine takes place. The injury is easily discovered by introducing the finger into the anus. In this case the bone should be pressed outwards, by introducing the fore and middle fingers of one hand dipped in oil into the rectum, and supporting the parts which correspond with it externally till the reduction is accomplished. Dislocations of these bones are apt to excite inflammation, which often terminates in dangerous abscesses; it ought therefore to be guarded against by every means in our power.

The *clavicle* is most frequently luxated at its junction with the sternum; because the violence which produces the injury is generally applied to the shoulder. The luxation is discovered by pain in the part, by the projection of the bone, and by the immobility of the shoulder. It is easily reduced by pushing the bone into its place with the fingers, while an assistant draws back the arms and shoulders. It is not so easy to retain the bone in its place. When it is the inner extremity of the clavicle which has been dislocated, the shoulder should be kept in its natural situation, neither raised nor depressed: the fore arm should be supported, as should also the head and shoulders, and a moderate pressure should be made upon the displaced end of the bone. For this purpose the machine represented fig. 84. in Pl. 26. the invention of Mr. Park of Liverpool, answers best. But when the outer extremity of the clavicle has been dislocated, the shoulder must be considerably raised, the arm supported in a sling, and the bone kept in its proper situation by a small compress placed over its end, and secured by a roller forming the figure 8; or it may be retained by the machine above mentioned. The bandage ought to be retained for a considerable time.

Luxations of the *ribs* are exceedingly rare. The symptoms are nearly the same with those arising from fracture, only that the pain is more severe at the articulation, and that no other spot but that will yield to pressure. All that can be done is to bend the body forward over a cask or some such body, in order to assist the viscera in pressing out the rib. Bandages are of little use. The patient should be kept quiet, and fed on a low diet: inflammation should be prevented, and opiates given if he has a troublesome cough.

SECT. IV. LUXATION *of the* BONES *of the* SUPERIOR EXTREMITIES.

THE head of *the os humeri* is moſt frequently diſlocated forwards and downwards, ſometimes downwards and backwards, but never upwards without a fracture of that part of the ſcapula which is placed above the joint. The luxation is diſcovered by the patient's inability to raiſe his arm, by violent pain attending the attempt, by the luxated arm being of a different length from the other, by the head of the humerus being felt out of its natural ſituation, while a vacuity is perceived under the acromion, and by the flatneſs of the injured joint, while the ſound one has its natural fulneſs. When the luxation is of long ſtanding, the whole arm is apt to become œdematous.

The patient ſhould be ſeated on a chair, and his body ſecured by a broad belt paſſed round it, and held by aſſiſtants. The elbow ſhould be bent, in order to relax the muſcles on the fore part of the luxated joint. A firm leather belt four or five inches broad, with ſtrong ſtraps, and lined with flannel, is to be tied round the arm immediately above the elbow: aſſiſtants are to extend the arm gradually, by pulling theſe ſtraps, while another aſſiſtant draws back the ſcapula. The ſurgeon ſtands on the outſide of the arm, directs the aſſiſtants, and varies the direction of the extenſion, according to the ſituation of the head of the bone. As ſoon as the head of the bone has cleared the brim of the ſocket, the muſcles draw it into its place, a crack is heard, the patient is relieved, and the anterior part of the ſhoulder acquires its uſual fulneſs.

Various *other methods* of extending the arm have been propoſed in difficult caſes; as, ſuſpending the patient by the luxated arm over the ſtep of a ladder or the top of a door, raiſing him up by the arm with ropes running over pulleys fixed in the ceiling of a room, &c. The jerk produced by the body being ſuddenly raiſed and let down again on a feather bed, has ſometimes ſucceeded when other means have failed. A gentler method is to lay the patient on the floor, while two or three ſtout men ſtanding on a table lay hold of him by the arm and pull him up. But all theſe methods are in danger of lacerating the ſoft parts by the ſuddenneſs with which the force is applied, and even ſometimes of breaking the end of the humerus if it be preſſed againſt the neck of the ſcapula. Mr. Freke's improvement on the ambé of Hippocrates has been conſidered as the beſt machine for extending the arm. But machinery is very ſeldom neceſſary; even caſes of long ſtanding may by proper management be reduced by means of aſſiſtants, providing reduction be at all practicable. Inflammation after the operation ſhould be obviated by the uſual remedies. If the bone be apt to ſtep out again, which ſometimes happens after repeated diſlocations, the arm ſhould be ſupported in a ſling till the parts have recovered their tone. Bliſters, friction, ſtimulating medicines applied to the ſhoulder, and cold water poured on it, have ſometimes been uſeful in reſtoring the ſtrength of the joint.

Luxations at *the elbow* moſt commonly happen upwards and backwards; and then the fore-arm is ſhortened, the end of the ulna projects behind, and is higher than uſual, while the extremity of the humerus can be felt in the bend of the elbow. The ſurgeon ſhould take hold of the wriſt with one hand, and the upper part of the fore-arm (which is to be moderately bent) with the other, and gradually pull the top of the fore-arm downwards, while at the ſame time he increaſes the curvature of the elbow to diſengage the ends of the bones from each other. He ſhould then pull the bones forward into their ſituation. When the luxation happens upwards and forwards, it ſhould be reduced while the arm is extended. After the reduction, the muſcles of the fore-arm ſhould be kept relaxed by bending the elbow a little till the parts have recovered their tone. When the bones of the fore-arm are diſlocated from each other, which happens moſt frequently at the wriſt, the rotatory motion of the hand is deſtroyed. After the reduction, the bones ſhould be bound together by a tight flannel roller, or a couple of ſplints ſhould be applied along the fore-arm, and the arm ſupported in a ſling.

The bones of *the wriſt* are not ſo often luxated as might be expected from the ſmallneſs of their ſize. When they are, great ſwelling and pain enſues, and the motion of the joint is entirely deſtroyed. Great attention is neceſſary, leſt luxation ſhould be miſtaken for a ſprain. The arm and hand ſhould be ſupported by aſſiſtants, but not ſtretched; and then the bones ſhould be puſhed into their place, and afterwards retained by proper bandages and ſplints. The bones of the metacarpus, when they happen to be diſlocated, which is very ſeldom, are to be reduced in the ſame manner. Diſlocations of the thumb or fingers are eaſily diſcovered. To reduce them, an aſſiſtant ſhould hold the phalanx from which the diſlocation happened, while the ſurgeon endeavours to elevate the bone from the one contiguous to it, and to paſs it into its place.

SECT. V. LUXATIONS *of the* BONES *of the* INFERIOR EXTREMITIES.

FROM the great ſtrength of *the hip joint*, it was formerly believed that the head of the thigh-bone was never luxated by external violence; but it is now known that it happens by no means unfrequently. The ball in ſtarting from its ſocket generally paſſes forwards and downwards into the foramen thyroideum. When this happens, the limb is conſiderably lengthened, the head of the bone is lodged near the under and fore part of the pelvis, the large trochanter is obſerved on the fore part of the thigh, a vacancy is perceived where the head of the bone and the trochanter ſhould be, and the toes are turned outwards. When the bone is diſlocated upwards and backwards, the limb is ſhortened, the great trochanter higher than uſual, the knee and foot turned inwards. When it is diſlocated upwards and forwards, the leg is ſhortened, the ball of the bone is felt on the os pubis in the groin, and the great trochanter on the upper and lower part of the thigh; a vacancy is diſcovered in the correſponding part of the hip; the knee and toes are turned outwards. When the ball ſlips downwards and backwards, the leg is lengthened, the toes turned inwards, and the great trochanter is lower than that of the other limb. If the ball ſlip directly downwards, the leg is lengthened, but the knee and toes keep nearly their natural ſituation. It is ſometimes difficult to diſtinguiſh between luxation and fracture of the neck of the bone. In fractures the bone is moſt frequently puſhed upwards, and the leg ſhortened, the knee and point of the toes are turned inwards, and may be moved much more readily outwards and inwards than when the bone is diſlocated.

For *reduction*, the patient ſhould be laid on a mattreſs on the ſound ſide, and a wooden roller covered with ſeveral folds of flannel placed between his thighs, and fixed firmly by ſtraps to the wall. A ſtrong bandage of buff leather, or ſomething ſimilar, ſhould be applied to the under end of the thigh, with ſtraps fixed to it to make the extenſion. The trunk of the body ſhould be properly ſecured, and the joint of the knee bent. The extenſion ſhould be made at firſt gently, and increaſed gradually, while, at the ſame time, the thigh is made to roll in different directions. When the extenſion is ſufficient, two aſſiſtants ſhould lay hold of the roller, and attempt

to raiſe the bone; the extending force ſhould then be ſlackened, and the ſurgeon ſhould puſh the head of the bone upwards and outwards, while an aſſiſtant preſſes the knee forcibly inwards. The muſcles themſelves will then commonly bring the bone into its place; and this is done with ſuch a jerk and noiſe, that it is heard by the by-ſtanders. If the reduction be not obtained, the extenſion muſt be repeated with greater force. Inſtead of the roller a broad ſtrap or table cloth is frequently uſed. The limb ſhould not be uſed for ſome time after reduction, and inflammation ſhould be prevented by the proper remedies.

The patella can neither be luxated upwards or downwards, without rupture of the tendons of the extenſors muſcles, or of the ſtrong ligament which fixes it to the tibia; but it may be luxated to either ſide. The luxation produces lameneſs, and much pain on attempting to move the joint. In recent caſes the injury is eaſily diſcovered; but when the ſurgeon is not called immediately, the ſwelling may be ſo great as to render it more difficult. For reduction, the limb ſhould be kept extended; the ſurgeon, by depreſſing the edge of the patella moſt diſtant from the joint, is enabled to raiſe the other, and puſh the bone into its place.

It may be neceſſary to remain a day or two in bed till the knee recover its tone. Sometimes, after the bone has been diſplaced, returns of the ſame complaint become frequent. In ſuch caſes, proper machinery applied to the ſide of the tumor, where the bone is apt to ſtart out, is uſed with advantage.

From the ſize of the joint, and the great ſtrength of the ligaments, luxations of the tibia from the os femoris rarely occur. When it does, it is eaſily diſcovered by the pain, lameneſs, and deformity of the limb. The patient ſhould be laid on a table, the muſcles relaxed, and the thigh ſecured by aſſiſtants; the limb ſhould then be extended, and the bones cleared of each other, when they will be eaſily replaced. After the reduction, the limb ſhould remain for ſome time perfectly at reſt; and inflammation, which is very apt to enſue, and is attended with very bad conſequences, ſhould be aſſiduouſly guarded againſt.

If the *ankle joint* be diſlocated forwards, the fore part of the foot is lengthened; if backwards, the foot is ſhortened and the heel lengthened (this is the moſt common variety); if to either ſide, there is an uncommon vacancy on the one ſide, and a prominency on the other. Diſlocation, however, can hardly take place outwardly without fracture of the end of the fibula.

For reduction, the limb ſhould be firmly held by aſſiſtants, the muſcles relaxed, and extenſion made till the bones are cleared of each other, when the aſtragulus will eaſily ſlip into its place.—The ſame rules ſhould be obſerved in reducing diſlocations of the bones of the foot. Luxations of the metatarſal bones and toes are reduced exactly in the ſame manner as the bones of the metacarpus and fingers.

CHAP. XXXII. Of FRACTURES.

SECT. I. *Of* FRACTURES *in general.*

THE term *fracture* is generally confined to ſuch diviſions in bones as are produced by external injury. When the integuments remain ſound, the fracture is called *ſimple*; when it communicates with a wound, it is called *compound.*

The general *ſymptoms* of fracture are pain, ſwelling, and tenſion in the contiguous parts. A grating noiſe when the part is handled, diſtortion, and a certain degree of loſs of power in the injured part, accompany almoſt every fracture, except when it runs longitudinally, and the divided parts are not completely ſeparated from each other. When there is only a ſingle bone in a limb, a fracture is eaſily detected; but where only one of two bones of a limb has ſuffered, it is often difficult to judge with certainty, eſpecially if the contiguous ſoft parts be tenſe and painful before the practitioner is called. In that caſe, the opinion muſt be regulated, not only by the attendant ſymptoms, but, 1ſt, By the age and habit of the patient; for bones are more eaſily fractured in old than in young perſons. Different diſeaſes, too, induce brittleneſs of the bones, as the lues venerea and ſea-ſcurvy. 2d, By the ſituation of the part; for bones are more apt to be fractured in the ſolid parts of their bodies than towards their extremities, where they are more ſoft and pliant. 3d, By the poſture of the limb; for a weight may fracture a bone lying on an unequal ſurface, which it would have ſuſtained without injury if equally ſupported. Fractures are ſometimes attended with a great degree of echymoſis, occaſioned by the ends of the fractured bones wounding ſome of the contiguous blood-veſſels.

In giving a *prognoſis* of fracture, various circumſtances are to be attended to. It is evident that ſmall fractured bones are more eaſily healed than large ones, and that the fracture of the middle of a bone is not near ſo dangerous as near the extremity. A cure is effected much more readily in youth than in old age, and in good conſtitutions than in bad. We ought alſo to attend to the concomitant ſymptoms, and the injury which the neighbouring parts may have ſuſtained. The more moderate the ſymptoms, the more favourable our prognoſis may be.

The *treatment* of fractures conſiſt of three particulars; replacement, retention, and obviating bad ſymptoms.

1. When bones are fractured directly acroſs the parts, they are often very little moved from their natural ſituation; but when the fracture is oblique, they are apt to paſs over each other, and to produce much uneaſineſs and deformity; the contiguous muſcles are ſeverely injured, and the pain is aggravated by the ſlighteſt motion. The ſurgeon ſhould put the limb into the beſt poſture for relaxing all the muſcles connected with it, according to the practice firſt introduced by Mr. Pott. If it be properly attended to, the ends of the bones will in general be eaſily replaced. When any difficulty occurs, a ſmall degree of extenſion may be made, taking care to keep the muſcles as relaxed as poſſible. Much attention ſhould be paid to replacing the bones properly, otherwiſe the limb will remain for ever after diſtorted.

2. After the bones are replaced, the limb ſhould be laid in the eaſieſt poſture, and the bones afterwards retained in their ſituation by proper compreſſes and bandages, not applied too tightly, till the cure be completed. The time neceſſary for this purpoſe depends on the ſize of the bone, the age and habit of the patient, the ſteadineſs with which the limb has been retained in its place, and the violence of the attending ſymptoms. In middle-aged perſons, and under favourable circumſtances, a fracture of the thigh bone, or of the bones of the leg, may be cured in two months; of the arm bone, or bones of the fore-arm, in ſix weeks; of the ribs, clavicles, and bones of the hand, in three weeks. In infancy the cure will take a ſhorter, and in old age a longer, time than this.

3. In ſimple fractures the inflammatory ſymptoms generally ſubſide in a few days. When they become worſe, which is ſometimes the caſe, aſtringent applications ſhould be employed. If theſe fail, blood ought to be drawn from the parts affected. This is of ſo much advantage, that it ought never to be omitted where the ſurrounding ſoft parts are much injured. Friction with emollient oils, warm bathing, the uſe of Bath and other ſimilar waters, are alſo of much ſervice. The limb ſometimes

puts on a clumſy appearance from an overgrowth of callus. When this tendency appears, ardent ſpirits and other aſtringents are conſidered as uſeful; ſometimes preſſure on the part by a thin plate of lead fixed by a bandage may be advantageous. Many inſtances occur, however, where no remedies prove ſucceſsful: the patient ought therefore to be acquainted beforehand with the probable event, to prevent unpleaſant reflections afterwards.

Sometimes the ends of the bone remain looſe long after they might have been reunited. This may be owing to ſome conſtitutional diſeaſe, to the bones not being kept ſteadily in contact, to ſome of the ſoft parts getting in between them, or to the bone being broken in different places, and the intermediate fractures being too ſmall to adhere. Pregnancy has alſo been mentioned as a cauſe. By removing theſe obſtructions, a perfect union may in recent caſes be accompliſhed. But where the caſe is of long ſtanding, callus of the bones becomes ſo hard and ſmooth as to move with the eaſe of a joint, ſo that no advantage can be derived from laying them together. In that caſe, an inciſion ſhould be made through the ſoft parts, and a ſmall portion of the ends of the bone removed with a ſaw. If this be properly performed, nature will ſupply the deficiency. When ſmall pieces of bone remain long looſe, they ſhould be extracted by making an opening. The intervention of muſcles or other ſoft parts is known by the very ſevere pain and tenſion, and by particular motions of the limb cauſing great pain and twitching of the muſcles which move it. The limb ſhould be put into all the variety of ſituation; and if this does not ſucceed, an opening muſt be made, and the ſoft parts removed. Sometimes in fractures blood-veſſels are ruptured by the ſharp ſpiculæ of the bone: this happens moſt commonly in compound fractures. When the effuſion of blood is great, the part ſwells ſo much that it is neceſſary to lay it open, and to ſecure the divided veſſels by a ligature. When the ſwelling is not great, the abſorption of the blood is truſted to nature. When the blood remains long in contact with the fractured bone, it ſometimes prevents the formation of callus; the perioſteum ſeparates from a conſiderable portion of the bone, and a thin fetid ſanies is diſcharged at the wound. When this happens, no cure can be expected till the parts of the bone deprived of perioſteum have exfoliated, or have been ſeparated by a ſaw.

Sect. II. Fractures *of the* Bones *of the* Face.

Fractures of *the noſe* may impede reſpiration, affect the ſpeech and ſenſe of ſmelling, give riſe to polypi and tedious ulcers, and may beſides be dangerous from their vicinity to the brain. When any part of the bones of the noſe has been raiſed above the reſt, it is to be preſſed into its place with the fingers; if it has been puſhed into the noſtril, it is to be raiſed with the end of a ſpatula or other ſimilar inſtrument. If any portion be almoſt entirely ſeparated from the reſt, it ſhould be removed; but if it adheres with conſiderable firmneſs, it is to be replaced. If the bones, after being replaced, do not remain in their proper ſituation, they are to be retained either by tubes introduced into the noſtrils, or by a double-headed roller, with proper compreſſes as the caſe may require. Inflammation ſhould be prevented by the proper remedies.

Much care is neceſſary in replacing the fractured bones of the face, and in dreſſing them, in order to prevent deformity. The dreſſings may be retained by adheſive plaſters. Inflammation, by which the eyes, noſe, or antrum maxillare, is apt to be injured, ſhould be prevented. When matter collects in the antrum, it is to be removed by the methods formerly deſcribed.

For replacing fractures of the *lower jaw*, the patient ſhould be ſeated in a proper light, with his head firmly ſecured. The ſurgeon ſhould preſs with one hand on the inſide of the bone, while with the other he guards againſt inequalities on the outſide. If a tooth come in the way, it ſhould be extracted; when any of the others are forced out of their ſockets, they ſhould be replaced, and tied to the neighbouring teeth till they become firm. The fractured parts being kept firm by an aſſiſtant, a thick compreſs of linen or cotton ſhould be laid over the chin, and made to extend from ear to ear over it; a four-headed roller ſhould be applied firm enough to keep the fractured parts in contact. The patient ſhould be kept quiet during the cure, and fed upon ſpoon-meat. The dreſſings ſhould be removed as ſeldom as poſſible. When the fracture is accompanied with an external wound, the parts ſhould be ſupported by an aſſiſtant during the dreſſing of it.

Sect. III. Fractures *of the* Clavicles, Ribs, Sternum, *and* Spine.

A fracture of *the clavicle* is eaſily diſcovered by the grating noiſe in the fractured bone upon moving the arm freely, by the ends of the bone yielding to preſſure, and by the motion of the humerus being impeded. All that can be done is to raiſe the arm, and ſupport it at a proper height, either by a ſling, or, which is better, by the leather caſe recommended in caſe of luxation of this bone. By this the fractured parts will be brought together, ſo far at leaſt as to prevent deformity, and render the bone ſufficiently ſtrong.

Fractures of *the ribs* are diſcovered by preſſures with the fingers. The ſymptoms are commonly moderate, and the patient ſoon gets well. In ſome caſes, however, the pain is ſevere, the breathing becomes difficult, attended with cough, and perhaps with ſpitting of blood, and the pulſe is quick, full, and ſometimes oppreſſed. Theſe ſymptoms ariſe from the ribs being beat in on the lungs.

In the treatment, it is proper in every caſe to diſcharge ſome blood. If one end of the rib riſe, it ought to be repreſſed by moderate preſſure; and to prevent its riſing again, a broad leather belt ſhould be applied pretty tight, and continued for ſome weeks. When a portion of the rib is forced inwards, an opening ſhould be made over it with a ſcalpel, and then it ſhould be elevated with the fingers or a forceps. When diſtreſſing ſymptoms proceed from air or blood collected in the cavity of the cheſt, theſe fluids ought to be diſcharged by an operation.

The ſymptoms of a fractured *ſternum* are nearly the ſame with thoſe of the ribs. It requires great attention from the vicinity of the heart and large blood-veſſels. The patient ought to loſe a quantity of blood, and be kept on an antiphlogiſtic regimen. If the pain, cough, and oppreſſed breathing, do not yield to theſe remedies, an inciſion ſhould be made on the injured part, and the depreſſed piece raiſed with a levator. Should this be inſufficient, it may be effected by means of the trepan: this indeed requires the greateſt caution, but it may certainly be attended with advantage when the patient's life is in danger.

Fractures of *the vertebræ* generally end fatally. We judge of the exiſtence of fracture there by examining the parts, by the ſeverity of the pain, and by palſy occurring in the parts ſituated below the injured part.

When any parts of the vertebræ near the integuments are looſe, they may be replaced with the fingers, and retained by proper bandages. When this is impoſſible, ſome of the lateſt

authors think it advifable to make an incifion, and raife any portions of the bone which may be depreffed.

SECT. IV. FRACTURES *of the* BONES *of the* SUPERIOR EXTREMITIES.

THE *fcapula* is feldom fractured; when it is, the fracture is eafily difcovered by the pain, the immobility of the arm, and by the touch. The parts may be replaced with greater eafe if the mufcles connected with them be relaxed. They are retained with difficulty. A long roller fhould be employed for this purpofe, with which the head and fhoulders are alfo to be fupported. The arm fhould alfo be fufpended to relax the mufcles as much as poffible, and inflammation particularly guarded againft by local bleedings.

Fractures of *the humerus* are eafily difcovered by the pain, the immobility of the arm, and a grating noife on handling the parts. In reducing the fracture, the mufcles fhould be completely relaxed by bending the arm and raifing it to a horizontal pofture. Extenfion, if neceffary, may be made by one affiftant grafping the arm between the fracture and the fhoulder, and another between the fracture and the elbow. After the reduction, one fplint covered with flannel fhould be laid along the whole outfide, and another along the whole infide of the arm; and then a flannel roller applied fufficiently tight to fupport the parts without interrupting the circulation. The arm may either be fupported in a fling or Mr. Park's leather cafe (fig. 104). The bandages fhould not be removed for feveral days, unlefs fome urgent fymptoms render it neceffary. In about a week, however, the arm fhould be examined to fee whether the bones have been properly fet.

When both of the bones of *the fore-arm* are broken, the fracture is eafily difcovered; but when only one bone is fractured, efpecially if it be the radius, the firmnefs of the other renders the difcovery more difficult; the grating noife, however, on moving the bone in different directions, will generally be a fufficient fymptom that a fracture has taken place. When the fracture happens near the wrift, particular attention is neceffary in order to prevent a ftiff joint. In order to replace the parts, the mufcles are to be relaxed by bending the joints of the elbow and wrift, and the limb extended a little above and below the fracture. After reduction, a fplint reaching from the elbow to the ends of the fingers is to be applied along the radius, and another along the ulna; and both are to be fecured with a roller or twelve-tailed bandage. When the fplints are applied, the palms fhould be turned towards the breaft as the moft convenient pofture. The arm fhould be hung in a fling. A partial diflocation of the bones of the wrift fometimes attends a fracture of the radius, by which a ftiff joint, under the beft practice, is apt to enfue, or permanent painful fwellings of the fore-arm. In fuch cafes, the patient ought to be warned of the danger, that no blame may be afterwards incurred.

When *the olecranum* is fractured, the arm muft be kept in an extended ftate during the cure, by applying a fplint oppofite to the joint of the elbow, reaching from the middle of the humerus to the points of the fingers. The arm fhould be hung by the patient's fide, to which it fhould be fixed by means of ftraps. To prevent the confequences of a ftiff joint, the dreffings fhould be removed about the eighth or tenth day, the fore-arm for fome time flowly moved backwards and forwards, and the joint rubbed with an emollient oil. By a repetition of this at proper intervals, a ftiff joint may be prevented.

Anchylofis, or ftiffnefs of the joint, commonly fucceeds fractures of the bones of *the wrift*, owing to the great inflammation which enfues, and to their not readily reuniting from their fmallnefs. To prevent this as much as poffible, after replacing the bones, the injured parts fhould be leeched freely, and in proportion to the violence of the fymptoms. Splints fhould be applied exactly as in fractures of the fore-arm, and the arm fupported by a fling.

In fractures of *the metacarpal bones*, a firm fplint fhould be applied over the whole palm and infide of the arm, from the points of the fingers to the elbow, in order to prevent the action of the flexors of the fingers. The beft fplint for a fractured finger is a piece of firm pafteboard properly fitted and foftened in water till it can be readily moulded into the form of the part. This fhould be applied along the whole length of the finger, and fecured with a narrow roller. At the fame time, a large roller fhould be applied over the infide of the hand to prevent the parts from being moved. To prevent ftiffnefs, the dreffings fhould be removed about the end of the fecond week, and the joint cautioufly bent; and this fhould be repeated daily till the cure be completed.

SECT. V. FRACTURES *of the* BONES *of the* INFERIOR EXTREMITIES.

FRACTURES of the body of *the thigh-bone* are readily difcovered by the grating noife when the ends of the bones are forcibly rubbed together, by the fhortnefs of the limb if the fracture be oblique, and by the limb being unable to fuftain the body. But fractures of the neck of the bone are often not eafily diftinguifhed from diflocation of the joint. In general they may be diftinguifhed by the circumftances mentioned in treating of luxations of this bone. In forming a prognofis, we ought to confider that no fractures are more apt to difappoint our expectations than thofe of the thigh, efpecially when the neck of the bone is broken, owing to the difficulty of difcovering the place of the fracture, and of retaining the bones even after they have been replaced. In order to reduce fractures of the thigh, the mufcles are to be relaxed by moderately bending the joints of the thigh and knee: when this is done, unlefs there be much pain and tenfion, the bones are eafily replaced by one affiftant holding the upper part of the thigh, while another fupports and gently pulls down its lower extremity, while the furgeon is employed in adjufting the fractured pieces. It is more difficult to reduce fractures of the neck of the bone, on account of the great ftrength and various directions of the furrounding mufcles. In general, however, we fhall fucceed by moderate extenfion, if we take care previoufly to relax all the mufcles as much as poffible: if we do not fucceed, we muft have recourfe to machinery.

The greateft difficulty is to retain the bones in their fituation after they are replaced. The limb muft be firmly fecured by fplints made of thin flips of wood glued to leather or of thick pafteboard. One fplint, broad enough to cover half of the thigh, fhould reach from the top of the hip joint to a little below the knee, and another, covering about a third part of the thigh, from the groin to a little below the knee. The fplints fhould be lined with flannel. They are to be fecured by a twelve-tailed bandage, and over all a thin pillow fhould be put nearly as long as the thigh. The fplints and bandages may be put on in the following manner: the patient being placed on a firm hair mattrefs, with his knee moderately bent, the long fplint bandage and pillow are to be applied to the outfide of the thigh, and the patient fhould be turned fomewhat towards the affected fide, with the knee and leg raifed a little higher than the body: the fhort fplint fhould then be applied along the infide of the thigh, and the bandage already placed without the other fplint, applied fo tight as to make an equal moderate preffure over the whole: (fee Pl. 26. fig. 85.) To make the part ftill more

ſecure, it is proper to inſert a long firm ſplint of timber under the middle of the pillow, and to fix it by two broad ſtraps to the upper part of the limb. To prevent the limb from being affected by involuntary ſtartings, the pillow ſhould be fixed to the bed by ſtraps: to keep off the weight of the bed-clothes. a frame with hoops ſhould be placed over the thigh. The parts ſhould be examined after ſome time to ſee that the bones be not diſplaced. When there is pain, ſwelling, and inflammation, leeches and other remedies ſhould be applied. To render the ſituation of the patient as eaſy as poſſible during the cure, he may be allowed after the ſecond week to turn a little more towards his back, and at the ſame time to extend the joint of the knee in a ſmall degree: after this time a little flexion and extenſion of the limb may be daily repeated to preſerve the uſe of the joint.

The method here deſcribed generally ſucceeds. Sometimes, however, notwithſtanding all our care, the ends of the bone ſlip over each other. To prevent the deformity which this occaſions, it has been attempted to make extenſion and counter-extenſion by machines: but the pain and irritation have always been ſo great that little advantage has yet been derived from ſuch means. The invention (fig. 86.) of the late Mr. Gooch of Norwich, improved by the late Dr. Aitken of Edinburgh, has been recommended as one of the beſt machines for oblique fractures of the thigh. After endeavouring to remove the pain, ſwelling, and inflammation, which are ſometimes ſo great as to preclude the application of the ſimpleſt bandage, this machine may be tried. But if it be found impracticable to uſe it, the cure muſt be conducted in the uſual way with the chance of the fractured pieces overlopping one another, and of courſe the limb being ſomewhat ſhortened.

The *patella* is moſt frequently fractured tranſverſely, ſometimes lengthwiſe, and ſometimes into ſeveral pieces. Fractures of this bone have been ſaid commonly to end in a ſtiff joint; but this is perhaps moſt frequently owing to the limb being kept too long in an extended poſture In the treatment of fractures of this bone, the leg ſhould be extended to relax as much as poſſible the ſoft parts connected with the bone. The patient ſhould be placed on a firm mattreſs, and a ſplint be placed under the limb long enough to reach from the top of the thigh to the under end of the leg, to which the limb ſhould be fixed by a number of ſtraps to keep it in a ſtate of extenſion. The fractured bones are then to be brought together, and ſuch a number of leeches applied to the joint as will remove as much blood as the patient can bear; and as long as much pain and tenſion continue, ſaturnine and other aſtringents are to be uſed for removing them. When this is accompliſhed, and the parts properly adjuſted, a large pledget of Goulard's cerate ſhould be laid over the joint, and a hooped frame employed to keep off the bed-clothes. In a longitudinal fracture the parts are eaſily kept together by a common uniting bandage or adheſive plaſter; but in tranſverſe fractures more force is neceſſary. Various bandages have been employed for drawing the pieces together in ſuch fractures; one of the beſt of theſe is that repreſented fig. 87. We need not be anxious, however, about bringing the pieces very cloſe together, as a cure may be made though they remain at a conſiderable diſtance. The bandages, unleſs particular ſymptoms occur, ſhould not be removed till the end of the ſecond week; after which the joint ſhould be cautiouſly bent every ſecond day to prevent ſtiffneſs.

The *leg* is commonly fractured near the lower end, this being the weakeſt part of the bones. In the treatment of a fractured leg the ſame rules apply which were given for a fractured thigh-bone. The muſcles ſhould be relaxed by bending the knee; but little advantage can be derived from bending the foot, for in proportion as the muſcles behind are relaxed thoſe before are put on the ſtretch: the patient may be therefore allowed to keep the foot in the eaſieſt poſture. The bones are commonly replaced by the gentle extenſion of the upper part of the limb by an aſſiſtant, while another ſupports it at the ankle. The bones being replaced, and the limb laid on its outſide with the knee bent, two ſplints (fig. 88.) are to be applied, long enough to reach from the upper part of the knee to the edge of the ſole, ſo as to prevent the motion both of the knee and ankle. The ſplints are to be retained by a twelve-tailed bandage, as in the caſe of fractured thigh-bone. See fig. 85.

If the patient be either very reſtleſs or troubled with ſpaſmodic affections of the muſcles of the leg, an additional ſplint, ſhaped to the form of the leg, ſhould be applied along the outſide of it, and fixed by a ſtrap at the upper, and another at the under part of the leg. When the patient cannot reſt when lying on either ſide, he may be placed on his back, and the curved ſtate of the knee ſtill preſerved by raiſing the leg a little above the level of the body on a frame made for the purpoſe. This variety of poſture may likewiſe be uſed in fractures of the thigh. The patient may from the firſt be laid in this poſture, or he may alternately change from the one to the other. No change of poſture, however, ſhould be allowed for the firſt ten or twelve days. When the fibula only is fractured, it is apt to be conſidered as a ſprain of ſome of the muſcles; but this ought to be particularly attended to, as the miſtake may be followed by bad conſequences. When both the bones of the leg are broken, the portion next the foot is commonly drawn towards the back part of the leg, ſo that a prominency is produced by the fractured part of the upper portion of the bone; and this is improperly termed the riſing end of the fractured bone. The appearance is entirely produced by the inferior portion falling back. Hence no advantage is derived from preſſure being made on the upper end of the bone: the inferior portion ſhould be raiſed ſo as to bring the parts into contact, and then by proper bandages they ought to be ſupported till they are perfectly united.

Fractures of the bones of *the foot and toes* are treated nearly in the ſame manner as fractures of the hand and fingers. Beſides the ſplint which may be neceſſary for the particular part, a large one ſhould be applied over the ſole; nor ſhould any motion be allowed for a conſiderable time either in the foot or ankle, otherwiſe the bones may be diſplaced, and a proper cure prevented.

Sect. VI. *Of* Compound Fractures.

By compound fracture is now generally meant a fracture of a bone communicating with an external wound in the integuments. They are much more dangerous than ſimple fractures. The generality of authors have conſidered amputation as indiſpenſable in caſes of compound fractures; while a few, particularly Mr. Bilguer, ſurgeon-general to the armies of the late king of Pruſſia, affirm that it is ſcarcely ever neceſſary. Both ſeem to have carried matters too far. Some of the lateſt and beſt ſurgeons have recommended never to amputate immediately in private practice, unleſs when the bones are ſo much ſhattered that they cannot reunite, or the texture of the ſoft parts completely deſtroyed; becauſe, even if amputation be at laſt neceſſary, the patient will have a greater chance of recovering than if it had been performed immediately after the accident: for the ſtate of weakneſs to which he is generally reduced render the attendant ſymptoms leſs violent. On the other hand, it has been conſidered as no bad rule in the army or navy, where patients cannot be kept in a proper ſituation,

and where sufficient attention cannot be given, to amputate immediately in cases of compound fractures of the large bones of the extremities. When amputation is not performed immediately, it is not, for several days at least, admissible. It may afterwards be rendered necessary by hemorrhagies, which cannot be stopped but by means more dangerous than amputation itself; by extensive mortification; or by the ends of the fractured bones remaining long disunited, while a great discharge of matter endangers the patient's life.

In *treating compound fractures*, all extraneous bodies should be removed, as also all those small pieces of bone which will probably not unite with the rest. For this purpose the opening, if necessary, should be enlarged with a scalpel. The next step is to replace the bones by relaxing the muscles as in simple fractures. Sometimes part of a bone projects so far through the integuments that it cannot be replaced without either sawing off the end of it, or enlarging the wound. If the fractured bone be long, sharp, and projecting much, it is best to saw it off; for though it were reduced, it would not readily reunite, and it would be apt to excite much pain and inflammation: but if it be broad at the base, and of no great length, it ought certainly to be sawed, even though it cannot be reduced without enlarging the wound. For the most part, it is only the skin which it is necessary to cut; but even the muscles ought to be divided, though as much as possible in the direction of their fibres, when the bone cannot otherwise be replaced. After the reduction, a pledget of some emollient ointment is to be laid over the wound, and the limb placed on a firm splint, and still kept in a relaxed posture. In dressing the wound, the limb ought not to be moved: the many-tailed bandage, therefore, should be used rather than a roller. Various contrivances have been fallen upon to allow the limb to be at rest while the surgeon is dressing it. The fracture box, invented by the late Mr. Rae, surgeon in Edinburgh, is one of the best. When the leg is laid on this, it may be dressed with tolerable facility without moving it. We are happy to have it in our power to announce to the gentlemen of the medical faculty, that another machine has lately been invented by Mr. Samuel James, surgeon in Hoddesdon, Herts, which, we are told, will effectually relax the muscles, and retain the bones in their natural situation, without pain to the patient or the least inconvenience to the operator. See fig. 89. Pl. 26.

It is of the greatest importance to prevent inflammation, which is apt either to produce mortification, or to give rise to extensive abscesses. The dressings should be removed once or twice daily according to the quantity of matter. The common application of warm poultices, on account of their inconvenience, may be deferred till they become necessary by the approach of inflammation, which they are to be considered as the surest means of preventing by exciting a discharge of matter. Whenever the inflammation subsides, and a free discharge of pus is produced, the poultices ought to be laid aside, lest they do harm by relaxing the parts too much, and exciting too copious a discharge. The sore ought then to be dressed with mild astringents, and the patient kept on a nourishing diet with tonic medicines. A free passage should be given to the matter by putting the limb in a favourable posture, and by making a counter opening, if necessary, to the most depending part. But this may be frequently avoided, by covering the sore with soft lint or sponge to absorb the matter. If the discharge become excessive, and cannot be lessened by the means above mentioned, it will be found to proceed from a portion of loose bone which has not been earlier noticed, by the removal of which it may be stopt. If, instead of producing matter, the inflammation terminate in gangrene, the danger is still greater than under the most extensive abscesses. For the treatment of this, the reader is referred to Chap. III. Sect. 2d.

CHAP. XXXIII. Of DISTORTIONS.

Distortions of the bones may arise from external injuries, from diseased constitutions, from a morbid state of the bones, or a contracted state of the muscles, or both; but the affection is most frequently owing to a weakly, delicate constitution, as in rickety or scrophulous cases.

In the treatment of distortions of the spine, particular attention ought to be paid to the cause of the disorder. If it appear to arise from the patient continuing too long in any particular posture, every habit of this kind should be guarded against on the first appearance of the disease. If the patient has turned too much to one side, the reverse of this should be advised. He ought to sleep upon a firm hair mattress, that his body may lie upon an equal surface. He should use an invigorating diet, the cold bath, bark, and other tonics. By a strict attention to the use of these remedies the disease has sometimes been retarded in its progress. Various machines have been invented for removing distortions of the spine by pressure; but considerable caution is here required, otherwise much injury may arise from it. Some advantage, however, in certain cases, has been derived from the use of the common collar (Pl. 26. fig. 90.); or the stays and machinery adapted to them (fig. 91.), invented in France, and afterwards brought into use in this country by Mr. Jones of London, are found to be still better suited to this purpose.

The same causes which produce distortions of the spine may likewise produce distortions of the limbs. Sometimes the distortion takes place with the original formation of the bones, at other times it occurs in infancy, and now and then at a more advanced period of life. In early infancy the bones are so pliable as to be readily affected by the postures of the body. When a child is too soon allowed to attempt to walk, its legs are apt to become crooked from their inability to support the weight of the body. Certain diseases likewise, especially rickets, soften the bones so much, that they yield to the posture of the body, and to the common action of their muscles.

When the distortion of a limb is owing to a curvature in a bone, if the case be recent, and especially if it occur in childhood, it may frequently be removed, without much difficulty, by making a gradual but constant pressure, by the use of machinery, on the convex side of the limb, till it recover its natural appearance. When the deformity occurs in the leg, a method has been used, in several instances, which is to fix a firm splint of iron, lined with leather, in the shoe, on the concave side of the leg, the other end of the splint to rest against the under end of the thigh; when, if a broad strap or two be applied round the leg and splint, an easy gradual pressure may be made, and considerable advantage derived from it. See fig. 92.

Along with the curvature above mentioned, it commonly happens that the feet and ankles are affected. When the bones of the leg are bent outward, the fore part of the foot is turned inward, and the inner edge upwards; and the reverse, if the leg be bent inward. In these cases the affections of the feet are generally owing to the curvature of the bones of the leg. By removing the curvature of these, the foot will commonly regain its natural situation, and the splint above-mentioned will for the most part be sufficient for the purpose. But in cases where the sole of the foot is turned much out of its natural direction, it may be necessary to fix the splint and

fhoe to a frame (fig. 93.), which will render the cure ftill more effectual.

Befides the inftrument already mentioned, fome have ufed a kind of boot, cut lengthwife, made of hardened leather or of metal, &c. which may in fome cafes fufficiently anfwer the purpofe.

In cafes of club-foot, where the diftortion is in the middle of the foot, a pair of fhoes, fuch as are reprefented in fig. 115. have been found ufeful. After the feet are fixed in the fhoes, the fore part of the feet may be feparated by means of a fcrew in two plates, which are fixed to the fole.

CHAP. XXXIV. Of AMPUTATION.

Sect. I. *Of* Amputation *in general.*

In amputation, which in furgery fignifies cutting off a limb, the great end to be aimed at is, the procuring of a handfome ftump, in which the bone may not protrude, but be well covered with flefh; fo that no excoriation or rawnefs may be apt to take place. As long ago as the year 1679, it was propofed by Jacob Young, an Englifh furgeon, in a treatife intitled *Currus Triumphalis ex Terebinthino*, to preferve a flap of flefh and fkin, which was to be folded over the bone, and which, uniting to the parts of the wound after amputation, would effectually cover the bone, and prevent the inconveniences above mentioned. No traces of the fuccefs of this method, however, can be found till the year 1696; when a Latin differtation was publifhed upon it by P. Adrians Verduin, an eminent furgeon in Amfterdam. The moft fanguine expectations were formed of its fuccefs; and it was even thought that the flap would prevent the neceffity of tying up the blood-veffels. However, it does not appear that the method as at that time practifed either did or could fucceed; and accordingly it was entirely laid afide; but it has been lately revived with confiderable improvements.

Amputation may be rendered *neceffary* when a member is fo much difeafed as to be ufelefs, or when it puts life in danger.

The caufes in general rendering this operation neceffary are, bad compound fractures; extenfive lacerated and contufed wounds; part of the limb being carried off by a cannon ball or otherwife, the bones being unequally broken and not properly covered; extenfive mortification; white fwellings of the joints; large exoftofes; ulcers attended with extenfive caries; cancer or other incurable ulcers; varicofe kinds of tumors; particularly diftortions of the bones.

Amputation may alfo be fometimes neceffary from violent hæmorrhagies of fome principal artery during the cure of a fractured limb, or from fuch a profufe difcharge of matter taking place that the ftrength of the patient is exhaufted. Lacerated and contufed wounds may require amputation, on account of hæmorrhagy enfuing which cannot be ftopped. Extenfive mortification may take place, and fuch large quantities of matter be formed, that the patient will be unable to bear up under the difcharge.

Where part of the limb is carried off, it is neceffary to amputate higher up, fo as to cut the bone, as well as the foft parts, in fuch a manner as may admit of a much fpeedier and fafer cure. When mortification occurs, every thing ought to be done for the fupport of the patient till the difeafe be ftopped; the firft fign of which is, the appearance of an inflamed circle between the difeafed and found parts. As foon as the difeafed begin to feparate from the found parts, amputation of the limb ought to be performed, and no time ought now to be loft, left the patient fuffer from the abforption of putrefcent matter.

No part of furgery is brought to greater perfection than the manner of performing amputation. Before the invention of the tourniquet, and the method of fecuring the veffels by ligature, the operation was feldom undertaken; and a great proportion of thofe upon whom it was performed died foon after. In the prefent improved method, one death does not happen in twenty, or even thirty cafes. In performing the operation, particular attention is to be paid to the fpot where the incifion is to be made; the quantity of fkin and cellular fubftance neceffary to be faved, fo as to cover the mufcles and bone completely, without being ftretched; cutting the mufcles in fuch a manner that they may unite with each other and entirely cover the end of the bone; the prevention of hæmorrhages during the operation; the tying of the arteries alone, without including the nerves or any of the contiguous parts; fecuring the integuments fo as to prevent them from retracting after the operation; and a proper fubfequent treatment of the cafe.

The following are the *general fteps of the operation:* The patient being properly placed, with affiftants to attend, and the apparatus in proper order, the flow of the blood to the limb is to be ftopped by the tourniquet (Pl. 24. fig. 10.). The firft incifion is to be made through the fkin and cellular fubftance by one, or rather by two, ftrokes of the amputating knife reprefented in Pl. 26. fig. 95. Thefe are next to be feparated from the mufcles, as far as may appear fufficient for covering the ftump. The feparated fkin or flap fhould be ftrongly drawn up, or what perhaps anfwers better, turned up all round the limb, leaving this part of the mufcles quite bare. The flap is to be kept in this fituation by an affiftant, while the operator makes the next incifion at the edge of the reflected fkin, and cuts till he comes to the bone. This incifion fhould be begun on the lower fide of the limb, that the blood may not prevent the eye from readily following the edge of the knife during the whole cut. The mufcles are now to be feparated from the bone as high as may enable them afterwards completely to cover it. The foft parts in general are then to be drawn up by retractors, which may be either of leather, as in fig. 96. or metal, as in fig. 97. The periofteum is to be divided at the place where the faw is to be applied; but no part of the bone is to be denuded of this membrane, which is afterwards to cover the ftump, otherwife troublefome exfoliations may enfue. At this place the faw (fig. 98.) is to be applied, and the bone divided with long fteady ftrokes. In this part of the operation a good deal depends upon the fteadinefs of the affiftant who holds the limb; for if it be held too high, the motion of the faw will be impeded; while the bone may be fplintered if it be not fufficiently raifed. Any points or fplinters which may be left fhould be immediately removed with the pincers (fig. 99.). The retractors are now to be laid afide, and the principal arteries feparated from the nerves, and fecured by the tenaculum (fig. 11.), or forceps (fig. 103.), and ligatures.

The tourniquet fhould next be a little flackened, to allow the different branches to be difcovered. The clotted blood is to be cleared away with a warm fponge. The patient fhould get fome warm cordial drink, and all the arterial branches which can be difcovered ought to be taken up. The ends of the ligatures are then to be cut of fuch a length as to allow them to hang without the lips of the wound. The mufcles and fkin are now to be drawn down and brought into clofe contact, that the ftump may be completely covered. The parts are next to be fecured by proper bandaging; and, if the operation has been properly performed, the cure will commonly be made

by the first intention, and may be completed in the course of three or four weeks, and sometimes in a shorter period. This however must depend much upon the constitution of the patient, as well as the manner of performing the operation.

Sect. II. *Of* Amputating *the* Arm *and* Fore-arm.

Amputation of the arm is performed according to the rules already laid down. No more of it should be removed than is diseased; for the longer the stump is, the more useful it proves. The tourniquet is to be applied a little above the part where the operation is to be performed: as much of the integuments should be saved as may be perfectly sufficient for covering the sore. In taking up the artery, after the bone has been divided, the operator ought to be attentive not to include the radial nerve, which may be readily discovered and separated, as it lies close upon the fore part of the artery. The fore-arm is to be amputated nearly in the same manner as the leg; only that the stump may be covered by amputating with the double incision, without the assistance of a flap, which it is necessary to form in the leg.

Sect. III. *Of* Amputating *the* Thigh.

In performing this operation, the patient ought to be placed upon a table of ordinary height, with the diseased limb supported and secured by an assistant seated before him, while other assistants take care of the other leg and the arms. The course of the blood is to be stopped by applying the tourniquet over the trunk of the femoral artery, near the upper part of the thigh. No more of the thigh ought to be removed than is rendered necessary by the disease, as the more of it is left, the more useful it will be to the patient. An assistant should grasp the limb with both hands a little above the place where the skin is to be divided, and draw it up as far as possible; while the operator, standing on the outside of the limb, makes a circular incision down to the muscles by one or two strokes of the knife. As much of the integuments is then to be dissected with a scalpel from the muscles as may cover the stump completely; and this part of the skin may either be turned back, or drawn tightly up by an assistant. The muscles may then be divided quite across to the bone by the edge of the skin, in the common way, or cut obliquely upwards, according to the method of Allanson, so as to lay the bone bare two or three fingers-breadth higher than is done in the common way The muscles are next to be separated from the bone with a scalpel a little way, that a sufficient quantity may be left for covering the end of it. The rest of the operation is to be performed exactly according to the general rules laid down in the first section of this chapter. The muscles and integuments are to be drawn over the end of the bone, and applied closely together, that the skin may completely cover the stump, and retained in this situation by an assistant till a flannel or cotton roller, according to the season of the year, which has been previously fixed round the body, be applied in such a manner as to support and fix them. For which purpose it should be passed two or three times, in a circular direction, round the top of the thigh, and should afterwards, with spiral turns, be brought down near to the end of the stump and fastened with pins; and it should not be tighter than may be sufficient to assist the plasters in preventing retraction.

The ends of the divided muscles are now to be laid exactly over the bone; and the edges of the skin are to be brought into contact, either so as to form a straight longitudinal line, according to the method of Mr. B. Bell, &c.; or they are to be placed horizontally, "that the wound may appear only in a line with the angles at each side," as advised by Allanson. The ligatures may either hang over the edges of the wound, or be brought to the angles. After the edges of the skin are in this manner exactly applied to each other, either a few slips of adhesive plaster are to be laid across the face of the stump, or two large pieces of adhesive plaster, with several pieces of tape fixed to them, are to be applied to the surface of the skin. The tapes are then to be tied with a running knot immediately over the wound; by which the parts will be kept so closely together as to prevent any collection of matter from being formed. The whole surface of the stump should next be covered with a large pledget spread with an emollient ointment, over which a compress of fine tow is to be put, and retained in its place by a broad cross strap of old linen, passing some way up the thigh, so as to be secured by the roller, which is now to be passed two or three times round the stump; and the pressure formed by the cross strap may afterwards be increased or diminished at pleasure, by drawing it with more or less tightness, and fixing it with pins to the roller While the stump is dressing, the tourniquet is removed, but replaced again loosely to enable the attendants to check any hæmorrhagy which may afterwards ensue.

The patient is now to be laid to rest, and the limb is to be placed upon a little tow covered with linen, or upon a thin soft pillow; and to prevent the patient from involuntarily moving the limb, and to guard against spasmodic startings, which frequently happen after this operation, it may be fixed to the bed by two straps. A basket or hooped frame ought to be placed over the stump to protect it from the bed-clothes. The patient should immediately get an anodyne draught, which will generally procure ease through the rest of the day. For this purpose, no more light should be let into the room than is merely necessary for allowing the attendants to pay attention to the stump. As hæmorrhages sometimes appear several hours after the operation, the person who takes the charge of the patient should watch this circumstance with the greatest attention. If there be only a slight oozing of blood, there is no occasion for being alarmed; but whenever it appears to proceed from a large artery, it must be secured. The spasmodic affections which frequently occur after amputation are seldom troublesome, unless some nerve has been included in securing the arteries; but when they do appear, laying the limb in the easiest posture, and giving opiates, are the principal means of procuring relief.

To prevent inflammation as much as possible, the patient is to be kept upon a strict antiphlogistic regimen, and his bowels kept open by laxative clysters, till the inflammatory stage is over, which will generally be in a few days. If, notwithstanding this treatment, the stump swells, and the patient complain of pain and tightness, we ought to endeavour to discover from what cause the uneasiness originates. If it be owing to the straps being too tightly fixed, they must be slackened. If the stump be found much swelled, a saturnine solution should be applied by means of several folds of linen; and if the patient be young and plethoric, he ought to lose a few ounces of blood from the arm; but if he is weak and emaciated, a different mode of treatment must be followed.

At the end of the third, or fourth day at farthest, the stump should be examined; and if it appear somewhat open and flaccid, the parts must be brought closer together and secured more firmly. After this time the dressings should be renewed every day, or every second day. In about a week after the operation the ligatures may generally be removed with ease; but if they do not separate readily, they may be gently pulled at every dressing, when they will, in a short time, be brought

away, and the wound will be foon healed by the firft intention. The roller fhould be cleaned and renewed as often as it is found fullied: nor fhould it be laid entirely afide till the end of the third or fourth week after the operation. When the roller is removed, we may depend upon the ftraps or tapes for keeping the parts together till the cure be quite accomplifhed. When the inflammatory fymptoms are entirely gone, no medicines ought to be given which would debilitate the patient, nor is any thing more neceffary than to keep the bowels gently open till a complete cure be made.

Sect. IV. *Of* Amputating *the* Leg.

The leg may be amputated for a difeafe in the foot at two different parts; the one a hand-breadth under the knee, the other a little above the ankle The former makes a fufficient fupport for the body to reft upon an artificial leg; but the latter does that equally well, and likewife preferves the motions of the knee.

In performing the operation a little way *under the knee*, the patient is to be placed and fecured in the fame manner as in operating upon the thigh. The tourniquet is to be placed a little above the knee, with the cufhion upon the artery in the ham. The furgeon places himfelf upon the infide of the leg, and makes a circular incifion through the integuments down to the mufcles The place where the incifion fhould be made muft depend upon the length of the limb; but in general it may be between fix and feven inches under the top of the tibia in an adult, or far enough down upon the limb to fave as much integuments as will cover the ftump. After the integuments are cut through in the manner already directed, as much of the mufcles are to be divided by the knife as can be done by a circular incifion; and the interoffeous parts are to be divided by a fcalpel or catline (fig. 121.). The retractors are then to be applied, and the bone fawed off immediately below the infertion of the tendons of the flexor mufcles. In fawing, the operator ought to begin upon both bones at the fame time, that he may finifh upon the tibia, left fplinters fhould be formed. The veffels are next to be fecured; the foft parts drawn over the bones; the adhefive plafters and other bandages applied in the fame manner as directed for amputating the thigh, only that here the roller need not be applied fo high as in the former operation. Two or three turns above the knee, however, are neceffary to prevent the dreffings from flipping down.

In amputating upon *the ankle*, the operator fhould fix upon that fpot which will leave the ftump of fuch a length as may be moft convenient for being fitted with an artificial machine refembling the other leg. Nine inches from the joint of the knee, in a leg of ordinary length, was found by Mr. Wilfon, a late ingenious artificial limb-maker in Edinburgh, to be the beft part fuited to this purpofe, on account of the equal preffure it makes upon the furface of the leg, without making any upon the end of the tender ftump. The operation is performed in the fame manner as that a little below the knee.

Sect. V. *Of* Amputating *at the* Joints *of the* Extremities.

The circumftances moft to be attended to in performing amputation at the joints are, firft to ftop the circulation by the tourniquet; or, where that is impracticable, to take up the trunk of the artery by a ligature; to make a circular incifion in fuch a place as may, after the operation is over, be fufficient to cover the wound: then a longitudinal incifion is to be made upon the oppofite fides of the limb, extending from the joint to the circular cut, and as deep as the bone, by which two flaps will be formed to cover that part of the joint which remains after the operation is finifhed. The ligaments of the joint are next to be divided, and the affected limb or part of the limb removed.

After this part of the operation, it was formerly a frequent practice to fcrape off the remaining cartilage, to unite the parts more firmly together. But this is now found to be unneceffary; for when the flefh is applied properly to the bone, if it do not grow to it, the union at leaft is fo clofe that it afterwards gives no inconvenience to the patient.

Any branches of arteries which may have been cut during the operation are now to be fecured; clotted blood is to be removed; and the mufcles and fkin are to be brought into clofe contact with the ends of the ligatures hanging out of the wound. The parts are to be retained by adhefive plafters, or twifted future, or both; and proper bandages applied in fuch a way that a cure may be made by the firft intention.

Amputating the arm at *the fhoulder-joint* has always been confidered as a dangerous as well as a difficult operation. It fhould never be attempted, when the fame purpofe can be accomplifhed by operating lower down. But cafes occafionally occur, where the life of the patient cannot, in any other manner, be faved.

Amputation may become neceffary here in confequence of abfceffes of the joint; caries of the humerus reaching to the joint: compound fractures, efpecially thofe from gun-fhot wounds, extending to the head of the bone; and of mortification.

In performing the operation, the patient fhould be laid upon a table of convenient height, covered with a mattrefs. He is then to be brought as near to the edge of it as poffible, and fecured by affiftants. The circulation of the blood in the arm is next to be ftopped, by an affiftant preffing ftrongly with a firm comprefs over the fubclavian artery where it paffes over the firft rib; or an incifion may be made along the courfe of the artery, which may be fecured after feparating from it the contiguous nerves. When the artery is compreffed, it will readily be known whether the compreffion proves effectual, by obferving when the pulfe at the wrift is entirely ftopped. As foon as this is the cafe, a circular incifion is to be made through the integuments at the infertion of the deltoid mufcle into the humerus. An affiftant then draws the fkin a little back, and at the edge of the retracted fkin the mufcles are to be cut in a circular direction to the bone.

If the artery has not been taken up at the beginning of the operation, it is now to be fecured, as well as any branches which come in the way.

The amputation-knife is now to be laid afide, and the reft of the operation finifhed with a ftrong fcalpel. A perpendicular incifion is next to be made at a little diftance from the outfide of the artery, beginning at the acromion, and terminating in the circular incifion, cutting as deep as the furface of the bone. A fimilar incifion is to be made upon the back part of the arm, fo that the flaps may be nearly of an equal breadth. The arterial branches are here to be fecured; the flaps are to be feparated from the bone, guarding againft wounding the trunk of the artery; the flaps are to be fupported by an affiftant; and the capfular ligament of the joint is to be cut from the fcapula: and thus the arm will be entirely feparated.

After the arm has been feparated, any arteries which appear about the joint are to be tied, and all the ligatures brought over the edges of the wound. The parts are to be cleared of clotted blood, and the two flaps drawn over the wound, and

fecured by the twifted future. A pledget of any emollient fhould then be applied, and a fufficient cufhion of lint, with a comprefs of old linen, put over the whole. A moderate preffure is next to be applied by a flannel roller; by which the parts will be fupported, their union facilitated, and matter moft likely prevented from being lodged. The treatment is then the fame with that after amputation in other parts of the extremities. For two or three days after the operation, it is neceffary that an affiftant fit with the patient to comprefs the artery in cafe a bleeding fhould enfue.

When it is neceffary to amputate *the whole hand*, the operation may be performed at the wrift, fo as to leave as much of the member as poffible; and the fame rules hold here as in amputating at any of the reft of the joints. The tourniquet is to be applied to the artery in the arm, and the cure is to be completed by the firft intention. When any of the carpal bones are affected, the fore will not heal till they either work out by fuppuration, or are cut out by the knife. When the middle of any of the metacarpal bones is difeafed, while their extremities are found, the trepan may be applied, and the difeafed parts removed, while the remaining found parts are preferved. But if the whole bodies of one or two of thefe bones be affected, while the reft remain found, all the affected bones ought to be removed. In performing the operation, an incifion is to be made along the courfe of the part affected; and if the operator have it in his choice, the incifion fhould be made upon the back part, fo as to fave the great veffels and nerves fituated in the palm. The integuments are then to be diffected, and turned to each fide; after which the difeafed bones or parts of bones are to be removed, guarding as much as poffible againft wounding the principal arteries or nerves which lie near them.

The difeafed parts are next to be feparated; any arteries which happen to be cut are to be fecured; and, on account of the free communication which they have with neighbouring branches, they ought to be tied at both cut ends. If after this a bleeding ftill continue, comprefs, ftyptics, and other remedies proper for ftopping blood, are immediately to be ufed. The fides of the wound are to be brought together, and an attempt made to cure them by the firft intention.

In *amputating the fingers*, it was formerly the practice to operate upon the bodies of the bones in the fame manner as in the larger extremities; but at prefent the removal at the joints is more frequently practifed.

In performing the operation, it is neceffary to fave as much fkin as may cover the ftump, and this ought to be done upon the fide next the palm, fo as to guard againft the effects of friction. The general fteps of the operation are the fame with thofe for amputation of the larger joints.

A circular incifion is to be made on the finger by a crooked biftoury, about the middle of the phalanx, and it may be carried at once to the bone. Another incifion is to be made with a common fcalpel at each fide of the finger, beginning at the circular one and continuing it to the joint, by which two flaps will be left to cover the ftump. The ligaments of the joint are now to be divided, and the bone removed. The blood-veffels are to be fecured by ligature, and the flaps exactly applied to each other; but in order to protect the end of the bone completely, a fmall portion may be cut from the uppermoft flap. The flaps are to be retained by adhefive plafter, or by the twifted future; but if the latter be ufed, the tendons ought to be avoided. Over the fore an emollient pledget is to be applied, and then a comprefs and roller. If the difeafe be fo fituated, that inftead of amputating at the cavity of the joint, the furgeon fhall think proper to operate upon the body of the bone, flaps are to be formed as above, and the bone is to be divided by means of a fmall fpring faw.

The amputation of the thigh, at the hip joint, has always been confidered as one of the moft formidable operations in furgery; fo much fo, that very few cafes appear on record of its having ever been put in practice. In the Medical Commentaries of Edinburgh, an inftance is recorded where the thigh was amputated at this joint, and where the patient furvived the operation 18 days, and then died from a different caufe, when all rifk of hæmorrhagy was over, and when the fore had even a favourable appearance, which fhows at leaft that the operation has been done with fafety. It certainly ought never to be done, however, unlefs as the laft refource, and when the life of the patient is in abfolute danger; and then only when as much fkin and mufcles can be faved as will cover the fore, and when there is alfo a probability of being able to ftop the hæmorrhagy, and prevent it from returning.

When the operation is to be performed, the patient is to be laid upon his back on a table, and properly fecured by affiftants; one of whom fhould be ready with a firm cufhion to prefs, if neceffary, upon the top of the femoral artery, juft after it paffes from behind Poupart's ligament to the thigh. A longitudinal incifion is now to be made through the fkin, beginning immediately under the ligament, and continuing it downwards along the courfe of the artery for about fix or feven inches. The aponeurofis of the thigh is then to be divided by gentle fcratches till a furrowed probe can be introduced, when the opening is to be dilated by means of a fcalpel, till two or three inches of the artery be laid bare. A ftrong ligature is now to be put under the artery by the affiftance of a curved blunt-pointed needle.

The part where the ligature fhould be paffed is immediately above the origin of the arteria profunda; for if that artery be not affected by the ligature, the patient might fuffer by the lofs of blood during the reft of the operation. The ligature is now to be fecured by a running-knot: Another ligature is to be introduced a little below the former, and likewife fecured; the artery is then to be divided between the ligatures. A circular incifion is now to be made through the integuments of the thigh, about fix inches from its upper end. The retracted fkin is then to be pulled at leaft an inch upwards; and at the edges of it the amputating knife is to be applied, fo as to cut the mufcles down to the bone. This being done, a cut is to be made upon the pofterior part of the thigh, beginning a little higher than the great trochanter, and continuing it down to the circular incifion, and as deep as the joint. A fimilar cut is to be made on the anterior part of the thigh, at a fmall diftance from the artery, and this reaching likewife down to the bone. The two mufcular flaps are to be feparated from the bone and joint, and held back by an affiftant. Every artery which appears is now to be fecured. Then the capfular ligament, and next the round one, are to be feparated from the acetabulum; by which means the limb will be removed from the body. The acetabulum and neighbouring bone are next to be examined; and if they appear found, the cafe will be more favourable; but at any rate, a cure is to be attempted by the firft intention. For which purpofe, after removing all the clotted blood from the furface of the wound, and bringing the ligatures over the edges of the fkin, the mufcles are to be placed as nearly as poffible in their natural fituation; and drawing the flaps together, fo as to cover the wound in the moft accurate manner, they are to be kept in this fituation by adhefive plafter, and by the twifted future and other dreffings, as in amputating at the under part of the thigh. The dreffings are to be retained by a

broad flannel roller paſſed three or four times round the body, and ſpirally over the ſtump, and ſecured. The patient is then to be laid in bed on the ſound ſide, and treated as for amputation in other parts of the body; only that greater attention is neceſſary, as there is no aſſiſtance from a tourniquet. Uncommon attention will alſo be neceſſary to prevent inflammation, and every ſymptom of fever which may ſucceed to the operation.

When *the foot* is ſo much diſeaſed as to require amputation, the operation might be performed at the point of the ankle; but for the reaſons given, when treating of amputation of the leg, it is found better to do it above the ankle. When a conſiderable part remains ſound, it ought to be ſaved. If any of the tarſal bones are affected, theſe are to be removed. When the middle or whole body of any of the metatarſal bones are diſeaſed, they are to be removed in the ſame manner as directed for ſimilar operations in bones of the hand; and if even two of them remain ſound, provided they be ſo placed as to ſupport the toes, they ought to be preſerved, as it is known that, by proper treatment, an oſſeous matter may afterwards fill a conſiderable part, if not the whole, of the void: or if any cavity remain, it may be ſo ſtuffed that the uſe of the foot may ſtill be enjoyed.

In performing an operation of this kind, the patient ſhould be laid upon a table, and the tourniquet applied in the ham to prevent hæmorrhagy. An inciſion is then to be made along the affected part; and if the ſeat of the diſeaſe admit it, the inciſion ſhould be made upon the upper ſide of the foot ſo as to ſave the ſole. The integuments are to be ſeparated and turned to each ſide, to allow the affected parts to be completely removed.

The principal veſſels and nerves are to be ſaved as much as poſſible; but if any particular artery be cut, it is to be ſecured, and the part treated as after the removal of ſimilar parts of the hand.

The amputation of *the toes* is exactly ſimilar to that of the fingers.

Sect. V. *Of removing the* Ends *of* Carious Bones *in the* Joints.

In compound fractures, the ends of bones, when they protruded in ſuch a manner that they could not otherwiſe be returned, have frequently been ſawed through; and their place has frequently been ſupplied by a renewal of bone, ſo as to preſerve the ordinary uſe of the limb. Many caſes have likewiſe happened, where a large part of the body of the bone has been thrown out by ſuppuration, and its place ſupplied; and a few are upon record, where either the whole of a bone, or that end next the joint, has been thrown out, and its place filled up with callus, ſo that no inconvenience has been felt. From theſe circumſtances, Mr. White of Mancheſter was led to preſerve an arm by ſawing off the head of a diſeaſed humerus; and Mr. Park of Liverpool, to ſave a limb, by ſawing off the ends of the bones, in a caſe of white ſwelling of the knee. When therefore it happens that the end of a bone is diſeaſed, while the other parts are ſound, the diſeaſed part may be removed, and the ſound one ſaved, ſo as in a great meaſure to preſerve the free uſe of the limb.

In performing the operation, the firſt ſtep ſhould be, to uſe ſuch means as may enable the operator to have a full management of the circulation of the part affected. Then a longitudinal inciſion of ſufficient length, and perhaps another acroſs it, may be neceſſary to be made through the ſoft parts of the joint; and this opening ought to be at a diſtance from the large blood-veſſels, that they may be in no danger of being injured. After the end of the diſeaſed bone is ſufficiently laid bare, it is either to be brought out of the joint, or a ſpatula or ſome other proper ſubſtance is to be introduced between the bone and ſoft parts, ſo as to defend the latter in time of ſawing the bone. After the diſeaſed part of the bone is removed, the arterial branches are to be ſecured, and the wound treated like any other wound of equal ſize.

During the cure the limb ought to be kept in the poſture moſt favourable for the removal of the bone, and afterwards for the preſervation of the natural motion of the joint.

In this way a limb may ſometimes be ſaved which would otherwiſe have been removed. But though the removal of the diſeaſed end of one bone may be readily effected, the removal of all that part of the bones which enters into the compoſition of a joint muſt be attended with ſo much inconvenience, that it can ſeldom be uſeful, unleſs it be where the ends of bones are deſtroyed by external violence; for then it appears that this operation may be performed with conſiderable ſucceſs.

Chap. XXXV. Of Diminishing Pain in Surgical Operations.

The pain induced by ſurgical operations may be leſſened in two different ways. The firſt is, by diminiſhing the natural ſenſibility of the ſyſtem; and for this purpoſe narcotics of different kinds, and particularly opium, have been uſed; but theſe are apt to induce diſagreeable ſymptoms, eſpecially ſickneſs and vomiting, which might be attended with bad conſequences after ſome operations. They are therefore ſeldom employed before an operation. When, however, they are given immediately after it, and repeated as circumſtances may require, they often give great relief.

The other method of diminiſhing pain is, by leſſening the ſenſibility of a particular part of the body. It has long been known, that the ſenſibility of any part may not only be leſſened, but entirely ſuſpended, by compreſſing the nerves which ſupply it. From a knowledge of this circumſtance, an inſtrument (Pl. 27. fig. 101.) was invented ſome years ago by Mr. James Moore of London, by which the principal nerves of a member might be ſo compreſſed as to render the parts below perfectly inſenſible. A difficulty, however, ariſes here; for as the nerves muſt be compreſſed at leaſt an hour previous to the operation, in order to render the parts quite inſenſible, and as it is extremely difficult to compreſs the nerves without at the ſame time affecting the veins, the latter are therefore in danger of being burſt. To prevent this inconvenience, Mr. Moore propoſes to open a vein; but this might be attended with bad conſequences in weakly conſtitutions. Beſides, it is ſaid, that by compreſſing the nerves in this manner, although leſs pain may be felt in the time of the operation, it is proportionally greater after the compreſſion is removed. In certain parts of the body, however, where ſufficient compreſſion can be made upon the nerves without acting much upon the veins, it would appear that the method may be practiſed with advantage; though it has not yet been done, excepting in a few inſtances.

Chap. XXXVI. Of Bandages.

The proper application of bandages is an object of great importance in ſurgery: and though dexterity is only to be acquired in this branch by practice, yet a few general rules may be found uſeful. Bandages are employed for the retention of dreſſings, for ſtopping hæmorrhages, for removing deformities,

and for effecting the union of divided parts. They ought to be formed of ſuch materials as are ſufficiently firm, while, at the ſame time, they give no uneaſineſs to the parts to which they are applied. They may be compoſed either of linen, cotton, or flannel. Of late years the two laſt have been preferred by many for their warmth and elaſticity, on which account they are certainly moſt proper, eſpecially in winter; and likewiſe in caſes where the parts are liable to ſwelling and inflammation, as in wounds, luxations, and fractures. Beſides, they more readily abſorb any moiſture which may be diſcharged from the ſores.

When firſt applied, they ſhould be clean, ſufficiently ſtrong, and as free of ſeams as poſſible. They ſhould be ſo tightly applied as to anſwer the purpoſe for which they are intended, without being in danger of impeding the circulation. They ſhould be applied in ſuch a manner that they may be eaſily looſened, and the parts examined with as much accuracy as poſſible; and they ſhould be laid aſide as ſoon as the purpoſe for which they are intended is accompliſhed; for when longer continued, they frequently impede the growth of the parts upon which they are applied.

With reſpect to bandages for particular parts, we ſhall begin with *the head*, and then proceed to the trunk and extremities. The *couvre chef* of the French, which is a ſquare napkin folded cornerwiſe, is moſt frequently uſed where a bandage is wanted for the head; but a nightcap, having a band to go round the head, and another to tie under the chin, appears to be more ſuitable for this purpoſe. For making compreſſion on any particular part of the head, as for ſtopping of bleeding veſſels, the radiated bandage may be employed.

For keeping the edges of wounds together, as in caſes of longitudinal cuts of the head, or of any other parts, the uniting bandage is uſually employed, and is always to be preferred to ſutures, where it retains the edges of the wound with ſufficient exactneſs. For retaining dreſſings upon the eyes, ſeveral turns of a roller have been uſed, and it is termed *monoculus* or *binoculus* according to its being applied to one or both eyes; but the *couvre chef*, and the nightcap already mentioned, are leſs apt to ſlip, and therefore found more convenient for this purpoſe.

For fractures of *the noſe*, or wounds there, or on any other part of the face, the uniting bandage anſwers beſt. And in caſes of fracture of the lower jaw, a four-headed roller is moſt convenient: the hole in the centre of the roller receives the chin, and aſſiſts in preventing the bandage from ſhifting. The two upper heads are to be carried backwards; and being made to paſs each other at the occiput, they are afterwards brought once or twice round the head. The two under heads of the roller being reflected over the chin, are then to be turned upwards and fixed on the upper part of the head.

The bandages neceſſary for *the neck* are, the machine already mentioned after the operation of bronchotomy, and one uſed in caſes of wry neck. For every other purpoſe of bandaging a common roller may anſwer perfectly well.

For fractures of the ſcapula the application of a long roller may be of ſervice.

For retaining dreſſings upon *the thorax* the napkin and ſcapulary are commonly, and very properly uſed; and when the napkin is employed merely for retaining dreſſings, it need not be longer than to paſs once round the body; but if it be uſed for making preſſure over a fractured rib, it ought to paſs two or three times round. For both purpoſes its breadth ought to be ſix or ſeven inches for an adult.

The ſame kind of bandages is alſo uſed for making preſſure on the abdomen, as in caſes of umbilical or ventral hernia; and to keep the bandage properly placed, a ſcapulary is uſed for preventing it from ſlipping down, and one or two ſtraps connected with it behind, are brought between the thighs, and fixed to it before to prevent it from moving up. A bandage of flannel, and different kinds of belts, are contrived for compreſſing *the abdomen* in the operation of tapping; and truſſes of various conſtructions are uſed for the retention of the protruded bowels in caſes of hernia.

Bandages of cotton or flannel are uſed for ſupporting *the ſcrotum* in the various diſeaſes which may occur there, as well as after the operations performed upon it.

One of the beſt bandages for *the penis* is a linen or cotton bag, fixed by a roller round the body.

For retaining dreſſings about *the anus*, or between that part and the ſcrotum, the T bandage is commonly uſed; and it is made either with one or two tails, according to the ſituation of the part to which it is to be applied.

In ſimple fractures, and moſt of the other diſeaſes of the arm, fore-arm, and hand, the roller is the bandage commonly uſed; but in compound fractures of theſe parts, as well as in the different kinds of fractures of the lower extremities, the twelve or eighteen tailed bandage is neceſſary.

For longitudinal wounds of the extremities, the uniting bandage is uſed with the ſame advantage as has been already mentioned for wounds of a ſimilar nature upon the head.

CHAP. XXXVII. The METHOD of OPENING a DEAD BODY.

Surgeons are often called, in order to inveſtigate the cauſe and ſeat of diſeaſes and death, either by the relations of the deceaſed, or the magiſtrates to whom a report is to be made; therefore, at the time of performing this operation, minutes ſhould be taken of what is obſerved. The inſtruments, and all things neceſſary, ſhould be diſpoſed in order, as for any other operation; as knives, a razor, a great and ſmall ſaw, ſciſſars ſtraight and curved, elevators, needles threaded, ſponges, tow, ſaw-duſt or bran, baſons with water, towels, and receivers for the viſcera when they are to be taken out of their cavities. The body is to be laid upon a ſuitable table, advantageouſly placed for the light, having a cloth thrown over the parts which decency demands ſhould be concealed, eſpecially in females.

When it is intended only to inſpect *the abdomen* and its contents, a longitudinal inciſion from the xiphoid cartilage to the os pubis, interſected by a tranſverſe one at the navel, will give a fair opportunity of anſwering theſe purpoſes, when the angles are reverſed. Should it be required to examine all the three cavities, and the parts contained in them, we are to begin by opening *the head*, making an inciſion quite croſs to the bone, from ear to ear; which ſection is preferable to the crucial, commonly made on this occaſion: then the ſcalp may be eaſily diſſected from the ſkull; and turned down over the face, and towards the neck, giving room for the ſaw. The head muſt be held very ſteadily by an aſſiſtant during the ſawing, which ſhould be begun on the middle of the frontal, proceeding to each temporal bone, and ſo to finiſh the circle upon the middle of the occipital bone; which may generally be done conveniently enough, by raiſing the head and inclining it forward after having proceeded as far as this bone; or the body may then be turned prone, ſhould that poſture be found more convenient to complete the circle. The cap of the ſkull is then to be raiſed with the elevator, occaſionally cutting the adheſions of the dura mater; after this the ancephalon is to be removed, carefully ſeparating the other attachments of the membrane.

In order to bring *the thorax and abdomen*, with the parts contained in these cavities, under one view, an incision is to be made on each side of the sternum, in the course of the cartilages of the ribs which are annexed to it; dissecting from thence the muscles with the teguments, the space of two or three inches towards the spine; then cutting through the cartilages, which will be seen, and easily divided with a knife a little curved near the point; then the incisions are to be continued from the sternum through the abdominal cavity, in an oblique direction, to each ilium or inguen; after which the clavicles are to be separated from the sternum, or this bone divided at its superior cartilaginous junction, with a strong knife, dissecting it from the mediastinum, and turning it downwards with the muscles, &c. of the abdomen. This is the most eligible manner of opening these cavities, and gives an opportunity of sewing them up with a better appearance for any person's view afterwards. That kind of stitch called by sempstresses the *herring-bone* or *flat-seam* has a very pretty and neat effect upon these occasions.

If it is proposed to take out the thoracic and abdominal viscera together, for further examination, the diaphragm is first to be cut down to the spine on both sides; then, to avoid being incommoded with blood, &c. two very strong ligatures are to be passed round the œsophagus and large blood-vessels, in which the trachea may be included; tying them strait, and then dividing these parts between the ligatures: the same measures are to be taken in respect to the inferior vessels upon the lumbar region, a little above the bifurcation of the aorta, including the vena cava; and also upon the rectum. After having observed these precautions, the viscera, with the diaphragm, are to be removed by a wary dissection, all the way close to the spine; and by gently drawing them at the same time, the separation will be greatly facilitated.

When the thoracic and abdominal viscera are to be taken out separately, in the first case ligatures must be made, as have been described upon the vessels, &c. just above the diaphragm, and in the other just below it, and upon the rectum.

Shou d we be called upon to perform this office *when the body is become very putrid*, it will be absolutely necessary to have such parts of it well washed with warm vinegar and brandy, and then sprinkled with lavender-water or some such odoriferous antiputrescent liquor, before the examination, in order to correct the stench, and defend us against the noxious quality of the effluvia; a precaution, the neglect of which may be attended with very direful effects.

CHAP. XXXVIII. Of EMBALMING DEAD BODIES.

In the early ages of the world, the practice of embalming dead bodies was very common, particularly among the Egyptians; but it has long been disused in almost all countries, except for great personages. The following directions are taken from Mr. Gooch, to whom they were communicated by a person of great character, and well acquainted with the modern practice of embalming in this kingdom.

After evisceration, as has been directed in opening a dead body, and continuing the incision farther upwards, even into the mouth, and, if practicable, without cutting the skin of the neck, all the cavities are to be well cleansed, and the humidity sucked up with sponges, then washed with *tinct. myrrhæ*, and filled with a species compounded of fragrant herbs, aromatic drugs, and gums reduced to powder not very fine, first restoring the heart to its former residence, after having opened its ventricles, cleansed and washed them with the tincture, stuffed them with the spices, and sewed them up; and then the cavities are to be stitched very close with the glover's or spiral suture. Large and deep incisions are also to be made in all the most fleshy parts, cleaning and washing them with the tincture in the same manner, filling them with the antiseptic spices, and stitching them up. Then the head, trunk, and limbs, are to be perfectly well covered with cerecloth; putting a piece under the chin, to be secured by sewing on the top of the head, after having well adjusted the cap of the skull, sewed the scalp together, and cleaned the mouth, as has been directed for the other parts, and putting in some of the spices. The cerecloth is to be prepared, according to art, with a composition made of wax, rosin, storax, and painter's drying oil. After the application of the cerecloth, with great care and exactness, cut into suitable pieces according to the respective parts, and closing them well every-where, the face being close shaved, is to be covered with some of the above composition melted, and laid on with a brush of a proper degree of heat, and of a moderate thickness; which may have a faint flesh-colour given it with vermillion; and when it is grown cold and stiff upon this part, it may be lightly covered with hard varnish; or this varnish, applied thick, may here serve the purpose alone. A cap is to be well adapted to the head, falling down upon the neck, and to be sewed under the chin, making a few circular turns about the neck with a roller of a proper breadth. All the rest of the corpse is to be inclosed in a sheet, to be artfully cut, and sowed on very close and smooth, with the finest tape, and the *flat-seam* mentioned in the preceding chapter; over which an appropriate dress is to be put, as the relations or friends think fit to direct and appoint, and then laid into the coffin, which should be in readiness: but when it is some great personage, who is to lie in state for public view before the funeral rites are solemnized, the dress must be appropriated to his dignity and character. The brain and other viscera are to be put with some of the spices into a leaden box. Sometimes the heart, prepared as has been directed, to preserve it from putrefaction, is deposited in an urn by itself.

EXPLANATION of the PLATES.

PLATE XXIV.

Fig. 1. A lancet and canula for discharging the contents of an abscess by means of a seton.

Fig. 2. A director for guiding the knife in discharging the contents of an abscess, &c.

Fig. 3. A pair of forceps for extracting polypi.

Fig. 4. A slit probe for conducting a ligature to the root of a polypus.

Fig. 5. A ring probe for assisting in securing a ligature upon the root of a polypus.

Fig. 6. A double canula for fixing a ligature upon the root of a polypus.

Fig. 7. A bandage for making compression after performing the operation of arteriotomy at the temples.

Fig. 8. A seton needle.

Fig. 9. *a*, *b*, Two pins of different forms used in the twisted or hare-lip suture. The first commonly made of silver, with a moveable steel point; the other of gold.

Fig. 10. The tourniquet now most generally used.

Fig. 11. The tenaculum used in drawing out the mouths of bleeding vessels for the purpose of securing them by ligature.

Fig. 12. A blunt-pointed bistoury.

Fig. 13. A raspatory for removing the pericranium in the operation of the trepan.

Fig. 14. The trephine, with all its parts connected and ready

for use. *a*, The centre-pin, which can be raised or depressed by the slider *b*. *c*, The part where the saw is united to the handle by means of the spring *d*.

Fig. 15. A brush for cleaning the teeth of the saw.

Fig. 16. Forceps for removing the piece of bone when nearly cut through by the trephine or the trepan.

Fig. 17. A levator also employed in removing the piece of bone.

Fig. 18. A lenticular for smoothing the ragged edge of the perforated bone.

Fig. 19. A speculum used for keeping the eye-lids separated, and the eye fixed, in performing various operations upon that organ.

Fig. 20. A flat curved hook for elevating the upper eye-lid, and fixing the eye, in performing various minute operations upon its surface.

Fig. 21. A couching needle.

Fig. 22. A couching needle for the right eye, fitted for the operator's right hand.

Fig. 23. A knife for extracting the cataract.

Fig. 24. A flat probe for scratching the capsule in extracting the crystalline lens.

Fig 25. A flat probe or scoop for assisting in removing the cataract.

Fig. 26. A knife for extracting the cataract from the right eye.

Fig. 27. One of Anel's probes for removing obstructions of the lachrymal ducts.

Fig. 28. A syringe and pipe (by the same) for injecting a liquid into the lachrymal ducts.

Fig. 29. A crooked pipe which fits the syringe.

PLATE XXV.

Fig. 30. An instrument for compressing the lachrymal sac.

Fig. 31. A trocar and canula for perforating the os unguis in the operation for the fistula lachrymalis.

Fig. 32, 33, 34. Instruments employed by Mr. Pellier in the operation for fistula lachrymalis. Fig. 32, a conductor for clearing the nasal duct. Fig. 33. a conical tube to be left in the duct. Fig. 34, a compressor for fixing the tube in its place.

Fig. 35. A trocar for making an artificial parotid duct.

Fig. 36. Forceps sometimes used for laying hold of the lip in the operation for hare-lip.

Fig. 37. Pins used in the operation for hare-lip, represented as they are usually inserted into the part.

Fig. 38. A gum-lancet.

Fig. 39. A trocar for perforating the antrum maxillare.

Fig. 40. An instrument of a tubular form for the same purpose.

Fig. 41. No. 1, 2, 3, 4, 5. 1. A file for removing inequalities upon the teeth. 2, 3, 4, 5. Different forms of instruments for removing tartar, &c. from the teeth.

Fig. 42. No. 1, 2, 3. 1, 2, Instruments for stuffing gold-leaf, &c. into a hollow tooth. 3. The handle which fits them all

Fig. 43. Forceps for extracting teeth.

Fig. 44. A punch or lever for extracting stumps of teeth.

Fig. 45. Mr. Chefelden's needle, with an eye near the point, for tying a knot on scirrhous tonsils.

Fig. 46. A speculum oris first proposed by Mr. B. Bell.

Fig. 47. A scarificator for scarifying the amygdalæ, and for opening abscesses in the throat.

Fig. 48. Forceps for extracting extraneous substances from the outer passage of the ear.

Fig. 49. An instrument used for concentrating sound in cases of deafness.

Fig. 50. A tube by which the Eustachian tube may be washed in certain cases of deafness.

Fig. 51. An instrument for perforating the lobes of the ear.

Fig. 52. An instrument recommended by Mr. B. Bell for supporting the head after the operation for wry neck.

Fig. 53. An instrument invented by Dr. Monro for fixing the canula after the operation of bronchotomy.

Fig. 54. A syringe for injecting the outer passage of the ear.

Fig. 55. A silver canula for carrying off pus collected in the thorax.

Fig. 56. Mr. André's lancet-pointed trocar, the canula of which is made of two hollow plates of steel screwed together at the larger extremity.

Fig. 57. A director used in the operation for the strangulated hernia.

Fig. 58. A spring-truss for an unguinal or femoral hernia of one side only.

Fig. 59. A spring-truss for an inguinal or femoral hernia existing on both sides,

Fig. 60. A spring truss for an umbilical hernia.

Fig. 61. Mr. André's trocar for evacuating the contents of an encysted hydrocele.

Fig. 62. Mr. B. Bell's trocar for operating in the hydrocele.

Fig. 63. A bag of *resina elastica*, with a stop-cock and short pipe, which fits the canula of the trocars fig. 77, 78, for the purpose of injecting the cavity of the tunica vaginalis in the case of hydrocele.

PLATE XXVI.

Fig. 64. A straight-edged bistoury, sharp-pointed.

Fig. 65. A sound used in searching for the stone.

Fig. 66. A grooved staff for the operation of lithotomy.

Fig. 67. A cutting gorget.

Fig. 68. A double gorget invented by Dr. Monro.

Fig. 69. Extracting forceps.

Fig. 70. A scoop.

Fig. 71. A grooved staff for the operation of lithotomy as it is performed in females.

Fig. 72. A tube containing a pair of elastic forceps for extracting stones from the urethra.

Fig. 73. A jugum penis used in cases of incontinence of urine in men.

Fig. 74. Pessaries for supporting the uterus in cases of prolapsus uteri in females; usually made of box-wood or cork.

Fig. 75. A catheter for a male.

Fig. 76. A catheter for a female.

Fig. 77. Mr. Hunter's caustic conductor.

Fig. 78. A bistoury used in the operation for phymosis.

Fig. 79. A silver canula for conducting the urine after amputation of the penis.

Fig. 80. A bistoury, with a probe of flexible silver joined to it, to be used in the operation for fistula in ano.

Fig. 81. A bistoury, which has been lately used by some practitioners in the operation for fistula in ano.

Fig. 82. A wire of silver or lead, with a tube of the same metal, for laying open a fistula in ano.

Fig. 83. A bandage for supporting the end of the rectum in cases of prolapsus ani.

Fig. 84. Mr. Park's leather-case for supporting the fore-arm after luxations of the joints or fractures of the bones of the superior extremities.

Fig. 85. Represents a fractured limb dressed with an eighteen-tailed bandage, and placed in the manner recommended by Mr. Pott.

PLATE XXVII.

Fig. 86. Mr. Gooch's machine, improved by Dr. Aiken, for keeping a fractured thigh-bone properly extended. The upper circular bandage goes round the waift, the under one fixes immediately above the knee.

Fig. 87. A bandage for a fractured patella.

Fig. 88. A leather fplint for a fractured leg.

Fig. 89. Mr. James's machine, which is an improvement upon one invented fome years ago by Mr. White of Manchefter, for retaining fractured thighs, or bones of the leg, in their natural fituation.

Fig. 90. The common collar ufed in diftortions of the fpine.

Fig. 91. Stays recommended by Mr. Jones for diftortions of the fpine.

Fig. 92. An apparatus for a diftortion of the leg.

Fig. 93. An apparatus for a diftorted leg, where the fole is turned much out of its natural direction.

Fig. 94. Shoes which have been ufed with advantage in particular cafes of club-feet.

Fig. 95. An amputating knife.

Fig. 96. A retractor of cloth or leather, ufed in amputating the larger extremities.

Fig. 97. Iron retractors recommended by Dr. Monro in amputation of the larger extremities.

Fig. 98. The amputating faw now moft generally ufed.

Fig. 99. Pincers for nipping off any points of bone which may remain after the faw has been ufed.

Fig. 100. A catline ufed in an amputation of the leg.

Fig. 101. An inftrument invented by Mr. Moore, of London, for compreffing the nerves, and thereby diminifhing pain in performing various operations upon the extremities.

Fig. 102. An apparatus invented by the late Dr. Monro for the cure of a rupture of the tendo achillis.

Fig. 103. A pair of fpring forceps, for laying hold of the extremities of arteries, &c.

SURINAM, a fettlement of South America, and part of the country of Guiana, bounded on the north by the Atlantic, on the eaft by the river Marawina, on the fouth by a country of Indians, and on the weft by the river Corentyn; about 150 miles from eaft to weft, and 60 from north to fouth. The principal rivers that belong to this fettlement, are the river Surinam, from which the colony takes its name, the Corentyn, the Copename, the Seramica, and the Marawina. Of thofe rivers, the firft only is navigable, the reft, not excepting the Marawina, being, though very long and broad, fo fhallow, and fo extremely crowded with rocks and fmall iflands, that they are of little confequence to Europeans; nor are their banks inhabited, except by fome of the Indians, or natives of the country. Into all thefe rivers, the courfes of which are not ftraight, but ferpentine, are difcharged a number of very large creeks or rivulets, the banks of which are inhabited by Europeans, and cultivated with fugar, cocoa, cotton, and indigo plantations, which form the moft delightful profpects that can be imagined, to thofe who travel by water, the univerfal mode of journeying in this country, as the foil is in general ill adapted for the conftruction of roads; and in fome places, the woods, &c. are abfolutely impenetrable. In the river Marawina is frequently found a curious ftone or pebble, which is known by the name of the Mariwana diamond, and which being polifhed, bears a very near refemblance to that moft valuable gem, and is confequently often fet in rings, &c. &c. Though fituated like Guinea, under the torrid zone, the heats in Guiana are much more fupportable than thofe on that part of the African coaft. The fcorching rays of the fun are, in Guiana, daily tempered by cooling breezes from the fea, while in Guinea the intenfe heat is increafed by the wind blowing continually over the land, and in its paffage traverfing numerous fandy deferts. The rainy and dry feafons which divide the year, as cold and warm weather divide it in Europe, may be termed the winter and fummer of this country. There is, however, one remarkable difference, between the European feafons and thofe in Guiana, which is, that Guiana has annually two winters and two fummers, which are diftinguifhed from each other by the appellation of the greater and the fmaller, not becaufe the rains are lefs violent in the two latter feafons, or the heat lefs intenfe, but from an opinion which has prevailed, that their period of duration is about half as long as that of the former. This diftinction, however, appears to be more imaginary than real, as far as refpects the rainy feafon. The continuance of the rains, during the time when the fun is vertical in this climate, is neceffary to the exiftence of animal and vegetable life, which without thefe feafonable refrefhments muft languifh and expire under the fervid influence of its rays. In general, the foil is abundantly fruitful; the earth during the whole of the year is adorned with continual verdure, the trees loaded at the fame time with bloffoms and ripe fruit, and the whole prefenting to the view the delightful union of fpring and fummer. This general appearance of fertility may be afcribed not only to the rains and warmth in this climate, but alfo to its low and marfhy fituation, which prevents the intenfe heats from deftroying vegetation, and from the extreme richnefs of the foil, particularly in thofe parts which are cultivated by European induftry. It muft, indeed, be confeffed, that fuch fituations are far from being favourable to health; but the fpirit of gain is a very powerful principle, and the certainty of prefent profit will generally be confidered as a weighty counterpoife to thofe evils which, if ever encountered, appear at a confiderable diftance; and as they are fometimes efcaped, may be always efteemed as uncertain. The uncultivated parts are covered with immenfe forefts, rocks, and mountains; fome of the latter enriched with a great variety of mineral fubftances; and the whole country is interfected by very deep marfhes or fwamps, and by extenfive heaths or favannas. The ftream along the coaft flows continually towards the north-weft, and the whole fhore is rendered almoft inacceffible from its being covered with dangerous banks, quickfands, bogs, and rocks, with prodigious bufhes, and a large quantity of brufh-wood, which are fo clofely interwoven as to be impenetrable. That part of Terra Firma which is called *Guiana*, or *The Wild Coaft*, and in which lies the colony of Surinam, is faid by fome to have been firft found out by the juftly celebrated Chriftopher Columbus, in the year 1498,

when he was ſent home in chains; though others contend, that it was not diſcovered till the year 1504, by Vaſco Unes, a Spaniard. In 1579 it was viſited by Sir Walter Raleigh, under Queen Elizabeth, who alſo failed up the river Oronoque above 600 miles, in ſearch of the ſuppoſed El Dorado, and in hopes of diſcovering the gold mines, of which he had the moſt lively expectations, from ſamples of a marcaſite, which the Spaniards call madre de oro. In the year 1634, a Captain Marſhal, and about ſixty Engliſh, were diſcovered in Surinam, employed in planting tobacco, according to the relation of David Piterſe de Vries, a Dutchman, who converſed with them upon the ſpot. In 1640 Surinam was inhabited by the French, who were obliged to leave it ſoon after, on account of the frequent invaſions which they juſtly ſuffered from the Carribbean Indians, for having, like their neighbours the Spaniards, treated them with the moſt barbarous cruelties. In the year 1650, this colony being vacant, Francis lord Willoughby of Parham, by King Charles the Second's permiſſion, ſent thither one veſſel, equipped by himſelf, to take poſſeſſion of it, in the name of his royal maſter; a little after which he diſpatched three veſſels more, one of them carrying twenty guns. All theſe were well received by the Indians or inhabitants of the country, with whom they entered into friendly treaties, and a kind of negociation. In the year 1662 the colony of Surinam was granted by charter of Charles II. to Francis lord Willoughby, and at that lord's deſire, to be divided with Lawrence Hide, ſecond ſon of Edward earl of Clarendon, for them and their deſcendants for ever. In the year 1665 Surinam was ſucceſsfully cultivated, moſtly by planting tobacco. They had alſo raiſed above forty fine ſugar-plantations, and erected a ſtrong fortreſs of hewn ſtone for their defenee. It is proper however to remark, that ſome ſuppoſe theſe improvements were effected by the Portugueſe, though at what period is uncertain; while the French ſtrenuouſly diſpute the point, and inſiſt that they were the work of monſieur Ponſert de Bretigny, when France had poſſeſſion of that country. However this may be, the fortreſs is ſituated about ſixteen or eighteen miles from the mouth of the river Surinam; and theſe induſtrious ſettlers found themſelves perfectly happy, in a ſmall town which they had built under the walls. Their felicity was not of long duration; for in the wars between Charles II. and the United Provinces, the Dutch having been driven, in 1661, from the Brazils by the Portugueſe, took the eolony of Surinam from the Engliſh, in the year 1667, under the command of a Captain Abraham Criuvon, who was diſpatched for that purpoſe, with three ſhips of war and 300 marines. The Engliſh commander, William Biam, loſt the ſettlement of Surinam by ſurprize, when above 600 of the beſt men in the colony were at work on the ſugar plantations. This neglect appears from the trifling loſs of the Dutch, who in ſtorming the citadel had but one man killed. They immediately planted the Prince of Orange's flag on the ramparts, and gave now to this fortreſs the name of *Zelandia,* and that of *Middleburgh* to the town of Paramaribo, after making the inbitants, amongſt other contributions, pay 100,000 pounds weight of ſugar, and ſending a number of them to the iſland of Tobago. This event took place in February, and in July following the peace was concluded at Breda; but moſt unluckily for the new poſſeſſors of Surinam, it was concluded unknown to the Engliſh eommodore, Sir John Harman, who in October that ſame year, having firſt taken Cayenne from the French, entered the river with a ſtrong fleet of ſeven ſhips of war, two bomb-ketches, &c. and retook the colony from the Dutch, killing on this occaſion above fifty of their men, and deſtroying nine pieces of cannon in fort Zelandia. The new inhabitants were now in their turn laid under contribution, and the Dutch garriſon were tranſported to the iſland of Barbadoes. At the diſcovery of Surinam, that the peace had been concluded between the contending powers, before commodore Harman retook the colony from the Dutch, conſiderable tumult and diſorder took place among the inhabitants, who knew not whom they ought to acknowledge as their lawful ſovereign. At length, by an order of King Charles, the ſettlement was ceded to the Dutch, in 1669, when 1200 of the old inhabitants, Engliſh and negroes together, left it, and went to ſettle on the iſland of Jamaica. At the cloſe of the ſucceeding war, it was agreed by the treaty of Weſtminſter, that Surinam ſhould be the property of the Dutch for ever, in exchange for the province of New York, which accordingly took place in the year 1674. The principal animals of prey are tigers; apes are abundant, as likewiſe parrots, ſcorpions; a great variety of inſects, and ſerpents of an amazing ſize. The rivers abound with alligators, and in the Surinam is found that wonderful fiſh the electrical eel: Paramaribo is the ehief town. *Long.* 53. 40. to 56. 25. W. Greenwich. *Lat.* 4. 45. to 6. N.

SURMOUNTED, in heraldry, is when one figure is laid over another.

SURMULLET. See MULLUS.

SURNAME, that which is added to the proper name for diſtinguiſhing perſons and families. It was originally diſtinguiſhed from *ſirname,* which denotes the name of the *ſire* or progenitor: thus Macdonald, Robertſon, are ſirnames expreſſing the ſon of Donald, the ſon of Robert. The word *ſurname,* again, ſignified ſome name ſuperadded to the proper name to diſtinguiſh the individual, as Artaxerxes *Longimanus,* Harold *Harefoot,* Malcolm *Canmore.* From this it is evident that every ſirname was a ſurname, though the reverſe was not ſo. In modern times they are eonfounded; and as there is now no oceaſion to preſerve the diſtinction, Dr. Johnſon has rejected the word *ſirname* altogether. See NAME.

Surnames were introduced among all nations at an early period, and ſeem to have been formed at firſt by adding the name of the father to that of the ſon. This was the practice among the Hebrews, as appears from the ſcriptures. Caleb is denominated the ſon of Jephunneh, and Joſhua the ſon of Nun. That the ſame thing was cuſtomary among the Greeks, every one who has read the poems of Homer muſt remember. We have an inſtance of it in the very firſt line of the Iliad: Αχιλλησς Πηληιαδεω, " Achilles the ſon of Peleus." This is perhaps the general origin of ſurnames, for it has been common among moſt nations (A).

The Romans generally had three names. The firſt called *prænomen* anſwered to our chriſtian name, and was intended to diſtinguiſh the individuals of the ſame family; the ſecond called *nomen* correſponded to the word *clan* in Scotland, and was given to all thoſe who were ſprung from the ſame ſtock; the third called *cognomen* expreſſed the particular branch of the tribe or clan from which an individual was ſprung. Thus Publius Cornelius Scipio, *Publius* correſponded to our names John, Robert, William; *Cornelius* was the name of the clan or tribe,

(A) This might be ſupported by examples borrowed from many nations. The old Normans uſed *Fitz,* which ſignifies ſon, as Fitzherbert, Fitzſimmons, the ſon of Herbert, the ſon of Simmons. The Iriſh uſed *O;* as O'Neal, the ſon of Neal. The Scotch Highlanders employed *Mac;* as Macdonald, the ſon of Donald. The Saxons added the word *ſon* to the end of the father's name, as Williamſon.

as Campbell was formerly the name of all the Duke of Argyle's clients, and Douglas the name of the retainers of the Duke of Hamilton's progenitors. *Scipio* being added, conveyed this information, that Publius, who was of the tribe of the Cornelii, was of the family of the Scipios, one of the branches or families into which that tribe was divided. Refpecting the three names which were common among the Romans, we may fay that the firft was a name, and the other two furnames.

Du Chefne obferves, that furnames were unknown in France before the year 987, when the lords began to affume the names of their demefnes. Camden relates, that they were firft taken up in England, a little before the conqueft, under King Edward the Confeffor: but he adds, they were never fully eftablifhed among the common people till the time of Edward II.; till then they varied with the father's name; if the father, *e. gr.* was called *Richard*, or *Roger*, the fon was called *Richardfon*, or *Hodgfon*; but from that time they were fettled, fome fay, by act of parliament. The oldeft furnames are thofe we find in Doomfday-Book, moft of them taken from places, with the addition of *de*; as Godefridus *de* Mannevilla, Walterus *de* Vernon, Robert *de* Oyly, &c. Others from their fathers, with *filius*, as Gulielmus *filius* Ofberni; others from their offices, as Eudo *Dapifer*, Gulielmus *Camerarius*, Giflebertus *Cocus*, &c. But the inferior people are noted fimply by their Chriftian names, without any furnames at all.

They feem to have been introduced into Scotland in the time of William the Conqueror by the Englifh who accompanied Edgar Atheling when he fled into that kingdom. Thefe had their proper furnames, as Moubray, Lovell, Lifle, ufing the particle *de* before them; which makes it probable that thefe furnames had been derived from the lands which their anceftors or they themfelves had poffeffed. In Kenneth II.'s time in 800 the great men had indeed begun to call their lands by their own names; but the ordinary diftinctions then ufed were only perfonal, and did not defcend to fucceeding generations, fuch as thofe employed by the Hebrews and Greeks: for example, *John the fon of William*; or the names of office, as Stewart; or accidental diftinctions from complexion or ftation, as Black, White, Long, Short; or the names of their trade, as Taylor, Weaver.

It was long before any furnames were ufed in Wales, except that of fon, as Evan ap Rice, Evan the fon of Rice; Evan ap Howel, Evan the fon of Howel: but many of them have at length formed feparate furnames, as the Englifh and Scots, by leaving out the *a* in *ap*, and joining the *p* to the father's name: thus Evan ap Rice becomes Evan Price; Evan ap Howel, Evan Powel.—We are told furnames were unknown in Sweden till the year 1514, and that the common people of that country ufe none to this day; and that the fame is the cafe with the vulgar Irifh, Poles, and Bohemians.

When we come to enquire into the etymology of furnames, we muft allow that many of them were originally fignificant of the qualities of mind, as Bold, Hardy, Meek; fome of the qualities of body, as Strong, Low, Short; others expreffive of the trade or profeffion followed by the perfons to whom they were applied, as Baker, Smith, Wright; Butler, Page, Marfhal. But the greateft number, at leaft of the ancient furnames, were borrowed from the names of places. Camden fays, that there is not a village in Normandy but has given its name to fome family in England. He mentions as examples, Percy, Devereux, Tankervil, Mortimer, Warren, &c. They were introduced with William the Conqueror. Several have been derived from places in the Netherlands, as Gaunt, Tournay, Grandifon; and many from the names of towns and villages in England and Scotland, as Wentworth, Markham, Murray, Aberdeen. Many have been formed from the names of animals, as quadrupeds, birds, fifhes; from vegetables, and parts of vegetables, as trees, fhrubs, flowers, and fruits; from minerals of different kinds. Others are formed from fuch a variety of accidents that it is impoffible to particularize them.

SURPLICE, the habit of the officiating clergy in the church of England. By Can. 58. every minifter faying the public prayers, or miniftering the facrament or other rites of the church, fhall wear a decent and comely furplice with fleeves, to be provided at the charge of the parifh. But by 1 Eliz. c. 2. and 13 and 14 Car. II. the garb prefcribed by act of parliament in the fecond year of king Edward VIth, is enjoined; and this requires that in the faying or finging of matins and even fongs, baptizing and burying, the minifter in parifh churches and chapels fhall ufe a furplice. And in all cathedral churches and colleges, the archdeacon, dean, provofts, mafters, prebendaries, and fellows, being graduates, may ufe in the choir, befides their furplices, fuch hoods as pertain to their feveral degrees. But in all other places every minifter fhall be at liberty to ufe a furplice or not. And hence in marrying, churching of women, and other offices not fpecified in this rubric, and even in the adminiftration of the holy communion, it feems that a furplice is not neceffary. Indeed for the holy communion the rubric appoints a white ALB plain, which differs from the furplice in being clofe-fleeved, with a veftment or cope.

SURREBUTTER, in law, is fecond rebutter; or the replication of the plaintiff to the defendant's rebutter.

SURREJOINDER, is a fecond defence of the plaintiff's declaration, by way of anfwer to the defendant's rejoinder.

SURRENDER, in common law, a deed or inftrument, teftifying that the particular tenant of lands and tenements, for life or years, doth fufficiently confent and agree, that he who has the next or immediate remainder or reverfion thereof, fhall have the prefent eftate of the fame in poffeffion; and that he hereby yields and gives up the fame to him, fo that the eftate for life or years may merge or drown by mutual agreement of the parties. Of furrenders there are three kinds; a furrender properly taken at common law; a furrender of copyhold or cuftomary eftates; and a furrender improperly taken, as of a deed, a patent, &c. The firft is the ufual furrender, and it is ufually divided into that in deed, and that in law.

Surrender, in deed, is that which is really made by exprefs words in writing, where the words of the leffee to the leffor prove a fufficient affent to furrender his eftate back again.

Surrender, in law, is that wrought by operation of the law, and which is not actual.—As if a man have a leafe of a farm for life or years, and during the term he accepts a new leafe; this act is, in law, a furrender of the former.

Surrender of a bankrupt. See Commission *of Bankruptcy*.

Surrender *of Copyholds*, is the yielding up of the eftate by the tenant into the hands of the lord, for fuch purpofes as are expreffed in the furrender; as to the ufe and behoof of A and his heirs, to the ufe of his own will, and the like. This method of conveyance is fo effential to the nature of a copyhold eftate, that it cannot poffibly be transferred by any other affurance. No feoffment, fine, or recovery (in the king's courts) hath any operation upon it. If I would exchange a copyhold with another, I cannot do it by an ordinary deed of exchange at the common law, but we muft furrender to each other's ufe, and the lord will admit us accordingly. If I would devife a copyhold, I muft furrender it to the ufe of my

laft will and teftament; and in my will I muft declare my intentions, and name a devifee, who will then be entitled to admiffion.

SURRENDER *of Letters Patent and Offices.* A furrender may be made of letters patent to the king, fo that he may grant the eftate to whom he pleafes, &c. and a fecond patent for years to the fame perfon for the fame thing is a furrender in law of the firft patent. 10 Rep. 66. If an officer for life accepts of another grant of the fame office, it is in law a furrender of the firft grant; but if fuch an officer takes another grant of the fame office to himfelf and another, it may be otherwife.

SURREPTITIOUS. See SUBREPTITIOUS.

SURROGATE, in law, denotes a perfon that is fubftituted or appointed in the room of another.

SURRY, a county of England, bounded on the weft by Berkfhire and Hampfhire, on the fouth by Suffex, on the eaft by Kent, on the north by Middlefex, from which it is parted by the Thames, whence it had the name of *Suth-rey* from the Saxons, *i. e.* the country on the fouth fide of the river. It is thirty-eight miles in length from eaft to weft, twenty-three in breadth from north to fouth, and 112 in circumference. It contains thirteen hundreds, 140 parifhes, of which thirty-five are vicarages, thirteen market-towns, 450 villages, 592,000 acres, and about 170,000 inhabitants. The members fent from it to parliament are fourteen, of which two are fent by each of the following boroughs, viz. Southwark, Bleechingley, Ryegate, Guildford, Gatton, Haflemere, and two for the county.

The air of this county, towards the middle, which confifts moftly of hills and heath, is fharp, but pure and wholefome. About the fkirts, where it is more level, and the foil richer, the air is milder, but alfo falubrious. In the middle parts the foil is barren enough in general; but towards the extremities, and where the country is open and champaign, it is fruitful in grafs and corn, particularly on the fouth fide in Holmfdale, in which meadows, woods, and corn-fields, are agreeably intermixed. The foil is alfo very fertile along the Thames, efpecially towards London, where it greatly contributes to maintain plenty in the London markets. It has feveral rivers, abounding with fifh, the chief of which are the Wye, the Mole, and the Wandle.

SURSOLID, or SURDESOLID, in arithmetic, the fifth power of a number, or the fourth multiplication of any number, confidered as a root.

SURVEYING, the art of meafuring land; that is, of taking the dimenfions of any tract of ground, laying down the fame in a map or draught, and finding the content or area thereof. See GEOMETRY.

SURVEYOR, a perfon who has the overfight and care of confiderable works, lands, or the like.

SURVEYOR, likewife denotes a gauger; as alfo a perfon who furveys lands, and makes maps of them.

SURVIVOR, in law, fignifies the longeft liver of joint tenants, or of any two perfons jointly interefted in a thing.

SURVIVORSHIP, is that branch of mathematics which treats of reverfions payable provided one or more particular perfons furvive certain others. By reverfions are meant payments not to take place till fome future period. Survivorfhip forms one of the moft difficult and complicated parts of the doctrine of reverfions and life-annuities. It has been very fully treated of by Mr. Thomas Simfon in his Select Exercifes; and brought to a ftate of very great perfection by Dr. Price and Mr. Morgan, who have beftowed a great deal of attention on this fubject. See ANNUITIES.

The calculations are founded on the expectation of lives at different ages, deduced from tables formed from bills of mortality. By the *expectation of life* is meant the mean time that any fingle or joint lives at a given age is found to continue; that is, the number of years which, taking one with another, they actually enjoy, and may be confidered as fure of enjoying; thofe who furvive that period enjoying as much more time in proportion to their number as thofe who fall fhort of it enjoy lefs. Thus, fuppofing 46 perfons alive, all 40 years of age, and that one will die every year till they are all dead in 46 years, half 46 or 23 will be the *expectation* of each of them. If M. de Moivre's hypothefis were true, that men always decreafe in arithmetical progreffion, the expectation of a fingle life is always half its complement, and the expectation of two joint lives one-third of their common complement. Thus, fuppofing a man 40, his expectation would be 23, the half of 46, his complement; the expectation of two joint lives, each 40, would be 15 years 4 months, or the third part of 46.

The number expreffing the expectation, multiplied by the number of fingle or joint lives (of which it is the expectation), added annually to a fociety, gives the whole number living together, to which fuch an annual addition would in time grow. Thus, fince 19, or the third of 57, is the expectation of two joint lives, whofe common age is 29, twenty marriages every year between perfons of this age would in 57 years grow to 20 times 19, or 380 marriages, always exifting together. And fince the expectation of a fingle life is always half its complement, in 57 years 20 fingle perfons added annually to a town will increafe to 20 times 28.5 or 570; and when arrived at this number, the deaths every year will juft equal the acceffions, and no farther increafe be poffible. It appears from hence, that the particular proportion that becomes extinct every year, out of the whole number conftantly exifting together of fingle or joint lives, muft, wherever this number undergoes no variation, be exactly the fame with the expectation of thofe lives, at the time when their exiftence commenced. Thus, was it found that a 19th part of all the marriages among any bodies of men, whofe numbers do not vary, are diffolved every year by the deaths of either the hufband or wife, it would appear that 19 was, at the time they were contracted, the expectation of thefe marriages. In like manner, was it found in a fociety, limited to a fixed number of members, that a 28th part dies annually out of the whole number of members, it would appear that 28 was their common expectation of life at the time they entered. So likewife, were it found in any town or diftrict, where the number of births and burials are equal, that a 20th or 30th part of the inhabitants die annually, it would appear that 20 or 30 was the expectation of a child juft born in that town or diftrict. Thefe expectations, therefore, for all fingle lives, are eafily found by a table of obfervations, fhowing the number that die annually at all ages out of a given number alive at thofe ages; and the general rule for this purpofe is, to divide the fum of all the living in the table, at the age whofe expectation is required, and at all greater ages, by the fum of all that die annually at that age and above it; or, which is the fame, by the number (in the Table) of the living at that age; and half unity fubtracted from the quotient will be the required expectation. Thus, in Dr. Halley's table, the fum of all the living at 20 and upwards is 20,724, which, divided by 598, the number living at the age of 20, and half unity fubtracted from the quotient, gives 34.15 for the expectation of 20.

In calculating the value or expectation of joint lives, Mr. de Moivre had recourfe to the hypothefis, that the probabilities of life decreafe in a geometrical progreffion; believing that the values of joint lives, obtained by rules derived from it, would not deviate much from the truth. But in this he was greatly miftaken; they generally give refults which are near a quarter of the true value too great in finding the prefent value of one

life after it has survived another in a single payment, and about 2-5ths too great when the value is sought in annual payments during the joint lives. They ought therefore to be calculated upon the hypothesis (if they are calculated on hypothesis at all), that the probabilities of life decrease in arithmetical progression, which is not very far from the truth. Even this hypothesis never corresponds with the fact in the first and last periods of life, and in some situations not in any period of life. Dr. Price and Mr. Morgan therefore have given tables of the value of lives, not founded on any hypothesis, but deduced from bills of mortality themselves. Some of these we shall give at the end of this article. Mr. Morgan has likewise given rules for calculating values of lives in this manner.

M. de Moivre has also fallen into mistakes in his rules for calculating the value of reversions depending on survivorship: these have been pointed out by Dr. Price in the third essay in the first volume of his Treatise on Reversionary Payments; who has also given proper rules for calculating these values, the most important of which are comprehended in the following paragraphs.

Suppose a set of married men to enter into a society in order to provide annuities for their widows, and that it is limited to a certain number of members, and constantly kept up to that number by the admission of new members as the old ones are lost; it is of importance, in the first place, to know the number of annuitants that after some time will come upon the establishment. Now since every marriage produces either a widow or widower; and since all marriages taken together would produce as many widows as widowers, were every man and his wife of the same age, and the chance equal which shall die first; it is evident, that the number of widows that have ever existed in the world, would in this case be equal to half the number of marriages. And what would take place in the world must also, on the same suppositions, take place in this society. In other words, every other person in such a society leaving a widow, there must arise from it a number of widows equal to half its own number. But this does not determine what number, all living at one and the same time, the society may expect will come to be constantly upon it. It is, therefore, necessary to determine how long the duration of survivorship between persons of equal ages will be compared with the duration of marriage. And the truth is, that, supposing the probabilities of life to decrease uniformly, the former is equal to the latter; and consequently that the number of survivors or (which is the same, supposing no second marriages) of widows and widowers alive together, which will arise from any given set of such marriages constantly kept up, will be equal to the whole number of marriages; or half of them (the number of widows in particular) equal to half the number of marriages. Now it appears that in most towns the decrease in the probabilities of life is in fact nearly uniform. According to the Breslaw Table of Observation, almost the same numbers die every year from twenty years of age to seventy-seven. After this, indeed, fewer die, and the rate of decrease in the probabilities of life is retarded. But this deviation from the hypothesis is inconsiderable; and its effect, in the present case, is to render the duration of survivorship longer than it would otherwise be. According to the London Table of Observations, the numbers dying every year begin to grow less at fifty years of age; and from hence to extreme old age there is a constant retardation in the decrease of the probabilities of life. Upon the whole, therefore, it appears that, according to the Breslaw Table, and supposing no widows to marry, the number inquired after is somewhat greater than half the number of the society; but, according to the London Table, a good deal greater. This, however, has been determined on the supposition that the husbands and wives are of equal ages, and that then there is an equal chance who shall die first. But in reality husbands are generally older than wives, and males have been found to die sooner than females, as appears incontestably from several of the tables in Dr. Price's Treatise on Reversions. It is therefore more than an equal chance that the husband will die before his wife. This will increase considerably the duration of survivorship on the part of the women, and consequently the number which we have been inquiring after. The marriage of widows will diminish this number, but not so much as the other causes will increase it.

If the society comprehends in it from the first all the married people of all ages in any town, or among any class of people where the numbers always continue the same, the whole collective body of members will be at their greatest age at the time of the establishment of the society; and the number of widows left every year will at a medium be always the same. The number of widows will increase continually on the society, till as many die off every year as are added. This will not be till the whole collective body of widows are at their greatest age, or till there are among them the greatest possible number of the oldest widows; and therefore not till there has been time for an accession to the oldest widows from the youngest part.

Let us, for the sake of greater precision, divide the whole medium of widows that come on every year into different classes according to their different ages, and suppose some to be left at fifty-six years of age, some at forty six, some at thirty-six, and some at twenty-six The widows, constantly in life together, derived from the first class, will come to their greatest age, and to a *maximum*, in thirty years supposing, with M. de Moivre, eighty-six to be the utmost extent of life. The same will happen to the second class in forty years, and to the third in fifty years. But the whole body composed of these classes will not come to a *maximum* till the same happens to the fourth or youngest class; that is, not till the end of sixty years. After this the affairs of the society will become stationary, and the number of annuitants upon it of all ages will keep always nearly the same.

If a society begins with its complete number of members, but at the same time admits none above a particular age: If, for instance, it begins with 200 members all under fifty, and afterwards limits itself to this number, and keeps it up by admitting every year, at all ages between twenty-six and fifty, new members as old ones drop off; in this case, the period necessary to bring on the *maximum* of annuitants will be just doubled.

To determine the sum that every individual ought to pay in a single present payment, in order to intitle his widow to a certain annuity for her life, let us suppose the annuity 3l. *per annum*, and the rate of interest four *per cent*. It is evident, that the value of such an expectation is different, according to the different ages of the purchasers, and the proportion of the age of the wife to that of the husband. Let us then suppose that every person in such a society is of the same age with his wife, and that one with another all the members when they enter may be reckoned forty years of age, as many entering above this age as below it. It has been demonstrated by M. de Moivre and Mr. Simpson, that the value of an annuity on the joint continuance of any two lives, subtracted from the value of an annuity on the life in expectation, gives the true present value of annuity on what may happen to remain of the latter of the two lives after the other.

In the present case, the value of an annuity to be enjoyed during the joint continuance of two lives, each forty, is, 9.826, according to the probabilities of life in the Table of Observations formed by Dr. Halley from the bills of mortality of

Breflaw in Silefia. The value of a fingle life forty years of age, as given by M. de Moivre, agreeably to the fame table, is 13.20; and the former fubtracted from the latter, leaves 3.37, or the true number of years' purchafe, which ought to be paid for any given annuity, to be enjoyed by a perfon forty years of age, provided he furvives another perfon of the fame age, intereft being reckoned at four *per cent. per annum*. The annuity, therefore, being 30l. the prefent value of it is 30 multiplied by 3.37, or 101l. 2s.

If, inftead of a fingle prefent payment, it is thought preferable to make annual payments during the marriage; what thefe annual payments ought to be is eafily determined by finding what annual payments during two joint lives of given ages are equivalent to the value of the reverfionary annuity in prefent money. Suppofe, as before, that the joint lives are each forty, and the reverfionary annuity 30l. *per annum*. An annual payment during the continuance of two fuch lives is worth 9.82 years' purchafe. The annual payment ought to be fuch as, being multiplied by 9.82, will produce 101.1 l. the prefent value of the annuity in one payment. Divide then 101.1 by 9.82, and 10.3 the quotient will be the annual payment. This method of calculation fuppofes that the firft annual payment is not to be made till the end of a year. If it is to be made immediately, the value of the joint lives will be increafed one year's purchafe; and therefore, in order to find the annual payments required, the value of a prefent fingle payment muft be divided by the value of the joint lives increafed by unity. If the fociety prefer paying part of the value in a prefent fingle payment on admiffion, and the reft in annual payments; and if they fix thefe annual payments at a particular fum, the prefent fingle payment paid on admiffion is found by fubtracting the value of the annual payment during the joint lives from the whole prefent value of the annuity in one payment. Suppofe, for inftance, the annual payments to be fixed at five guineas, the annuity to be 30 l. the rate of intereft four *per cent.* and the joint lives each 40: the value of the annuity in one prefent fingle payment is 101.1 l. The value of five guineas or 5.25 *per annum*, is (5.25 multiplied by 9.82 the value of the joint lives) 51.55; which, fubtracted from 101.1 l. gives l. 49.5, the anfwer.

If a fociety takes in all the marriages among perfons of a particular profeffion within a given diftrict, and fubjects them for perpetuity to a certain equal and common tax or annual payments, in order to provide life annuities for all the widows that fhall refult from thefe marriages; fince, at the commencement of fuch an eftablifhment, all the oldeft, as well as the youngeft, marriages are to be intitled equally to the propofed benefit, a much greater number of annuitants will come immediately upon it than would come upon any fimilar eftablifhment which limited itfelf in the admiffion of members to perfons not exceeding a given age. This will check that accumulation of money which fhould take place at firft, in order to produce an income equal to the difburfements at the time when the number of annuitants comes to a *maximum*; and therefore will be a particular burden upon the eftablifhment in its infancy. For this fome compenfation muft be provided; and the equitable method of providing it is, by levying fines at the beginning of the eftablifhment on every member exceeding a given age, proportioned to the number of years which he has lived beyond that age. But if fuch fines cannot be levied, and if every payment muft be equal and common, whatever difparity there may be in the value of the expectations of different members, the fines muft be reduced to one common one, anfwering as nearly as poffible to the difadvantage, and payable by every member at the time when the eftablifhment begins. After this, the eftablifhment will be the fame with one that takes upon it all at the time they marry; and the tax or annual payment of every member adequate to its fupport will be the annual payment during marriage due from perfons who marry at the mean age at which, upon an average, all marriages may be confidered as commencing. The fines to be paid at firft are, for every particular member, the fame with the difference between the value of the expectation to him at his prefent age, and what would have been its value to him had the fcheme begun at the time he married. Or, they are, for the whole body of members, the difference between the value of the common expectation, to perfons at the mean age of all married perfons taken together as they exift in the world, and to perfons at that age which is to be deemed their mean age when they marry.

Suppofe we wifh to know the prefent value of an annuity to be enjoyed by one life, for what may happen to remain of it beyond another life, after a given term; that is, provided both lives continue from the prefent time to the end of a given term of years; the method of calculating is this. Find the value of the annuity for two lives, greater by the given term of years than the given lives; difcount this value for the given term; and then multiply by the probability, that the two given lives fhall both continue the given term; and the product will be the anfwer. Thus, let the two lives be each 30, the term feven years, the annuity l. 10, intereft four *per cent.* The given lives, increafed by feven years, become each 37. The value of two joint lives, each 37, is 10.25. The value of a fingle life at 37 is 13.67. The former fubtracted from the latter is 3.42, or the value of an annuity for the life of a perfon 37 years of age, after another of the fame age, as has been fhown above. 3.42 difcounted for feven years (that is, multiplied by 0.76 the value of 1 l. due at the end of feven years) is 2.6. The probability that a fingle life at 30 fhall continue feven years is $\frac{49}{56}$ (A). The probability, therefore, that two fuch lives fhall continue feven years, is $\frac{2401}{3136}$, or in decimals 0.765; and 2.6 multiplied by 0.765 is 1.989, the number of years' purchafe which ought to be given for an annuity to be enjoyed by a life now 30 years of age, after a life of the fame age, provided both continue feven years. The annuity then being 10l. its prefent value is l.19.89.

Suppofe the value is required of an annuity to be enjoyed for what may happen to remain of one life after another, provided the life in expectation continues a given time. 1. Find the prefent value of the annuity for the remainder of the life in expectation after the given time, which is done in this manner: Multiply the prefent value of the life at the given time by the prefent value of 1l. to be received at that time, and multiply the product again by the probability that the life in expectation will continue fo long. Let the given time which the life in expectation is to continue be 15 years, and let the perfon then be arrived at 50 years of age. A life at fifty, according to M. de Moivre's valuation of lives, and reckoning intereft at four *per cent.* is worth 11.34 years' purchafe. The prefent value of 1 l. to be received at the end of 15 years, is 0.5553, and the probability that a life at 35 will continue 15 years is $\frac{146}{490}$. Thefe three values multiplied into one another give l.4.44 for the prefent value of the life in expectation. 2. Find the value of the reverfion, provided both lives con-

(A) The probability that a given life fhall continue any number of years, or reach a given age, is (as is well known) the fraction, whofe numerator is the number of the living in any table of obfervations oppofite to the given age, and denominator, the number oppofite to the prefent age of the given life.

tinue the given time, by the rule given in parag. 5th. 3. Add theſe values together, and the ſum will be the anſwer in a ſingle preſent payment. We ſhall now illuſtrate this rule by an example.

An annuity of 10l. for the life of a perſon now 30, is to commence at the end of 11 years, if another perſon now 40 ſhould be then dead; or, if this ſhould not happen at the end of any year beyond 11 years in which the former ſhall happen to ſurvive the latter: What is the preſent value of ſuch an annuity, reckoning intereſt at four *per cent.* and taking the probabilities of life as they are in Dr. Halley's table.

The value of 10l. *per annum,* for the remainder of the life of a perſon now 30, after 11 years is l.69.43. The probability that a perſon 40 years of age ſhall live 11 years, is, by Dr. Halley's table, $\frac{335}{445}$. The probability, therefore, that he will die in 11 years, is $\frac{335}{445}$ ſubtracted from unity (B), or $\frac{110}{445}$; which multiplied by l. 69.43, gives l. 17.16.—The value of the reverſion, provided both live 11 years, is 17l. and this value added to the former, makes l. 34.16. the value required in a ſingle preſent payment; which payment divided by l. 11.43, the value of two joint lives, aged 30 and 40, with unity added, gives 3l.; or the value required in annual payments during the joint lives, the firſt payment to be made immediately.

TABLE I. *Showing the Preſent Values of an Annuity of £.1 on a Single Life, according to M. de Moivre's Hypotheſis.*

Age	3 per Ct.	3½ per Ct.	4 per Ct.	4½ per Ct.	5 per Ct.	6 per Ct.
8	19,736	18,160	16,791	15,595	14,544	12,790
9	19,868	18,269	16,882	15,672	14,607	12,839
10	19,868	18,269	16,882	15,672	14,607	12,839
11	19,736	18,160	16,791	15,595	14,544	12,790
12	19,604	18,049	16,698	15,517	14,480	12,741
13	19,469	17,937	16,604	15,437	14,412	12,691
14	19,331	17,823	16,508	15,356	14,342	12,639
15	19,192	17,707	16,410	15,273	14,271	12,586
16	19,050	17,588	16,311	15,189	14,197	12,532
17	18,905	17,467	16,209	15,102	14,123	12,476
18	18,759	17,344	16,105	15,015	14,047	12,419
19	18,610	17,220	15,999	14,923	13,970	12,361
20	18,458	17,093	15,891	14,831	13,891	12,301
21	18,305	16,963	15,781	14,737	13,810	12,239
22	18,148	16,830	15,669	14,641	13,727	12,177
23	17,990	16,696	15,554	14,543	13,642	12,112
24	17,827	16,559	15,437	14,442	13,555	12,045
25	17,664	16,419	15,318	14,340	13,466	11,978
26	17,497	16,277	15,197	14,235	13,375	11,908
27	17,327	16,133	15,073	14,128	13,282	11,837
28	17,154	15,985	14,946	14,018	13,186	11,763
29	16,979	15,835	14,816	13,905	13,088	11,688
30	16,800	15,682	14,684	13,791	12,988	11,610
31	16,620	15,526	14,549	13,673	12,855	11,530
32	16,436	15,367	14,411	13,553	12,780	11,449
33	16,248	15,204	14,270	13,430	12,673	11,365
34	16,057	15,039	14,126	13,304	12,562	11,278
35	15,864	14,871	13,979	13,175	12,449	11,189
36	15,666	14,699	13,829	13,044	12,333	11,098
37	15,465	14,524	13,676	12,909	12,214	11,003
38	15,260	14,345	13,519	12,771	12,091	10,907
39	15,053	14,163	13,359	12,630	11,966	10,807
40	14,842	13,978	13,196	12,485	11,837	10,704
41	14,626	13,789	13,028	12,337	11,705	10,599
42	14,407	13,596	12,858	12,185	11,570	10,490
43	14,185	13,399	12,683	12,029	11,431	10,378
44	13,958	13,199	12,504	11,870	11,288	10,263
45	13,728	12,993	12,322	11,707	11,142	10,144
46	13,493	12,784	12,135	11,540	10,992	10,021
47	13,254	12,571	11,944	11,368	10,837	9,895
48	13,012	12,354	11,748	11,192	10,679	9,765
49	12,764	12,131	11,548	11,012	10,515	9,630
50	12,511	11,904	11,344	10,827	10,348	9,492
51	12,255	11,673	11,135	10,638	10,176	9,349
52	11,994	11,437	10,921	10,443	9,999	9,201
53	11,729	11,195	10,702	10,243	9,817	9,049
54	11,457	10,950	10,478	10,039	9,630	8,891
55	11,183	10,698	10,248	9,829	9,437	8,729
56	10,902	10,443	10,014	9,614	9,239	8,561
57	10,616	10,181	9,773	9,393	9,036	8,387
58	10,325	9,913	9,527	9,166	8,826	8,208
59	10,029	9,640	9,275	8,933	8,611	8,023
60	9,727	9,361	9,017	8,694	8,389	7,831
61	9,419	9,076	8,753	8,449	8,161	7,633
62	9,107	8,786	8,482	8,197	7,926	7,428
63	8,787	8,488	8,205	7,938	7,684	7,216
64	8,462	8,185	7,921	7,672	7,435	6,997
65	8,132	7,875	7,631	7,399	7,179	6,770
66	7,794	7,558	7,333	7,119	6,915	6,535
67	7,450	7,234	7,027	6,831	6,643	6,292
68	7,099	6,902	6,714	6,534	6,362	6,040
69	6,743	6,565	6,394	6,230	6,073	5,779
70	6,378	6,219	6,065	5,918	5,775	5,508
71	6,008	5,865	5,728	5,596	5,468	5,228
72	5,631	5,505	5,383	5,265	5,152	4,937
73	5,246	5,136	5,029	4,926	4,826	4,636
74	4,854	4,759	4,666	4,576	4,489	4,324
75	4,453	4,373	4,293	4,217	4,143	4,000
76	4,046	3,978	3,912	3,847	3,784	3,664
77	3,632	3,575	3,520	3,467	3,415	3,315
78	3,207	3,163	3,111	3,076	3,034	2,953
79	2,776	2,741	2,707	2,673	2,641	2,578
80	2,334	2,309	2,284	2,259	2,235	2,188
81	1,886	1,867	1,850	1,832	1,816	1,783
82	1,429	1,411	1,406	1,394	1,384	1,362
83	0,961	0,955	0,950	0,943	0,937	0,925
84	0,484	0,483	0,481	0,479	0,476	0,472
85	0,000	0,000	0.000	0.000	0,000	0,000

(B) For the difference between unity and the fraction expreſſing the probability that an event will happen, gives the probability that it will not happen.

TABLE II. *Showing the Value of an Annuity on the Joint Continuance of Two Lives, according to M. de Moivre's Hypothesis.*

Age of Youngest.	Age of Eldest.	Value at 3 per Ct.	Value at 4 per Ct.	Value at 5 per Ct.
	10	15,206	13,342	11,855
	15	14,878	13,093	11,661
	20	14,503	12,808	11,430
	25	14,074	12,480	11,182
10	30	13,585	12,102	10,884
	35	13,025	11,665	10,537
	40	12,381	11,156	10,128
	45	11,644	10,564	9,646
	50	10,796	9,871	9,074
	55	9,822	9,059	8,391
	60	8,704	8,105	7,572
	65	7,417	6,980	6,585
	70	5,936	5,652	5,391
	15	14,574	12,860	11,478
	20	14,225	12,593	11,266
	25	13,822	12,281	11,022
	30	13,359	11,921	10,736
	35	12,824	11,501	10,402
15	40	12,207	11,013	10,008
	45	11,496	10,440	9,541
	50	10,675	9,767	8,985
	55	9,727	8,975	8,318
	60	8,632	8,041	7,515
	65	7,377	6,934	6,544
	70	5,932	5,623	5,364
	20	13,904	12,341	11,067
20	25	13,531	12,051	10,840
	30	13,098	11,711	10,565
	35	12,594	11,314	10,278
	40	12,008	10,847	9,870
20	45	11,325	10,297	9,420
	50	10,536	9,648	8,880
	55	9,617	8,879	8,233
	60	8,549	7,967	7,448
	65	7,308	6,882	6,495
	70	5,868	5,590	5,333
	25	13,192	11,786	10,621
	30	12,794	11,468	10,367
	35	12,333	11,093	10,067
	40	11,770	10,655	9,708
25	45	11,130	10,131	9,278
	50	10,374	9,509	8,761
	55	9,488	8,766	8,134
	60	8,452	7,880	7,371
	65	7,241	6,826	6,440
	70	5,826	5,551	5,294
	30	12,434	11,182	10,133
	35	12,010	10,838	9,854
	40	11,502	10,428	9,514
	45	10,898	9,936	9,112
30	50	10,183	9,345	8,620
	55	9,338	8,634	8,018
	60	8,338	7,779	7,280
	65	7,161	6,748	6,373
	70	5,777	5,505	5,254
	35	11,632	10,530	9,600
	40	11,175	10,157	9,291
35	45	10,622	9,702	8,913
	50	9,955	9,149	8,450
	55	9,156	8,476	7,879
	60	8,202	7,658	7,172
	65	7,066	6,662	6,294
	70	5,718	5,450	5,203
	40	10,777	9,826	9,014
	45	10,283	9,418	8,671
40	50	9,677	8,911	8,244
	55	8,936	8,283	7,710
	60	8,038	7,570	7,039
	65	6,951	6,556	6,198
	70	5,646	5,383	5,141
	45	9,863	9,063	8,370
	50	9,331	8,619	7,987
45	55	8,662	8,044	7,500
	60	7,831	7,332	6,875
	65	6,807	6,435	6,080
	70	5,556	5,300	5,063
	50	8,892	8,235	7,660
	55	8,312	7,738	7,230
50	60	7,568	7,091	6,664
	65	6,623	6,258	5,926
	70	5,442	5,193	4,964
	55	7,849	7,332	6,873
55	60	7,220	6,781	6,386
	65	6,379	6,036	5,724
	70	5,201	5,053	4,833
	60	6,737	6,351	6,001
60	65	6,043	5,730	5,444
	70	5,081	4,858	4,653
65	65	5,547	5,277	5,031
	70	4,773	4,571	4,385
70	70	4,270	4,104	3,952

TABLE III. *Showing the Values of Annuities on Single Lives, among Males and Females, according to the Probabilities of the Duration of Life in the Kingdom of Sweden.*

	MALES.		FEMALES.		Lives in general.	
Ages.	4 per Ct.	5 per Ct.	4 per Ct.	5 per Ct	4 per Ct	5 per Ct.
1	16,503	14,051	16,820	14,271	16,661	14,161
2	17,355	14,778	17,719	15,034	17,537	14,906
3	17,935	15,279	18,344	15,571	18,139	15,425
4	18,328	15,624	18,780	15,951	18,554	15,787
5	18,503	15,786	18,927	16,088	18,715	15,937
6	18,622	15,901	19,045	16,203	18,833	16,052
7	18,693	15,977	19,131	16,291	18,912	16,134
8	18,725	16,021	19,162	16,335	18,943	16,178
9	18,715	16,030	19,151	16,343	18,933	16,186
10	18,674	16,014	19,109	16,325	18,891	16,169
11	18,600	15,970	19,041	16,286	18,820	16,128
12	18,491	15,896	18,952	16,229	18,721	16,062
13	18,378	15,819	18,840	16,153	18,609	15,986
14	18,246	15,724	18,707	16,059	18,476	15,891
15	18,105	15,624	18,568	15,960	18,336	15,792
16	17,958	15,517	18,424	15,856	18,191	15,686
17	17,803	15,404	18,290	15,761	18,046	15,582
18	17,643	15,285	18,151	15,662	17,897	15,473
19	17,492	15,175	18,013	15,563	17,752	15,369
20	17,335	15,059	17,872	15,462	17,603	15,260
21	17,192	14,955	17,725	15,356	17,458	15,155

	Males.		Females.		Lives in general.	
Ages.	4 per Ct.	5 per Ct.	4 per Ct.	5 per Ct.	4 per Ct.	5 per Ct.
22	17,042	14,846	17,573	15,245	17,307	15,045
23	16,887	14,732	17,414	15,129	17,150	14,930
24	16,742	14,627	17,252	15,009	16,997	14,818
25	16,592	14,517	17,087	14,886	16,839	14,701
26	16,436	14,402	16,915	14,757	16,675	14,579
27	16,274	14,282	16,751	14,636	16,512	14,459
28	16,105	14,156	16,588	14,515	16,346	14,335
29	15,930	14,024	16,427	14,396	16,178	14,210
30	15,751	13,889	16,261	14,272	16,006	14,080
31	15,575	13,756	16,104	14,156	15,839	13,956
32	15,395	13,619	15,941	14,035	15,668	13,827
33	15,208	13,477	15,787	13,923	15,497	13,700
34	15,014	13,327	15,629	13,806	15,321	13,566
35	14,812	13,170	15,465	13,684	15,138	13,427
36	14,601	13,006	15,278	13,542	14,939	13,274
37	14,382	12,833	15,070	13,382	14,726	13,107
38	14,154	12,652	14,854	13,213	14,504	12,932
39	13,916	12,462	14,629	13,036	14,272	12,749
40	13,668	12,261	14,401	12,856	14,034	12,558
41	13,426	12,065	14,185	12,687	13,805	12,376
42	13,196	11,880	13,994	12,538	13,595	12,209
43	12,984	11,710	13,798	12,387	13,391	12,048
44	12,763	11,532	13,596	12,229	13,179	11,880
45	12,535	11,347	13,383	12,06	12,959	11,704
46	12,297	11,153	13,151	11,876	12,724	11,514
47	12,051	10,951	12,894	11,668	12,472	11,309
48	11,795	10,738	12,620	11,443	12,217	11,090
49	11,528	10,516	12,333	11,205	11,930	10,860
50	11,267	10,298	12,049	10,970	11,658	10,634
51	11,030	10,100	11,769	10,737	11,399	10,418
52	10,785	9,895	11,492	10,507	11,138	10,201
53	10,531	9,682	11,220	10,280	10,875	9,981
54	10,269	9,460	10,937	10,042	10,603	9,751
55	9,998	9,229	10,642	9,792	10,320	9,510
56	9,717	8,988	10,334	9,529	10,025	9,258
57	9,425	8,736	10,012	9,253	9,718	8,994
58	9,140	8,489	9,692	8,976	9,416	8,732
59	8,845	8,232	9,358	8,687	9,101	8,458
60	8,540	7,963	9,039	8,406	8,789	8,184
61	8,241	7,700	8,739	8,144	8,490	7,922
62	7,950	7,442	8,453	7,895	8,201	7,668
63	7,669	7,193	8,166	7,643	7,917	7,418
64	7,382	6,938	7,870	7,382	7,626	7,160
65	7,090	6,676	7,566	7,111	7,328	6,893
66	6,792	6,408	7,252	6,831	7,022	6,619
67	6,489	6,134	6,930	6,541	6,709	6,337
68	6,201	5,872	6,596	6,239	6,398	6,055
69	5,933	5,628	6,253	5,926	6,093	5,777
70	5,670	5,389	5,897	5,599	5,783	5,494
71	5,418	5,158	5,564	5,293	5,491	5,225
72	5,180	4,940	5,261	5,013	5,220	4,976
73	4,940	4,719	4,998	4,770	4,969	4,744
74	4,724	4,521	4,792	4,581	4,758	4,551
75	4,487	4,302	4,582	4,388	4,534	4,345
76	4,253	4,084	4,367	4,189	4,310	4,136
77	4,024	3,871	4,145	3,983	4,084	3,927
78	3,768	3,631	3,913	3,767	3,840	3,699
79	3,512	3,390	3,668	3,536	3,590	3,463
80	3,260	3,152	3,402	3,285	3,331	3,218
81	3,017	2,921	3,145	3,041	3,081	2,981
82	2,792	2,706	2,905	2,812	2,848	2,759
83	2,600	2,523	2,699	2,615	2,649	2,569
84	2,473	2,403	2,559	2,480	2,516	2,441
85	2,371	2,306	2,552	2,476	2,461	2,391
86	2,281	2,222	2,518	2,416	2,399	2,334
87	2,154	2,103	2,431	2,365	2,292	2,338
88	1,955	1,912	2,294	2,236	2,124	2,074
89	1,698	1,664	2,108	2,059	1,903	1,861
90	1,417	1,392	1,873	1,833	1,645	1,612
91	1,154	1,136	1,628	1,596	1,391	1,366
92	0,835	0,824	1,349	1,325	1,092	1,074
93	0,477	0,471	1,071	1,054	0,774	0,762
94	0,240	0,238	0,799	0,788	0,519	0,513
95	0,000	0,000	0,544	0,537		
96	0,000	0,000	0,320	0,317		

Table IV. *Showing the Values of Annuities on Two Joint Lives, according to the Probabilities of the Duration of Human Life among Males and Females collectively, reckoning Interest at* 4 per cent.

Interest 4 *per cent.*

Difference of 0, 6, 12, and 18 years.

Ages	Values.	Ages.	Values.	Ages.	Values.	Ages.	Values
1- 1	12,252	1- 7	13,989	1-13	13,894	1-19	13,389
2- 2	13,583	2- 8	14,780	2-14	14,557	2-20	14,008
3- 3	14,558	3- 9	15,323	3-15	14,988	3-21	14,417
4- 4	15,267	4-10	15,685	4-16	15,259	4-22	14,671
5- 5	15,577	5-11	15,817	5-17	15,326	5-23	14,725
6- 6	15,820	6-12	15,887	6-18	15,354	6-24	14,740
7- 7	16,003	7-13	15,914	7-19	15,351	7-25	14,727
8- 8	16,109	8-14	15,888	8-20	15,310	8-26	14,673
9- 9	16,152	9-15	15,824	9-21	15,244	9-27	14,590
10-10	16,141	10-16	15,729	10-22	15,149	10-28	14,484
11-11	16,087	11-17	15,617	11-23	15,033	11-29	14,357
12-12	15,982	12-18	15,477	12-24	14,889	12-30	14,202
13-13	15,855	13-19	15,327	13-25	14,736	13-31	14,045
14-14	15,701	14-20	15,164	14-26	14,566	14-32	13,874
15-15	15,535	15-21	15,001	15-27	14,392	15-33	13,700
16-16	15,361	16-22	14,832	16-28	14,216	16-34	13,520
17-17	15,196	17-23	14,665	17-29	14,042	17-35	13,340
18-18	15,023	18-24	14,491	18-30	13,860	18-36	13,141
19-19	14,854	19-25	14,320	19-31	13,687	19-37	12,934
20-20	14,682	20-26	14,144	20-32	13,512	20-38	12,720
21-21	14,525	21-27	13,976	21-33	13,345	21-39	12,505
22-22	14,360	22-28	13,807	22-34	13,173	22-40	12,286
23-23	14,194	23-29	13,635	23-35	12,997	23-41	12,073
24-24	14,020	24-30	13,455	24-36	12,801	24-42	11,873
25-25	13,849	25-31	13,284	25-37	12,599	25-43	11,683
26-26	13,671	26-32	13,108	26-38	12,387	26-44	11,485
27-27	13,495	27-33	12,935	27-39	12,170	27-45	11,284
28-28	13,323	28-34	12,763	28-40	11,953	28-46	11,072
29-29	13,148	29-35	12,586	29-41	11,742	29-47	10,847
30-30	12,963	30-36	12,390	30-42	11,543	30-48	10,606
31-31	12,795	31-37	12,192	31-43	11,359	31-49	10,365
32-32	12,624	32-38	11,988	32-44	11,170	32-50	10,128
33-33	12,456	33-39	11,779	33-45	10,978	33-51	9,905
34-34	12,286	34-40	11,568	34-46	10,775	34-52	9,679
35-35	12,109	35-41	11,361	35-47	10,557	35-53	9,452
36-36	11,904	36-42	11,156	36-48	10,314	36-54	9,207
37-37	11,683	37-43	10,953	37-49	10,059	37-55	8,951
38-38	11,452	38-44	10,741	38-50	9,805	38-56	8,683
39-39	11,209	39-45	10,519	39-51	9,558	39-57	8,404
40-40	10,964	40-46	10,286	40-52	9,308	40-58	8,124
41-41	10,732	41-47	10,049	41-53	9,066	41-59	7,839
42-42	10,531	42-48	9,813	42-54	8,830	42-60	7,569
43-43	10,346	43-49	9.581	43-55	8,597	43-61	7,318

Intereſt 4 *per cent.*

Ages.	Values.	Ages.	Values.	Ages.	Values.	Ages.	Values.
44-44	10,154	44-50	9,351	44-56	8,354	44-62	7,075
45-45	9,954	45-51	9,129	45-57	8,101	45-63	6,836
46-46	9,736	46-52	8,897	46-58	7,841	46-64	6,586
47-47	9,497	47-53	8,658	47-59	7,563	47-65	6,323
48-48	9,236	48-54	8,402	48-60	7,281	48-66	6,048
49-49	8,966	49-55	8,139	49-61	7,008	49-67	5,764
50-50	8,707	50-56	7,874	50-62	6,749	50-68	5,487
51-51	8,469	51-57	7,613	51-63	6,505	51-69	5,221
52-52	8,230	52-58	7,351	52-64	6,256	52-70	4,953
53-53	7,994	53-59	7,083	53-65	6,004	53-71	4,694
54-54	7,748	54-60	6,814	54-66	5,743	54-72	4,455
55-55	7,495	55-61	6,555	55-67	5,474	55-73	4,231
56-56	7,229	56-62	6,299	56-68	5,204	56-74	4,043
57-57	6,924	57-63	6,045	57-69	4,936	57-75	3,844
58-58	6,678	58-64	5,788	58-70	4,664	58-76	3,637
59-59	6,388	59-65	5,519	59-71	4,395	59-77	3,430
60-60	6,104	60-66	5,249	60-72	4,149	60-78	3,210
61-61	5,844	61-67	4,984	61-73	3,927	61-79	2,974
62-62	5,600	62-68	4,729	62-74	3,747	62-80	2,744
63-63	5,367	63-69	4,482	63-75	3,563	63-81	2,557
64-64	5,128	64-70	4,231	64-76	3,370	64-82	2,396
65-65	4,881	65-71	3,982	65-77	3,180	65-83	2,252
66-66	4,626	66-72	3,750	66-78	2,974	66-84	2,123
67-67	4,362	67-73	3,527	67-79	2,743	67-85	2,010
68-68	4,103	68-74	3,340	68-80	2,514	68-86	1,910
69-69	3,851	69-75	3,147	69-81	2,324	69-87	1,798
70-70	3,593	70-76	2,946	70-82	2,155	70-88	1,661
71-71	3,345	71-77	2,752	71-83	2,004	71-89	1,464
72-72	3,128	72-78	2,558	72-84	1,875	72-90	1,189
73-73	2,935	73-79	2,355	73-85	1,768	73-91	0,937
74-74	2,797	74-80	2,172	74-86	1,692	74-92	0,708
75-75	2,648	75-81	2,017	75-87	1,605	75-93	0,575
76-76	2,490	76-82	1,877	76-88	1,497	76-94	0,481
77-77	2,340	77-83	1,756	77-89	1,339	77-95	0,421
78-78	2,170	78-84	1,639	78-90	1,097		
79-79	1,967	79-85	1,524	79-91	0,863		
80-80	1,758	80-86	1,416	80-92	0,638		
81-81	1,600	81-87	1,320	81-93	0,511		
82-82	1,472	82-88	1,225	82-94	0,427		
83-83	1,364	83-89	1,094	83-95	0,379		
84-84	1,276	84-90	0,902				
85-85	1,212	85-91	0,725				
86-86	1,172	86-92	0,556				
87-87	1,127	87-93	0,459				
88-88	1,071	88-94	0,396				
89-89	0,949	89-95	0,364				
90-90	0,718						
91-91	0,516						
92-92	0,326						
93-93	0,236						
94-94	0,190						
95-95	0,024						

TABLE V. *Showing the Values of two Joint Lives, according to the Probabilities of the Duration of Human Life among Males and Females collectively.*

Intereſt 4 *per cent.*

Difference of age 24, 30, 36, and 42 years.

Ages.	Values.	Ages.	Values.	Ages.	Values.	Ages.	Values.
1-25	12,832	1-31	12,196	1-37	11,465	1-43	10,546
2-26	13,409	2-32	12,730	2-38	11,913	2-44	10,946
3-27	13,778	3-33	13,066	3-39	12,164	3-45	11,168
4-28	14,003	4-34	13,264	4-40	12,284	4-46	11,260
5-29	14,037	5-35	13,277	5-41	12,242	5-47	11,183
6-30	14,033	6-36	13,242	6-42	12,185	6-48	11,064

Intereſt 4 *per cent.*

Ages.	Values.	Ages.	Values.	Ages.	Values.	Ages.	Values.
7-31	14,006	7-37	13,170	7-43	12,112	7-49	10,915
8-32	13,944	8-38	13,059	8-44	12,004	8-50	10,743
9-33	13,855	9-39	12,913	9-45	11,865	9-51	10,560
10-34	13,741	10-40	12,743	10-46	11,694	10-52	10,357
11-35	13,604	11-41	12,563	11-47	11,493	11-53	10,140
12-36	13,428	12-42	12,379	12-48	11,259	12-54	9,898
13-37	13,234	13-43	12,196	13-49	11,011	13-55	9,644
14-38	13,023	14-44	11,997	14-50	10,759	14-56	9,371
15-39	12,798	15-45	11,787	15-51	10,514	15-57	9,087
16-40	12,570	16-46	11,562	16-52	10,264	16-58	8,799
17-41	12,351	17-47	11,328	17-53	10,018	17-59	8,503
18-42	12,146	18-48	11,076	18-54	9,761	18-60	8,208
19-43	11,951	19-49	10,819	19-55	9,500	19-61	7,928
20-44	11,751	20-50	10,567	20-56	9,228	20-62	7,658
21-45	11,550	21-51	10,332	21-57	8,953	21-63	7,396
22-46	11,335	22-52	10,092	22-58	8,675	22-64	7,127
23-47	11,107	23-53	9,852	23-59	8,385	23-65	6,851
24-48	10,862	24-54	9,602	24-60	8,097	24-66	6,566
25-49	10,612	25-55	9,347	25-61	7,823	25-67	6,275
26-50	10,364	26-56	9,080	26-62	7,557	26-68	5,986
27-51	10,130	27-57	8,807	27-63	7,297	27-69	5,702
28-52	9,894	28-58	8,534	28-64	7,032	28-70	5,415
29-53	9,659	29-59	8,250	29-65	6,761	29-71	5,136
30-54	9,413	30-60	7,967	30-66	6,481	30-72	4,881
31-55	9,167	31-61	7,702	31-67	6,197	31-73	4,646
32-56	8,912	32-62	7,446	32-68	5,917	32-74	4,453
33-57	8,651	33-63	7,196	33-69	5,642	33-75	4,251
34-58	8,389	34-64	6,942	34-70	5,364	34-76	4,040
35-59	8,114	35-65	6,679	35-71	5,093	35-77	3,833
36-60	7,833	36-66	6,402	36-72	4,840	36-78	3,605
37-61	7,561	37-67	6,115	37-73	4,603	37-79	3,352
38-62	7,296	38-68	5,828	38-74	4,405	38-80	3,098
39-63	7,033	39-69	5,543	39-75	4,195	39-81	2,889
40-64	6,763	40-70	5,254	40-76	3,975	40-82	2,710
41-65	6,492	41-71	4,977	41-77	3,762	41-83	2,553
42-66	6,225	42-72	4,730	42-78	3,539	42-84	2,418
43-67	5,957	43-73	4,507	43-79	3,295	43-85	2,305
44-68	5,689	44-74	4,322	44-80	3,052	44-86	2,203
45-69	5,426	45-75	4,128	45-81	2,854	45-87	2,083
46-70	5,153	46-76	3,921	46-82	2,684	46-88	1,933
47-71	4,884	47-77	3,715	47-83	2,533	47-89	1,708
48-72	4,633	48-78	3,489	48-84	2,369	48-90	1,385
49-73	4,398	49-79	3,238	49-85	2,277	49-91	1,090
50-74	4,205	50-80	2,990	50-86	2,171	50-92	0,818
51-75	4,008	51-81	2,792	51-87	2,050	51-93	0,662
52-76	3,803	52-82	2,623	52-88	1,901	52-94	0,551
53-77	3,605	53-83	2,475	53-89	1,681	53-95	0,468
54-78	3,389	54-84	2,344	54-90	1,366		
55-79	3,150	55-85	2,232	55-91	1,078		
56-80	2,909	56-86	2,130	56-92	0,810		
57-81	2,710	57-87	2,010	57-93	0,655		
58-82	2,539	58-88	1,864	58-94	0,546		
59-83	2,385	59-89	1,644	59-95	0,464		
60-84	2,248	60-90	1,333				
61-85	2,135	61-91	1,050				
62-86	2,037	62-92	0,789				
63-87	1,916	63-93	0,639				
64-88	1,790	64-94	0,533				
65-89	1,585	65-95	0,456				
66-90	1,290						
67-91	1,017						
68-92	0,764						
69-93	0,617						
70-94	0,514						
71-95	0,411						

The values of joint lives in these tables have been computed for only one rate of interest; and of single lives in Table III. for only two rates of interest. The following rules will show, that it would be a needless labour to compute these values (in strict conformity to the observations) for any other rates of interest.

Account of a method of deducing, from the correct values (according to any observations) of any single or joint lives at one rate of interest, the same values at other rates of interest.

PRELIMINARY PROBLEMS.

PROB. I. The expectation given of a single life by any table of observations, to find its value, supposing the decrements of life equal, at any given rate of interest.

Solution. Find the value of an annuity certain for a number of years equal to twice the expectation. Multiply this value by the perpetuity increased by unity, and divide the product by twice the expectation: The quotient subtracted from the perpetuity will be the value required.

Example. The expectation of a male life aged 10, by the Sweden observations, is 43.94. Twice this expectation is 87.88. The value of an annuity certain for 87.88 years is (reckoning interest at 4 *per cent.*) 24.200. The product of 24.200 into 26 (the perpetuity increased by unity) is 629.2, which, divided by 87.88, gives 7.159. And this quotient subtracted from 25 (the perpetuity) gives 17.84 years' purchase, the value of a life aged ten, deduced from the expectation of life at that age, according to the Sweden observations. (See the Tables in Dr. Price on Reversions, vol. ii.)

PROB. II. Having the expectations given of any two lives by any table of observations, to deduce from thence the value of the joint lives at any rate of interest, supposing an equal decrement of life.

Solution. Find the difference between twice the expectation of the youngest life and twice the expectation of the oldest life increased by unity and twice the perpetuity. Multiply this difference by the value of an annuity certain for a time equal to twice the expectation of the oldest life; and by twice the same expectation divide the product, reserving the quotient.

From twice the perpetuity subtract the reserved quotient, and multiply the remainder by the perpetuity increased by unity. This last product divided by twice the expectation of the youngest life, and then subtracted from the perpetuity, will be the required value.

When twice the expectation of the youngest life is greater than twice the expectation of the oldest life increased by unity and twice the perpetuity, the reserved quotient, instead of being subtracted from twice the perpetuity, must be added to it, and the sum, not the difference, multiplied by the perpetuity increased by unity.

Example. Let the joint lives proposed be a female life aged 10, and a male life aged 15; and let the table of observations be the Sweden table for lives in general, and the rate of interest 4 *per cent.* Twice the expectations of the two lives are 90.14 and 83.28.

Twice the expectation of the oldest life, increased by unity and twice the perpetuity, is 134.28, which lessens by 90.14 (twice the expectation of the youngest life), leaves 44.14 for the reserved remainder. This remainder multiplied by 24.045 (the value of an annuity certain for 83.28 years), and the product divided by 83.28 (twice the expectation of the oldest life), gives 12.744, the quotient to be reserved; which subtracted from double the perpetuity, and the remainder (or 37.255) multiplied by the perpetuity increased by unity (or by 26) gives 968.630, which divided by 90.14 (twice the expectation of the youngest life) and the quotient subtracted from the perpetuity, we have 14.254 for the required value.

The value of an annuity certain, when the number of years is a whole number with a fraction added (as will be commonly the case) may be best computed in the following manner. In this example the number of years is 83.28. The value of an annuity certain for 83 years is 24.035. The same value for 84 years is 24.072. The difference between these two values is 0.37; which difference multiplied by 28 (the fractional part of the number of years), and the product (.0103) added to the least of the two values, will give 24.045 the value for 83.28 years.

General Rule. Call the correct value (supposed to be computed for any rate of interest) the first value. Call the value deduced (by the preceding problems) from the expectations at the same rate of interest, the second value. Call the value deduced from the expectations for any other rate of interest the third value.

Then the difference between the first and second values added to or subtracted from the third value, just as the first is greater or less than the second, will be the value at the rate of interest for which the third value has been deduced from the expectations. The following examples will make this perfectly plain.

Example I. In the two last tables the correct values are given of two joint lives among mankind at large, without distinguishing between males and females, according to the Sweden observations, reckoning interest at 4 *per cent.* Let it be required to find from these values the values at 3 *per cent.* and let the ages of the joint lives be supposed 10 and 10.

The correct value by Table IV. (reckoning interest at 4 *per cent.*) is 16.141. The expectation of a life aged 10 is 45.07. The value deduced from this expectation at 4 *per cent.* by Prob. II. is 14.539. The value deduced by the same problem from the same expectation at 3 *per cent.* is 16.808. The difference between the first and second values is 1.602, which, added to the third value (the first being greater than the second), makes 18.410, the value required.

Example II. Let the value be required of a single male life aged 10, at 3 *per cent.* interest, from the correct value at 4 *per cent.* according to the Sweden observations.

First, or correct value at 4 *per cent.* (by Table III.) is 18.674. The expectation of a male life aged 10 is 43.94.

The second value (or the value deduced from this expectation by Prob. I.) is 17.838.

The third value (or the value deduced from the same expectation at 3 *per cent.* is 21.277.

The difference between the first and second is .836; which (since the first is greater than the second) must be added to the third; and the sum (that is, 22.113) will be the value required.

The third value at 5 *per cent.* is 15.286; and the difference added to 15.286 makes 16.122 the value of a male life aged 10 at 5 *per cent.* according to the Sweden observations. The exact value at 5 *per cent.* is (by Table III.) 16.014.

Again: The difference between 16.014 (the correct value at 5 *per cent.*), and 15.286 (the value at the same interest deduced from the expectation), is .728; which added (because the first value is greater than the second) to 13.335 (the value deduced at 6 *per cent.* from the expectation) gives 14.063, the value of the same life, reckoning interest at 6 *per cent.*

These deductions, in the case of single lives particularly, are so easy, and give the true values so nearly, that it will be scarcely ever necessary to calculate the exact values (according to any given observations) for more than one rate of interest.

If, for inſtance, the correct values are computed at 4 *per cent.* according to any obſervations, the values at 3, 3½, 4½, 5, 6, 7, or 8 *per cent.* may be deduced from them by the preceding rules as occaſion may require, without much labour or any danger of conſiderable errors. The values thus deduced will ſeldom differ from the true values ſo much as a tenth of a year's purchaſe. They will not generally differ more than a 20th or 30th of a year's purchaſe. In joint lives they will differ leſs than in ſingle lives, and they will come equally near to one another whatever the rates of intereſt are.

The preceding tables furniſh the means of determining the exact differences between the values of annuities, as they are made to depend on the ſurvivorſhip of any male or female lives; which hitherto has been a *deſideratum* of conſiderable conſequence in the doctrine of life annuities. What has made this of conſequence is chiefly the multitude of ſocieties lately eſtabliſhed in this and foreign countries for providing annuities for widows. The general rule for calculating from theſe tables the value of ſuch annuities is the following:

Rule. "Find in Table III. the value of a female life at the age of the wife. From this value ſubtract the value in Table IV. of the joint continuance of two lives at the ages of the huſband and wife. The remainder will be the value in a ſingle preſent payment of an annuity for the life of the wife, ſhould ſhe be left a widow. And this value divided by the value of the joint lives increaſed by unity, will be the value of the ſame annuity in annual payments during the joint lives, and to commence immediately."

Example. Let the age of the wife be 24, and of the huſband 30. The value in Table III. (reckoning intereſt at 4 *per cent.*) of a female life aged 24, is 17.252. The value in Table IV. of two joint lives aged 24 and 30, is 13.455, which ſubtracted from 17.252 leaves 3.797, the value in a ſingle preſent payment of an annuity of 1l. for the life of the wife after the huſband; that is, for the life of the widow. The annuity, therefore, being ſuppoſed 20l. its value in a ſingle payment is 20 multiplied by 3.797, that is, l.75.94. And this laſt value divided by 14.455 (that is, by the value of the joint lives increaſed by unity), gives 5.25, the value in annual payments beginning immediately, and to be continued during the joint lives of an annuity of 20l. to a wife aged twenty-four for her life, after her huſband aged thirty.

SURYA, the orb of the ſun perſonified and adored by a ſect of Hindoos as a god. He ſeems to be the ſame divinity with the Phœbus of Greece and Rome; and the ſect who pay him particular adoration are called *Sauras.* Their poets and painters deſcribe his car as drawn by ſeven green horſes, preceded by Arun, or the *Dawn,* who acts as his charioteer, and followed by thouſands of genii worſhipping him and modulating his praiſes. He has a multitude of names, and among them twelve epithets or titles, which denote his diſtinct powers in each of the twelve months; and he is believed to have deſcended frequently from his car in a human ſhape, and to have left a race on earth, who are equally renowned in the Indian ſtories with the Heliadai of Greece: it is very ſingular, that his two ſons called *Aſwinau* or *Aſwinicumarau,* in the dual, ſhould be conſidered as twin-brothers, and painted like Caſtor and Pollux; but they have each the character of Æſculapius among the gods, and are believed to have been born of a nymph, who, in the form of a mare, was impregnated with ſun-beams.

SUS, the Hog, in zoology, a genus of quadrupeds belonging to the claſs of *mammalia* and order of *belluæ.* There are four cutting teeth in the upper jaw, whoſe points converge; and, for the moſt part, ſix in the lower jaw, which ſtand forwards: there are two tuſks in each jaw, thoſe in the upper jaw being ſhort, while thoſe of the under jaw are long, and extend out of the mouth. The ſnout is prominent, moveable, and has the appearance of having been cut off, or truncated. The feet are armed with divided or cloven hoofs. There are ſix ſpecies; the ſcrofa, æthiopicus, tajaſſu, babyruſſa, porcus, and africanus. The moſt remarkable are,

1. The *ſcrofa,* or common hog, having the body covered with briſtles; two large teeth above and below. In a wild ſtate, of a dark brinded colour, and beneath the briſtles is a ſoft ſhort hair; the ears ſhort, and a little rounded. Tame: the ears long, ſharp pointed, and ſlouching; the colour generally white, ſometimes mixed with other colours. In a tame ſtate it is univerſal; except in the frigid zones, and in Kamtſchatka, where the cold is very ſevere. Since its introduction into America by the Europeans, it abounds to exceſs in the hot and temperate parts. It is found wild in moſt parts of Europe. In the foreſts of South America there are vaſt droves, which derive their origin from the European kind relapſed into a ſtate of nature; and are what Mr. Bancroft, in his Hiſtory of Guiana, deſcribes as a particular ſpecies by the name of *Warree.* They cannot bear exceſſive cold; inhabit wooded countries; and are very ſwift. In America they are uſeful by clearing the country of rattle-ſnakes, which they devour without danger.

Of all quadrupeds, the hog is the moſt rude and brutal. The imperfections of his form ſeem to have an influence on his nature and diſpoſitions. All his habits are groſs; all his appetites are impure; all his ſenſations are confined to a furious luſt, and a brutal gluttony. He devours indiſcriminately every thing that comes in his way, even his own progeny the moment after their birth. This voraciouſneſs ſeems to proceed from the perpetual cravings of his ſtomach, which is of an immoderate ſize; and the groſſneſs of his appetites, it is probable, ariſes from the bluntneſs of his ſenſes of taſte and of feeling. The rudeneſs of the hair, the hardneſs of the ſkin, and the thickneſs of the fat, render theſe animals leſs ſenſible to blows. Mice have been known to lodge upon a hog's back, and to eat his ſkin and fat, without his ſhowing any marks of ſenſibility. The other ſenſes of the hog are very good. It is well known to the hunters that the wild boar hears and ſmells at a great diſtance; for, in order to ſurpriſe him, they are obliged to watch him in ſilence during the night, and to place themſelves oppoſite to the wind, that he may not perceive the ſmell, which never fails to make him turn back.

But the hog, though the moſt impure and filthy of all quadrupeds, is yet uſeful by the very ſordidneſs of its manners; this alone devouring what is the refuſe of all others, and contributing not only to remove what would be a nuiſance to the human race, but alſo converting the moſt nauſeous offals into the richeſt nutriment: for this reaſon its ſtomach is capacious, and its gluttony exceſſive: not that its palate is inſenſible to the difference of eatables; for where it finds variety, it will reject the worſt with as diſtinguiſhed a taſte as other quadrupeds.

The parts of this animal are finely adapted to its way of life. As its method of feeding is by turning up the earth with its noſe for roots of different kinds, ſo nature has given it a more prone form than other animals; a ſtrong brawny neck; eyes ſmall, and placed high in the head; a long ſnout, noſe callous and tough, and a quick ſenſe of ſmelling to trace out its food. Its inteſtines have a ſtrong reſemblance to thoſe of the human ſpecies. The external form of its body is very unwieldy; yet, by the ſtrength of its tendons, the wild boar (which is only a variety of the common kind) is enabled to fly from the hunters with amazing agility: the back-toe on the feet of this animal prevents its ſlipping while it deſcends declivities, and muſt be of ſingular uſe when purſued. Yet, notwithſtanding its powers of motion, it is by nature ſtupid,

inactive, and drowſy; much inclined to increaſe in fat, which is diſpoſed in a different manner from that of other animals, and forms a regular coat over the whole body. It is reſtleſs at a change of weather, and in certain high winds is ſo agitated as to run violently, ſcreaming horribly at the ſame time: it is fond of wallowing in the dirt, either to cool its ſurfeited body, or to deſtroy the lice, ticks, and other inſects with which it is infeſted. Its diſeaſes generally ariſe from foul feeding and intemperance: meaſles, impoſthumes, and ſcrophulous complaints, are reckoned among them. Theſe are beſt prevented by keeping the animals, as the ancients ſtrongly recommended, very clean in their ſties; allowing them air, exerciſe, and a ſufficiency of water. Linnæus obſerves, that its fleſh is wholeſome food for athletic conſtitutions, or thoſe that uſe much exerciſe; but bad for ſuch as lead a ſedentary life: it is, however, of moſt univerſal uſe; and furniſhes numberleſs materials for epicuriſm.

The boar, or male of theſe creatures, is choſen with great care, when intended for the propagation of his ſpecies; and is thus employed from the age of two to five years, and then either ſold or fatted. The males not allotted to this uſe are caſtrated, ſometimes at the age of ſix weeks, and ſometimes when they are ſix months old; and then fed to a great ſize either for ſale or for the uſe of the family. Sows are kept for breed generally from one year old to ſeven, and are then ſpayed and fatted. They have commonly more greaſe on their inteſtines than hogs, theſe being fatteſt on their backs.

As to the age of theſe animals, it is ſaid that the life of the wild boar may be extended to twenty-five or thirty years. Ariſtotle ſays, that hogs in general live twenty years; and adds, that both males and females are fertile till they arrive at the age of fifteen. They can engender at the age of nine or twelve months; but it is better to reſtrain them till they be eighteen months or two years. The firſt litter of the ſow is not numerous; and, when only one year old, her pigs are weak, and even imperfect. She may be ſaid to be in ſeaſon at all times. Though full, ſhe ſolicits the approach of the male. This may be regarded as an exceſs among animals; for almoſt every other ſpecies refuſe the male after conception. The ardour of the ſow, though almoſt perpetual, is however marked by paroxyſms and immoderate movements, which always terminate by her wallowing in the mire. She, at the ſame time, emits a thick whitiſh fluid. She goes four months with young; brings forth in the beginning of the fifth; and ſoon afterwards ſolicits the male, is impregnated a ſecond time, and of courſe brings forth twice a-year. The wild ſow, which every way reſembles the domeſtic kind, produces only once a-year. This difference in fertility is probably owing to want of nouriſhment, and the neceſſity of ſuckling her pigs much longer than the domeſtic ſow, which is never allowed to nurſe her young above fifteen days or three weeks. Only eight or nine of the litter are kept longer; the reſt are ſold. In fifteen days, pigs are excellent food.

As theſe creatures, though exceedingly voracious, will feed almoſt on any thing, they are bred and kept every-where, and are quickly and cheaply fatted. In miry and in marſhy grounds (from which they are not averſe) they devour worms, frogs, fern, ruſh, and ſedge roots. In drier and in woody countries, they feed on hips, haws, ſloes, crabs, maſt, cheſnuts, acorns, &c. and on this food they will grow fleſhy and fat. They are a kind of natural ſcavengers, will thrive on the traſh of an orchard, the outcaſts of the kitchen, the ſweepings of barns and granaries, the offals of a market, and moſt richly on the refuſe of a dairy. If near the ſea, they will ſearch the ſhores for ſhell-fiſh; in the fields, they eat graſs; and in cities and large towns they are kept in great numbers, and ſupported chiefly by grains. It is evident that the facility of feeding them every-where at a ſmall expence, is a national benefit, more eſpecially in a country where the people are much accuſtomed to eat fleſh. It is no leſs obſervable, that notwithſtanding this facility of feeding, and the multitudes of ſwine maintained, they ſeldom fail of coming to a good market. In no part of Europe is the management of theſe creatures better underſtood than in Britain. The time of farrowing is adjuſted to the nature of the farm, the food it can ſupply; and the number of pigs ſold and kept are in like manner adjuſted. New kinds of food, more wholeſome and nutritive than what were uſed formerly, have been introduced, ſuch as turnips, carrots, clover, &c. They are in moſt places regularly managed and cloſely attended. Tuſſer, many years ſince, affirmed from his own experience, that a ſow might bring as much profit as a cow. In ſome counties, it is ſaid, a ſow dependent on a dairy hath produced, all expences deducted, about 10l. in the ſpace of a year.—In Britain, theſe animals in different counties are of very different ſizes. In Leiceſterſhire, Northamptonſhire, and Pembrokeſhire, they are very large. In Hampſhire, Wiltſhire, and wherever they can run in the woods, and feed on maſt and acorns, their fleſh is firmer and better. The Chineſe ſwine are common with us: they are ſmaller, blacker, and their legs ſhorter than ours: ſo that, when fat, their bellies literally touch the ground. They thrive exceedingly well with us, are very prolific, and their fleſh very fine and well taſted.

In conſidering the advantages derived from theſe creatures, it is to be obſerved, that the fleſh of all the different kinds, and at all ages, is looked upon as a very ſubſtantial and agreeable aliment; and of courſe, in their proper ſeaſons, the different ſorts of proviſions thus ſupplied are all of them very ſaleable. The wild boar was eſteemed a prime delicacy amongſt the Romans, and the fleſh of the tame was much more in favour with our anceſtors than with us; though BRAWN has ſtill many admirers, is made in the greateſt perfection, and conſidered as a rarity peculiar to this country. Pork, though it might be wiſely prohibited in ſome warm countries, is found by experience equally nutritive and ſalutary here. As ſuch it furniſhes a very large proportion of that food which is vended in our markets. In takes ſalt better, and keeps longer, than the fleſh of any other animal; and the conſumption of it is prodigious when pickled or ſalted, more eſpecially in our foreign garriſons and in the ſea-ſervice. Our bacon is differently cured, ſo as to render it acceptable to all palates; and our hams are not at all inferior to thoſe of other countries. Freſh pork ſells nearly as dear as beef; the lard brings double or triple the price; the blood, the inteſtines, the feet, and the tongue, are all prepared as food. The fat of the inteſtines and web, which differs from common lard, is employed for greaſing axles of wheels, and for many other purpoſes. Sieves are made of the ſkin; and bruſhes, pencils, &c. of the briſtles. The dung is reputed next in value to that of ſheep. Mr. Worlidge propoſes that ſwine ſhould be turned into a cloſe well-paled, and planted with greens, pulſe, and roots, on which they may feed, and by their trampling and their dung raiſe a great quantity of excellent ſoil. Mr. Mortimer aſſures us that ſome, on poor light ſhallow land in Staffordſhire, ſow a ſmall white pea, which they never reap, but turn in ſo many hogs to eat them as they think they will fat; and there they lie day and night, and their dung will ſo enrich the land, that it will bring a good ſward upon it, and will graze many years afterwards. Our old huſbandmen had an ill opinion of this dung, as ſuppoſing it bred weeds, but it will probably not obtain much credit at preſent. In ſome places they waſh with hogs' dung for want of ſoap; which anſwers tolerably well, if the linen hangs long enough in the air to become thoroughly ſweet.

The wild boar was formerly a native of our country, as appears from the laws of Hoel-dda, who permitted his grand huntſman to chace that animal from the middle of November to the beginning of December. William the Conqueror puniſhed with the loſs of their eyes any that were convicted of killing the wild boar, the ſtag, or the roebuck; and Fitz Stephen tells us, that the vaſt foreſt that in his time grew on the north ſide of London, was the retreat of ſtags, fallow-deer, wild boars, and bulls. Charles I. turned out wild boars in the New Foreſt, Hampſhire; but they were deſtroyed in the civil wars.

On the continent the wild boar is hunted with dogs, or killed by ſurpriſe during the night, when the moon ſhines. As he runs ſlowly, leaves a ſtrong odour behind him, and defends himſelf againſt the dogs, and often wounds them dangerouſly, fine hunting dogs are unneceſſary, and would have their noſe ſpoiled, and acquire a habit of moving ſlowly by hunting him. Maſtiffs, with very little training, are ſufficient. The oldeſt, which are known by the tract of their feet, ſhould only be attacked: A young boar of three years old is difficult to hunt down; becauſe he runs very far without ſtopping. But the older boars do not run far, allow the dogs to run near, and often ſtop to repel them. During the day, he commonly remains in his ſoil, which is in the moſt ſequeſtrated part of the woods. He comes out in the night in queſt of food. In ſummer, when the grain is ripe, it is eaſy to ſurpriſe him among the cultivated fields, which he frequents every night. As ſoon as he is ſlain, the hunters cut off his teſticles, the odour of which is ſo ſtrong, that in a few hours it would infect the whole fleſh. The ſnout of an old boar is the only part that is eſteemed; but every part of the caſtrated and young boar, not exceeding one year fed, makes delicate eating. The pork of the domeſtic boar is ſtill worſe than that of the wild boar; and it can only be rendered fit for eating by caſtration and fattening. The ancients caſtrated the young boars which they could carry off from their mothers, and returned them to the woods, where they grew fat, and their pork was much better than that of domeſtic hogs. There are ſeveral varieties of the common hog.

2. The *æthiopicus*, or Ethiopian hog, with ſmall tuſks in the lower jaw, very large ones in the upper, in old boars bending towards the forehead in form of a ſemicircle: no fore teeth: noſe broad, depreſſed, and almoſt of a horny hardneſs: head very large and broad: beneath each eye a hollow, formed of looſe ſkin, very ſoft and wrinkled; under theſe a great lobe or wattle, lying almoſt horizontal, broad, flat, and rounded at the end, placed ſo as to intercept the view of any thing below from the animal. Between theſe and the mouth on each ſide, there is a hard callous protuberance. The mouth is ſmall: ſkin duſky: briſtles diſpoſed in faſciculi, of about five each; longeſt between the ears and on the beginning of the back, thinly diſperſed on the reſt of the back. Ears large and ſharp pointed, inſide lined with long whitiſh hairs: tail ſlender and flat, not reaching lower than the thighs, and is covered with hairs diſpoſed in faſciculi. Body longer, and legs ſhorter, than in the common ſwine: its whole length four feet nine inches; height before, two feet two inches: but in a wild ſtate, it grows to an enormous ſize.—Theſe animals inhabit the hotteſt parts of Africa, from Senegal to Congo, alſo the iſland of Madagaſcar. We know little of their nature; but they are repreſented as very fierce and ſwift, and that they will not breed with the domeſtic ſow.

3. The *tajaſſu*, pecary, or Mexican hog, with four cutting teeth above, and ſix below: two tuſks in each jaw; thoſe in the upper jaw pointing down, and little apparent when the mouth is ſhut; the others hid: length from noſe to the end of the rump about three feet: head not ſo taper as in common ſwine: ears ſhort and erect: body covered with briſtles, ſtronger than thoſe of the European kind, and more like thoſe of a hedge-hog; they are duſky, ſurrounded with rings of white; thoſe on the top of the neck and back are near five inches long, grow ſhorter on the ſides; the belly almoſt naked; from the ſhoulders to the breaſt is a band of white: no tail: on the lower part of the back is a gland, open at the top, diſcharging a fetid ichorous liquor; this has been by miſtake called a *navel*.—Inhabits the hotteſt parts of South America, and ſome of the Antilles: lives in the foreſts on the mountains: not fond of mire or marſhy places: leſs fat than the common hog. Theſe animals go in great droves. They are very fierce, and will fight ſtoutly with the beaſts of prey: the jaguar, or American leopard, is their mortal enemy; often the body of that animal is found with ſeveral of theſe hogs ſlain in combat. Dogs will ſcarce attack this animal: if wounded, it will turn on the hunters. They feed on fruits and roots; alſo on toads and all manner of ſerpents, which they hold with their fore-feet, and ſkin with great dexterity. The fleſh is reckoned very good food; but all writers agree that the dorſal gland muſt be cut out as ſoon as the animal is killed, or the fleſh will become ſo infected as not to be eatable. The Indian name of this ſpecies is *paquiras*, from whence ſeems to be derived that of *pecary*. There are more varieties of this ſpecies, the *tajaſſu minor* and the *patera*.

4. The *babyruſſa*, or Indian hog, with four cutting teeth in the upper, ſix in the lower jaw; ten grinders to each jaw; in the lower jaw two tuſks pointing towards the eyes, and ſtanding near eight inches out of their ſockets; from two ſockets on the outſide of the upper jaw two other teeth, twelve inches long, bending like horns, their ends almoſt touching the forehead: ears ſmall, erect, ſharp-pointed: along the back are ſome weak briſtles; on the reſt of the body only a ſort of wool, ſuch as is on the lambs: the tail long, ends in a tuft, and is often twiſted: the body plump and ſquare. Inhabits Buero, a ſmall iſle near Amboina: it is alſo found in Celebes, but neither on the continent of Aſia or Africa; what M. de Buffon takes for it is the Ethiopian boar. They are ſometimes kept tame in the Indian iſles: live in herds: have a very quick ſcent: feed on herbs and leaves of trees; never ravage gardens like other ſwine: their fleſh well taſted. When purſued and driven to extremities, they ruſh into the ſea, ſwim very well, and even dive, and paſs thus from iſle to iſle. In the foreſts they often reſt their heads, by hooking their upper tuſks on ſome bough. The tuſks, from their form, are uſeleſs in fight.

SUSA, the ancient royal reſidence of the kings of Perſia, built by Darius Hyſtaſpis, according to Pliny; though he probably only reſtored it, being a very ancient city, founded by Tithonus father of Memnon. It was in compaſs 120 ſtadia, of an oblong quadrangular form, with a citadel called *Memnoneum*. In ſcripture it is called *Suſan*, the royal citadel, from the great number of lilies growing in that diſtrict (Athenæus); ſituate on the river Uhlai, or Eulæus (Daniel): and the Spaniards call at this day a lily *aſuſena* (Pinedo). Suſa was the winter, as Ecbatana was the ſummer, reſidence of the kings of Perſia (Xenophon, Strabo, Plutarch). Here the kings kept their treaſure (Herodotus). Now called *Tuſter*.

SUSSEX, a county of England, bounded on the north by Surry and Kent, on the north-eaſt by Kent, on the ſouth-eaſt and ſouth by the Engliſh Channel, and on the weſt by Hampſhire; about ſeventy-five miles from eaſt to weſt, and twenty in its mean breadth, from north to ſouth. In the time of the Saxon heptarchy, this country was a kingdom. It is divided into ſix parts, called Rapes, and theſe into ſixty-one hundreds,

in which are one city, Chichefter, twenty towns, and 312 parifhes. The foil, towards the north, is generally a clay, with fome fand running through the county from eaft to weft. This is bounded by a ftiff rich loam, and afterwards by chalk, on a range of hills, called the South Downs, which extend from the county of Hants to Eaftbourne in an unbroken chain, at leaft fifty miles, though feldom five miles in breadth. To the north of Chichefter is a narrow ftrip of gravel; and to the fouth, bordering on the fea, fome rich loam. Suffex has long been remarkable for timber, efpecially oak; and the fheep, fed on the South Downs, have been particularly celebrated for the excellency of the mutton. The principal rivers are the Arun, Adur, Oufe, and Rother. The towns are Arundel, Bramber. Eaft Grinftead, *Haftings*, Horfham, Lewes, Midhurft, *Rye*, *Seaford*, Shoreham, Steyning, and *Winchelfea*; all which, with the county and city of Chichefter, return each two members to the Britifh parliament. Thofe in *italics* are Cinque-ports. Other towns are Battel, Brighthelmftone, Cuckfield, Eaftbourne, Haylfham, Newhaven, Petworth, and Tarring.

SUTHERLANDSHIRE, a county of Scotland, bounded on the weft and north by the fea, on the eaft by the county of Caithnefs, and on the fouth-eaft by the Frith of Dornoch, and on the fouth and the fouth-weft by the county of Rofs. It is ufually divided into Strathnavern and Sutherland Proper, the former containing the northern, the latter the fouthern part. In length about fifty miles, from north to fouth, and forty-fix where broadeft, from eaft to weft. It is mountainous, with fertile vallies between, which abound with cattle and game. In the mountains are quarries of marble, free-ftone, flate, and other ftone fit for building, lime-ftone, &c. The coaft contains a great number of bays and lochs which abound in fifh, efpecially falmon, fwans, and other water fowl. Dornoch is the chief town.

SUTLER, in war, one who follows the army, and furnifhes the troops with provifion. Sutlers pitch their tents, or build their huts, in the rear of each regiment, and about head-quarters.

SUTRIUM (anc. geog.), a famous city, and an ancient colony of the Romans, the key of Etruria; founded about feven years after the taking of Rome by the Gauls (Velleius). Now *Sutri* in St. Peter's patrimony, on the river Pozzolo; furrounded on every fide with rocks, twenty-four miles to the north-weft of Rome.

SUTTON (Samuel), was born at Alfretton in Derbyfhire, and going into the army ferved under the Duke of Marlborough in Queen Anne's wars with great credit. He afterwards came to London, commenced brewer, and kept a coffee-houfe in Alderfgate ftreet, which was well frequented by the learned men of that time, by whom Mr. Sutton was much refpected, as a man of ftrong natural parts and uncultivated genius. About the year 1740 he fchemed a very fimple and natural method for extracting the foul air from the wells of fhips, by pipes communicating with the fire-places of the coppers; which operated as long as any fire was kept burning for the fhip's ufe. He took out a patent in 1744, to fecure the profits of his invention; and died about the year 1752.

SUTTON'S *Air-pipes*. See AIR-*Pipes*.

SUTURE, in anatomy, a kind of articulation peculiar to the cranium or fkull. See ANATOMY.

SUTURE, in furgery, a method of uniting the lips of wounds together. See SURGERY.

SWABBER, an inferior officer on board fhips of war, whofe employment it is to fee that the decks are kept clean and neat.

SWABIA. See SUABIA.

SWALLOW, in natural hiftory, is claffed under the genus of HIRUNDO, under which article the different fpecies have been already defcribed. Concerning this bird, one curious queftion, however, ftill remains to be difcuffed, What becomes of it in the winter? Upon this fubject there are three opinions. Some fay that it migrates to a warmer climate; fome, that it retires to hollow trees and caverns, where it lies in a torpid ftate; and others have affirmed that it lies in the fame ftate in the bottom of lakes and under the ice. The firft opinion is fupported by Marfigli, Ray, Willoughby, Catefby, Reamur, Adanfon, Buffon, &c. The firft and fecond opinion are both adopted by Pennant and White. The third is fanctioned by Schæffer, Hevelius, Derham, Klein, Ellis, Linnæus, Kalm; and the fecond and third have been ftrongly defended by the Honourable Daines Barrington.

Though we cannot help giving a preference to that opinion which appears the moft probable, yet we do not think that any one of them is eftablifhed upon fuch evidence as fo curious a fubject requires, and as the advanced ftate of natural hiftory would lead us to expect. We fhall therefore ftate the arguments upon which each opinion is founded as fairly and diftinctly as we can, and as often as poffible in the very words of their refpective advocates. By doing fo, we fhall place the whole fubject before the eyes of our readers, who will thus have an opportunity of examining it attentively, and of making fuch obfervations and experiments as may lead to the truth.

Thofe who affert that the fwallow migrates to a warmer country in winter, argue in this manner: That many birds migrate, is a fact fully proved by the obfervations of natural hiftorians (fee MIGRATION). Is it not more probable, therefore, that fwallows, which difappear regularly every feafon, retire to fome other country, than that they lie in a ftate of torpor in caverns or lakes? But this opinion does not reft on probability, it is founded on facts.

We often fee them collected in great flocks on churches, rocks, and trees, about the time when they annually difappear. The direction of their flight has been obferved to be fouthward. Mr. White, the ingenious hiftorian of Selborne, travelling near the coaft of the Britifh Channel one morning early, faw a flock of fwallows take their departure. At the beginning of his journey he was environed with a thick fog; but on a large wild heath the mift began to break, and difcovered to him numberlefs fwallows, cluftered on the ftanding bufhes, as if they had roofted there: as foon as the fun burft out, they were inftantly on wing, and with an eafy and placid flight proceeded towards the fea. After this he faw no more flocks, only now and then a ftraggler.

Mr. Lafkey of Exeter obferved attentively the direction which a flock of fwallows took in the autumn of 1793. On the 22d of September about feven o'clock in the morning, the wind being eafterly, accompanied with a cold drizzling rain, Mr. Lafkey's houfe was entirely covered with houfe-fwallows. At intervals large flocks arrived and joined the main body, and at their arrival an unufual chirping commenced. The appearance of the whole company was fo lethargic, that he found it an eafy matter to catch a confiderable number of them, which he kept in a room all that day. By heating the room they all revived: he opened four of them, and found their ftomachs quite full. The main body occupied the houfe-top all day, except for two hours. About half an hour after nine on the morning of the 23d, there was a great commotion with very loud chirping, and within a few minutes after, the whole multitude took their flight, in a direct fouth-eaft direction, having afcended to a great height in the atmo-

ſphere. He let go the birds which he had caught, at certain intervals till four o'clock, and they all flew toward the ſame quarter.

Not only has the direction of their flight been obſerved, but they have alſo been found on their paſſage at a great diſtance from land. Mr. Adanſon informs us, that about fifty leagues from the coaſt of Senegal four ſwallows ſettled upon the ſhip on the 6th of October; that theſe birds were taken; and that he knew them to be European ſwallows, which, he conjectures, were returning to the coaſt of Africa. Sir Charles Wager's authority may alſo be appealed to: "Returning home," ſays he, "in the ſpring of the year, as I came into ſoundings in our channel, a great flock of ſwallows came and ſettled on all my rigging; every rope was covered, they hung on one another like a ſwarm of bees; the decks and carving were filled with them. They ſeemed almoſt famiſhed and ſpent, and were only feathers and bones; but being recruited with a night's reſt, took their flight in the morning." This vaſt fatigue proves that their journey muſt have been very great, conſidering the amazing ſwiftneſs of theſe birds: in all probability they had croſſed the Atlantic ocean, and were returning from the ſhores of Senegal, or other parts of Africa; ſo that this account from that moſt able and honeſt ſeaman, confirms the later information of Mr. Adanſon.

Mr. Kalm, who is an advocate for the opinion that ſwallows lie immerſed in lakes during the winter, acknowledges, that in croſſing the Atlantic from Europe a ſwallow lighted on the ſhip on the 2d September, when it had paſſed only two-thirds of the ocean. Since, therefore, ſwallows have been ſeen aſſembled in great flocks in autumn flying off in company towards ſouthern climes, ſince they have been found both in their paſſage from Europe and returning again, can there be any doubt of their annual migration?—For Mr. Barrington's objections to this opinion, ſee Migration.

The ſecond notion (ſays Mr. Pennant) has great antiquity on its ſide. Ariſtotle and Pliny give it as their belief, that ſwallows do not remove very far from their ſummer habitation, but winter in the hollows of rocks, and during that time loſe their feathers. The former part of their opinion has been adopted by ſeveral ingenious men; and of late ſeveral proofs have been brought of ſome ſpecies, at leaſt, having been diſcovered in a torpid ſtate. Mr. Collinſon favoured us with the evidence of three gentlemen, eye-witneſſes to numbers of ſand martins being drawn out of a cliff on the Rhine, in the month of March 1762. And the Honourable Daines Barrington communicated to us the following fact, on the authority of the late Lord Belhaven, That numbers of ſwallows have been found in old dry walls and in ſand hills near his lordſhip's ſeat in Eaſt Lothian; not once only, but from year to year; and that when they were expoſed to the warmth of a fire, they revived. We have alſo heard of the ſame annual diſcoveries near Morpeth in Northumberland, but cannot ſpeak of them with the ſame aſſurance as the two former: neither in the two laſt inſtances are we certain of the particular ſpecies.

"Other witneſſes crowd on us to prove the reſidence of thoſe birds in a torpid ſtate during the ſevere ſeaſon. Firſt, In the chalky cliffs of Suſſex; as was ſeen on the fall of a great fragment ſome years ago. Secondly, In a decayed hollow tree that was cut down, near Dolgelli, in Merionethſhire. Thirdly, In a cliff near Whitby, Yorkſhire; where, on digging out a fox, whole buſhels of ſwallows were found in a torpid condition. And, laſtly, The reverend Mr. Conway of Sychton, Flintſhire, was ſo obliging as to communicate the following fact: a few years ago, on looking down an old lead-mine in that county, he obſerved numbers of ſwallows clinging to the timbers of the ſhaft, ſeemingly aſleep; and on flinging ſome gravel on them, they juſt moved, but never attempted to fly or change their place: this was between All Saints and Chriſtmas.

"Theſe are doubtleſs the lurking places of the later hatches, or of thoſe young birds which are incapable of diſtant migrations. There they continue inſenſible and rigid; but like flies may ſometimes be reanimated by an unſeaſonable hot day in the midſt of winter: for very near Chriſtmas a few appeared on the moulding of a window of Merton college, Oxford, in a remarkably warm nook, which prematurely ſet their blood in motion, having the ſame effect as laying them before a fire at the ſame time of year. Others have been known to make this premature appearance; but as ſoon as the cold natural to the ſeaſon returns, they withdraw again to their former retreats.

"The above are circumſtances we cannot but aſſent to, though ſeemingly contradictory to the common courſe of nature in regard to other birds. We muſt, therefore, divide our belief relating to theſe two ſo different opinions; and conclude, that one part of the ſwallow tribe migrate, and that others have their winter quarters near home. If it ſhould be demanded, why ſwallows alone are found in a torpid ſtate, and not the other many ſpecies of ſoft billed birds, which likewiſe diſappear about the ſame time? reaſons might be aſſigned."

The third opinion, viz. that ſome lie immerſed in water, has been ably ſupported by Mr. Kalm, who has collected a multitude of facts which are ſtrongly in favour of it. "The queſtion," ſays he, "ought for the future to be thus ſtated: the ſwallows in Spain, Italy, France, and perhaps ſome from England, remove to warmer climates; ſome Engliſh ones, and ſome in Germany and other mild countries, retire into clefts and holes in rocks, and remain there in a torpid ſtate. In the cold northern countries the ſwallows immerſe in the ſea, in lakes, and rivers; and remain in a torpid ſtate, under ice, during winter. There are ſtill ſome objections to this latter aſſertion, which we muſt remove. It is ſaid, Why do not rapacious fiſh, and aquatic quadrupeds and birds, devour theſe ſwallows? The anſwer is obvious, ſwallows chooſe only ſuch places in the water for their winter retreat as are near reeds and ruſhes; ſo that ſinking down there between them and their roots, they are by them ſecured againſt the rapacioufneſs of their enemies. But others object, Why are not theſe birds caught in ſuch freſh waters as are continually haraſſed by nets? I believe the ſame anſwer which has been made to the firſt objection will ſerve for this likewiſe. Fiſhermen take care to keep off with their nets from places filled with reeds and ruſhes, for fear of entangling and tearing their net; and thus the ſituation of ſwallows under water, is the reaſon that they are ſeldom diſturbed in their ſilent winter-retreats. What confirms this opinion ſtill more is, that ſwallows were never caught in Pruſſia according to the above-mentioned affidavits, but with thoſe parts of the net which paſſed near to the reeds and ruſhes; and ſometimes the ſwallows were yet faſtened with their feet to a reed, when they were drawn up by the net. As to the argument taking from their being ſo long under water without corruption, I believe there is a real difference between animals ſuffocated in water and animals being torpid therein. We have examples of things being a long time under water; to which we may add the intenſe cold of theſe northern regions, which preſerves them. Who would have thought that ſnails and polypes might be diſſected, and could reproduce the parts ſevered from their bodies, if it was not a fact? Natural hiſtory ought to be ſtudied as a collection of facts, not as the hiſtory of our gueſſes or opinions. Nature

varies in an infinite manner; and Providence has diverſified the inſtinct of animals and their economy, and adapted it to the various ſeaſons and climates."

With Mr. Kalm's concluding obſervations we heartily concur. Natural hiſtory ought to be ſtudied as a collection of facts; and it was from this very notion that we have ſtated the above-mentioned opinions ſo fully, and brought together the facts which the beſt advocates for each opinion have judged moſt proper for ſupporting them. We are ſenſible of the great improbability of the third opinion, and know that many arguments have been uſed to prove its abſurdity; ſuch as theſe, The ſwallow is lighter than water, and therefore cannot ſink; if it moults at all, it muſt moult under water during its torpid ſtate, which is very improbable; there is no inſtance of land animals living ſo long under water without reſpiration. Many other arguments of the ſame ſort have been advanced, and certainly afford a ſhort way of deciding the queſtion; but unleſs they were ſufficient to prove the immerſion of ſwallows a phyſical impoſſibility, they are of no force when oppoſed to the evidence of teſtimony, if there be no cauſe to ſuſpect the witneſſes of inaccuracy or deſign. The true way to refute ſuch an opinion is by accurate obſervation and experiment. We have not heard of any accurate enquiries being made by philoſophers in thoſe northern countries where ſwallows are ſaid to paſs the winter under water. The Count de Buffon, indeed, ſhut up ſome ſwallows in an ice-houſe by way of experiment, which died in a few days; but as he does not tell us what precautions he took to make the experiment ſucceed, it is not entitled to any attention.

Mr. John Hunter made this very judicious experiment on the banks of the Thames. In the month of September, he prepared a room, with every accommodation and convenience which he could contrive, to ſerve as a dormitory for ſwallows, if they were diſpoſed to ſleep in winter. He placed in the centre a large tub of water with twigs and reeds, &c. which reached to the bottom. In the corners of the room he contrived artificial caverns and holes, into which they might retire; and he laid on the floor, or ſuſpended in the air, different lengths of old wooden pipes, which had formerly been employed in conveying water through the ſtreets, &c.

When the receptacle was rendered as complete as poſſible, he then engaged ſome watermen to take by night a large quantity of the ſwallows that hang upon the reeds in the Thames about the time of their departure. They brought him, in a hamper, a conſiderable number; and had ſo nicely hit the time of their capture, that on the very day following there were none to be ſeen.

He put the ſwallows into the room ſo prepared, where they continued to fly about, and occaſionally perch on the twigs, &c. But not one ever retired into the water, the caverns, holes, or wooden pipes, or ſhewed the leaſt diſpoſition to grow torpid, &c. In this ſituation he let them remain till they all died but one. This, appearing to retain ſome vigour, was ſet at liberty; when it mounted out of ſight, and flew away. All the birds lay dead ſcattered about the room; but not one was found aſleep or torpid, or had, if the correſpondent remembers, ſo much as crept into any of the receptacles he had ſo provided.

This experiment was ingenious, and certainly does render the doctrine of immerſion much more improbable; but it is not deciſive; for it may ſtill be urged by the advocates for that doctrine, as Mr. Kalm has done, that it may only be in the colder countries where ſwallows retire into the water. We formerly ſaid that none of the three opinions are ſupported by ſuch evidence as to ſatisfy the mind completely. Opinions which reſpect events which happen every year ought to be confirmed by a great number of obſervations, and not by a few inſtances diveſted of almoſt all their concomitant circumſtances. Can no better proofs be brought to prove the migration of ſwallows than thoſe of Adanſon and Sir Charles Wager, or the circumſtances mentioned by Mr. White and Mr. Laſkey reſpecting their diſappearing? We ought not merely to know that ſome ſwallows have taken a ſoutherly flight in autumn, that ſome have been found at a great diſtance from land in the ſpring, or in harveſt; but we ought to know to what countries they actually retire. Before we can reſt ſatiſfied, too, that it is a general fact that ſwallows remain in a torpid ſtate during winter, either in caverns or in the bottom of lakes, &c. we muſt have more proofs; we muſt know what ſpecies of ſwallows they are ſaid to be, in what countries this event takes place, and ſeveral other circumſtances of the ſame kind.

We cannot help being of opinion that much remains to be done in order properly to aſcertain what becomes of the ſwallows in Europe during winter. It would be neceſſary in the firſt place, to know accurately what are the countries in which ſwallows are found. 2. Do they remain viſible the whole year? or, if they diſappear, at what ſeaſon does this happen, and when do they appear again? 3. Do they ever appear while a ſtrong north wind blows, or do they only come in great numbers with a ſouth wind? We will endeavour to anſwer ſome of theſe queſtions in part; but muſt regret, that all the information on this ſubject which we have been able to cull from the beſt writers in natural hiſtory is very ſcanty; and we merely give it by way of ſpecimen, hoping that future obſervations will ſoon render it more complete.

There are five ſpecies which viſit Britain during the ſummer months; the common or chimney ſwallow, the martin, ſand martin, ſwift, and goat-ſucker. The chimney ſwallow frequents almoſt every part of the old continent; being known (ſays Dr. Latham) from Norway to the Cape of Good Hope on the one ſide, and from Kamtſchatka to India and Japan on the other. It is alſo found in all parts of North America, and in ſeveral of the Weſt-Indian Iſlands. In Europe it diſappears during the winter months. It appears generally a little after the vernal equinox; but rather earlier in the ſouthern, and later in the northern latitudes. It adheres to the uſual ſeaſons with much regularity; for though the months of February and March ſhould be uncommonly mild, and April and May remarkably cold, it never deviates from its ordinary time. In the cold ſpring of 1740 ſome appeared in France before the inſects on which they feed had become numerous enough to ſupport them, and great numbers died. In the mild and even warm ſpring of 1774 they appeared no earlier than uſual. They remain in ſome warm countries the whole year. Kolben aſſures us that this is the caſe at the Cape of Good Hope; but (he ſays) they are more numerous in winter. Some birds of this ſpecies live, during winter, even in Europe; for example, on the coaſt of Genoa, where they ſpend the night in the open country on the orange ſhrubs.

2. The *martins* are alſo widely diffuſed through the old continent; but the countries where they reſide or viſit have not been marked by naturaliſts with much attention. 3. The *ſand martins* are found in every part of Europe, and frequently ſpend the winter in Malta. Two birds of this ſpecies were ſeen in Perigord in France, on the 27th December, 1775, when there was a ſoutherly wind, attended with a little rain. 4. The *ſwift* viſits the whole continent of Europe; has alſo been obſerved at the Cape of Good Hope, and in Carolina in North America. 5. The *goat-ſuckers* are not very common birds, yet are widely ſcattered. They are found in every country between Sweden and Africa; they are found alſo in India. In April the ſouth-weſt wind brings them to Malta, and in autumn they repaſs in great numbers.

In the Tranſactions of the Linnæan Society, vol. I. is given

by Mr. Markwick, of Catsfield, in Suſſex, an accurate table, expreſſing the day of the month on which the birds, commonly called *migratory*, appeared in ſpring, and diſappeared in autumn, for 16 years, from 1768 to 1783 incluſive. From this table we ſhall extract the dates for five years, and add the very few obſervations which we have been able to collect reſpecting the time when the ſwallow appears and diſappears in other countries.

	Firſt ſeen.	*Laſt ſeen.*
1779.		
Chim. Swal.	Ap. 14.	Oct. 29.
Martins	14.	15.
Sand Mart.	May 7.	
Swift	9.	
1780.		
Chim. Swal.		Nov. 3.
Martins	Ap. 29.	3.
Sand Mart.	8.	Sep. 8.
Swift	May 6.	8.
1781.		
Chim. Swal.	Ap. 8.	Oct. 15.
Martins	May 12.	Sep. 7.
Sand Mart.	Ap. 16.	Sep. 1.
Swift	May 12.	1.
1782.		
Chim Swal.	Ap. 22.	Sep. 1.
Martins	26.	Nov. 2.
Sand Mart.	May 13.	Aug. 28.
Swift	18.	28.
1783.		
Chim. Swal.	Ap. 13.	Nov. 6.
Martins	May 1.	6.
Sand Mart.	July 25.	Sep. 1.
Swift	May 13.	Nov. 6.

	Chim. Swal.	Swifts.	Martins.	S. Mart.
		Appear about		
In Burgundy			Ap. 9.	Ap. 12.
In Selborne Hampſhire	Ap. 4.	Ap. 24.	Ap. 30.	
In South Zele, Devonſhire	25.	May 1.	May 15.	
In Blackburn, Lancaſhire	29.	Ap. 28.		
In Upſal in Sweden			May 9.	

Were tables of the ſame kind made in every different country, particularly within the torrid zone, it would be eaſy to determine the queſtion which we have been conſidering. To many, perhaps, it may not appear a matter of ſuch importance as to be worth the labour. We acknowledge it to be rather a curious than an important enquiry; yet it is one which muſt be highly gratifying to every mind that can admire the wiſdom of the Great Architect of nature. The inſtinct of the ſwallow is indeed wonderful: it appears among us juſt at the time when inſects become numerous; and it continues with us during the hot weather, in order to prevent them from multiplying too much. It diſappears when theſe inſects are no longer troubleſome. It is never found in ſolitude: it is the friend of man, and always takes up its reſidence with us, that it may protect our houſes and our ſtreets from being annoyed with ſwarms of flies.

Swallow-*Wort*, in Botany. See Asclepias.

SWAMMERDAM (John), a celebrated and learned natural philoſopher, was the ſon of John James Swammerdam, an apothecary and famous naturaliſt of Amſterdam, and was born in 1637. His father intended him for the church, and with this view had him inſtructed in Latin and Greek; but he, thinking himſelf unequal to ſo important a taſk, prevailed with his father to conſent to his applying himſelf to phyſic. As he was kept at home till he ſhould be properly qualified to engage in that ſtudy, he was frequently employed in cleaning his father's curioſities, and putting every thing in its proper place. This inſpired our author with an early taſte for natural hiſtory; ſo that, not content with the ſurvey of the curioſities his father had purchaſed, he ſoon began to make a collection of his own, which he compared with the accounts given of them by the beſt writers. When grown up, he ſeriouſly attended to his anatomical and medical ſtudies; yet ſpent part of the day and the night in diſcovering, catching, and examining the flying inſects proper to thoſe times, not only in the province of Holland, but in thoſe of Guelderland and Utrecht.— Thus initiated in natural hiſtory, he went to the univerſity of Leyden in 1651; and in 1663 was admitted a candidate of phyſic in that univerſity. His attention being now engaged by anatomy, he began to conſider how the parts of the body prepared by diſſection could be preſerved, and kept in conſtant order for anatomical demonſtration; and herein he ſucceeded, as he had done before in his nice contrivances for diſſecting and managing the minuteſt inſects. Our author afterwards made a journey into France, where he ſpent ſome time at Saumur, and where he became acquainted with ſeveral learned men. In 1667 he returned to Leyden, and took his degree of doctor of phyſic. The next year the Grand Duke of Tuſcany being in Holland in order to ſee the curioſities of the country, came to view thoſe of our author and his father; and on this occaſion Swammerdam made ſome anatomical diſſections of inſects in the preſence of that prince, who was ſtruck with admiration at our author's great ſkill in managing them. eſpecially at his proving that the future butterfly lay with all its parts neatly folded up in a caterpillar, by actually removing the integuments that covered the former, and extricating and exhibiting all its parts, however minute, with incredible ingenuity, by means of inſtruments of inconceivable fineneſs. On this occaſion the duke offered our author 12,000 florins for his ſhare of the collection, on condition of his removing them himſelf into Tuſcany, and coming to live at the court of Florence; but Swammerdam, who hated a court life, declined his highneſs's propoſal. In 1663 he publiſhed a General Hiſtory of Inſects. About this time, his father began to take offence at his inconſiderately neglecting the practice of phyſic, which might have ſupported him in affluence; and would neither ſupply him with money nor clothes. This reduced him to ſome difficulties. In 1675 he publiſhed his Hiſtory of the Ephemeras; and his father dying the ſame year, left him a fortune ſufficient for his ſupport: but he did not long ſurvive him, for he died in 1682 Gaubius gave a tranſlation of all his works from the original Dutch into Latin, from which they were tranſlated into Engliſh, in folio, in 1758. The celebrated Boerhaave wrote his life.

SWAN, in ornithology. See Anas.

SWANPAN, or Chineſe Abacus; an inſtrument for forming arithmetical operations, deſcribed by Du Halde in his Hiſtory of China. It is compoſed of a ſmall board, croſſed with 10 or 12 parallel rods or wires, each ſtrung with ivory balls, which are ſo divided by a partition in the middle, that two are on one ſide of it, and five on the other. The two in the upper part ſtand each for five units, and each of the five in the lower part for one. "In joining and ſeparating theſe balls, they reckon much as we do with counters; but, according to our author, more expeditiouſly than Europeans do even with figures." This is hardly credible; but if all the Chineſe weights and meaſures be decimally divided, as by his very lame deſcription of the *ſwanpan* they would appear to be, it is eaſy to conceive how computation may be made by this inſtrument very expeditiouſly. The inſtrument, too, may be ſo contrived as to ſuit any diviſion of weights and meaſures, and in that form be uſeful to the blind; but as we have elſewhere given deſcriptions of ſuperior inſtruments, for their accommodation (ſee Blind), it is needleſs to offer in this place any improvement of the *ſwanpan*.

SWANEMOTE, Swainmote, or Sweinmote. See Forest-*Courts*.

SWEARING. See Oath.

SWEAT, a ſenſible moiſture iſſuing from the pores of the ſkins of living animals. The exceſs of it weakens the body, deprives the blood of its watery part. A ſudden ſuppreſſion of it brings on diſeaſe.

SWEATING sickness, a diſorder which appeared in England about the year 1481, and was by foreigners called the *Engliſh ſweat*. It returned again in 1485; then in 1506; afterwards in 1517. It appeared again in 1528, or 1529, at which time alone it ſpread itſelf to the Netherlands and Germany: a circumſtance which ſhows the impropriety of calling it *the Engliſh ſweat*, in Latin *ſudor Anglicanus;* beſides, Sennertus takes notice, that it ſpread as far as Denmark, Norway, and

France. It raged again in 1548. And the laſt return of it in London was in 1551, when it was ſo violent as in one day to take off 120 of the inhabitants of Weſtminſter. Some were ſeized abroad, and cut off in the road, others at home. Some when awake, others when faſt aſleep. Some died in a moment, and others in one, two, three, four, or more hours after they began to ſweat.

SWEDEN, a country of Europe, known to the Romans by the name of *Scandinavia*, is bounded on the north by Norwegian Lapland, on the eaſt by Ruſſia, on the ſouth by the Baltic, and on the weſt by the Scaggerac and Norway. The whole kingdom is divided into five general parts, viz. Sweden Proper, Gothland, Nordland, Lapland, and Finland; each of which is again ſubdivided into provinces. The Swedes likewiſe added to their dominions Livonia, Eſtonia, Ingria, Pomerania, the iſles Oeſel and Rugen, Wiſmar and its territories, Bremen and Werden; but of all theſe, none now are left them but Farther Pomerania; even Finland itſelf has been diſmembered. The five parts of which Sweden is eſſentially compoſed, yet form the largeſt ſtate in Europe, next to Ruſſia. Geographers are not agreed reſpecting its ſuperficial content. Buſchin fixes it at 13,500 ſquare German miles, and his account ſeems to approach neareſt to truth. The kingdom of Sweden is ſituated between the twenty-eighth and the forty-eighth degree of longitude from Ferro, and the fifty-fifth and ſeventieth of northern latitude. The winter here is long, dry, and exceedingly cold; the ſummer ſhort and hot. The Swedes experience a rapid change from the former of theſe ſeaſons to the latter; ſpring and autumn being almoſt unknown: during the long nights of winter, the moon, the aurora borealis, and the reflection of the ſnow, produce a mild and agreeable light. In ſummer, the ſun remains ſo long above the horizon, that the night conſiſts only of a ſlight twilight; vegetation then acquires its full vigour, and Nature ſeems to regain that time which ſhe has loſt during the froſty ſeaſon. Though Sweden is ſituated under a rigorous climate, it enjoys a much milder temperature than thoſe countries of Aſia and America, which have the ſame latitude. Thunder is ſeldom heard in this country; it produces no venomous reptiles; and earthquakes never ſpread terror and conſternation. Some of its learned men pretend, that the traces of extinguiſhed volcanoes are to be ſeen in it, but the proofs which they bring are far from being convincing. The pure and ſharp air, which the Swedes breathe, renders them vigorous, and preſerves them from epidemical diſeaſes. They often attain to a very great age. Linnæus reckons that there are in Sweden 1300 ſpecies of plants, 200 of which are uſed in medicine; and 1400 ſpecies of animals. Wolves, foxes, hares, birds of prey, moor-fowl, cocks of the wood, together with freſh and ſalt-water fiſh, are found here in great abundance; bears, elks, does, roebucks, ſables, beavers, and polecats, are more uncommon. It has been remarked, that no beeches grow beyond Eaſt Gothland, and no oaks beyond Upland; the birch grows in all the provinces. The pine and the fir, however, are the principal foreſt-trees. With regard to mineral productions, Sweden is very rich, eſpecially in iron and copper, with abundance of lead, marble, alum, limeſtone, coal, vitriol, curious petrifactions, porphyry, amethyſts, load-ſtone, ſlate, talk, quickſilver, ſulphur, mother of pearl, &c. and in ſome places ſilver. The moſt remarkable mountain, is the *Sevebergſrygn*, which, in Weſt Gothland, begins to riſe above the level of the ſea; it extends towards the north, between Norway and Norland, and ſeparates theſe two countries by ſummits, covered with eternal ſnow. According to Mr. Bergman, it ſtretches as far as the northern part of Aſia. All the mountains of Sweden are compoſed of gravel, freeſtone, calcareous ſtone, ſlate, different kinds of petrifactions and granite: the baſis of the greater part of the mountains is granite. The ſoil of the plains and valleys which lie between the hills and mountains, is very proper for cultivation; and commerce and navigation are greatly aſſiſted by numerous rivers, bays, and lakes. A Swediſh author, who has written on the mineral ſprings of Sweden, reckons up 360; they abound in every province of the kingdom. Sweden contains, altogether, 105 cities, or large towns, the principal of which is Stockholm. About half a century before the chriſtian æra, Gylfe, of the race of Forniother, reigned in Sweden; at the ſame period Sigge, afterwards ſurnamed Oden the Divine, fell upon the northern part of Europe, and conquered thoſe vaſt countries, at the head of a ſwarm of barbarians, whom he had collected between the Tanais and the Boriſthenes. The conqueror divided his conqueſts among his ſons. Ynge obtained Sweden, and became the founder of the family of the Ynglingars; Ingiald Ilrode, the laſt prince of that family, reigned in the ſeventh century: he had the title of king of Upſal, which was the place of his nativity. Ivar Widfame, or the Conqueror, extended the boundaries of the kingdom, and his family continued on the throne for ſeveral centuries. Olof Schætkonung, or the Infant, cauſed himſelf to be baptiſed, and found means to introduce Chriſtianity into the kingdom, about the beginning of the eleventh century. The crown, before hereditary, became elective, under the race of Stenkil Magnus, ſurnamed Smeek, or the Fooliſh, elected in the year 1318, obtained by inheritance the kingdom of Norway, and loſt, by his ſimplicity, ſeveral of the provinces of Sweden. His ſon Hokan, or Hako, became king of Norway, refuſed the crown of Sweden; but he afterwards obtained that of Denmark, by his marriage with Margaret, daughter of Waldemar. The Swedes, diſcontented with Magnus Smeek, depoſed him, and choſe in his room Albert of Mecklenburg; but this foreign prince wielded the ſceptre with ſo much ſeverity, that his ſubjects, haraſſed by the yoke of oppreſſion, called in Margaret, the widow of Hako, who ſoon after propoſed to make only one ſtate of the three northern kingdoms, and to unite them under the ſame ſceptre. This union was concluded at Calmar, in the year 1397; and the deputies of the three kingdoms ſtipulated, that each of them ſhould be governed according to its own laws. Eric XIII. whom ſhe choſe for her ſucceſſor, openly purſued a ſyſtem of oppreſſion: he treated Sweden like a conquered country, and entruſted the adminiſtration of the kingdom to Danes, who committed the moſt horrid barbarities. Incenſed at this treatment, the Dalecarlians revolted. Engelbrecht, who was born amongſt them, and well known by his eminent qualities, put himſelf at their head, attacked the tyrant's guards, and avenged the nation. Eric now promiſed to govern according to the Swediſh laws; but as there is no depending on the word of a perfidious deſpot, Engelbrecht was aſſaſſinated by a rival, jealous of his influence, and oppreſſion once more reſumed his courſe. The Dalecarlians again revolted, and engaged the inhabitants of the other provinces to join them. The tyrant, therefore, appeared in Sweden, at the head of his troops; but was obliged to ſeek ſhelter in Denmark. The Danes equally oppreſſed by his tyranny, did not long afford him an aſylum; he was baniſhed from that country, and Chriſtopher of Bavaria aſcended the throne. On the death of this prince, which happened in the year 1448, the Swedes and Norwegians gave the ſceptre to Charles Knutſon, of an ancient and illuſtrious family, and allied to that of the old Swediſh kings: but the Danes decreed it to Chriſtian I. of the family of Oldenburg. The Archbiſhop of Upſal, a powerful and ambitious prelate, by forming intrigues againſt Charles, put Sweden into the hands of Chriſtian, who not being able to govern a people proud of their privileges, was ſoon ſtripped of his authority.

By this revolution, Charles again obtained the diadem; but being dethroned a second time, he was re-established in the year 1461, and reigned in peace till his death, which happened in 1470. Christian II. or Christian the Nero of the North, was crowned king, in the year 1519; and he soon signalised his power by horrid cruelties, which incensed the whole nation against him; Gustavus Ericson Vasa, a fugitive in his own country, formed a design of delivering it; and, under him, Sweden recovered its independence. He caused the sceptre to be declared hereditary in his family, in the year 1544, and died in 1560. Gustavus was succeeded by his son Eric XIV. who did not possess the same qualities as his father. He was deposed, and being thrown into prison, was there poisoned by the order of his brother John. John had married Catherine Jagellon, whom he loved and consulted. That princess had great influence in the council; and being a zealous supporter of the catholic religion, which she professed, she prevailed upon her husband to render Sweden dependent on the holy See. Lutheranism, however, had taken too deep root; and the efforts which the king made to destroy it, tended only to establish it more. John died in 1572, very little regretted, because he was unworthy of the esteem of his subjects. His son Sigismund, already king of Poland, ought to have succeeded him; but Charles, duke of Sudermania, the youngest of Gustavus's sons, taking advantage of the disposition in which the people then were, caused himself to be elected regent of the kingdom. Sigismund undertook to conquer Sweden; but the duke defeated his army, and afterwards mounted the throne. Gustavus II. was as great in peace as in war: he succeeded his father in 1611, and showed himself a model for heroes and kings. Christina, the daughter of Gustavus and Mary Eleonora of Brandenburg, was very young at the time of her father's death. The peace of Bromsebro was concluded in the year 1645; that of Westphalia in 1648; and both these added to the glory, the territories, and the political influence of Sweden. When Christina came of age, she showed herself worthy of the throne which she occupied as long as the wise Oxenstierna was her minister and confident; but when she neglected the counsel of that respectable veteran, she no longer met with the esteem and affection of her subjects: and Christina, fatigued with the cares of government, quitted her throne, her country, and her religion, and retired in 1654. Charles Gustavus, or Charles X. son of John Casimir, of the Palatinate family of Deux Ponts, and of Catherine, daughter of Charles IX. was appointed by Christina to succeed her, and the States confirmed this choice. All the northern powers took up arms against this kingdom, and the emperor of Russia, and the elector of Brandenburg, joined its enemies. Charles, however, laid siege to Copenhagen; but being repulsed, death soon after put an end to his career. The peace of Oliva, concluded in 1660, immediately after the death of Charles X. restored tranquillity to the north. Charles XI. was mediator at the peace of Ryswick, in 1697, in which year he died; and Charles XII. assumed the reins of government. The duke of Holstein, who had married his eldest sister, Edwig Sophia, being attacked by Denmark, Charles marched to his assistance, struck a terror into the Danes, and concluded, in 1700, the peace of Travendal. More formidable enemies, Augustus II. and Peter I. czar of Russia, threatened Sweden. Charles therefore entered Livonia, and with 8000 Swedes attacked and defeated 80,000 Russians, near Narva, on the 20th of November, 1700. From Livonia he hastened to Poland, where he gained several victories, dethroned Augustus, and caused Stanislaus Letzinski to be elected in his stead. Soon after he marched into Saxony, made the dethroned king sign a peace, and obtained for the Protestants of Silesia the free exercise of their religion. The Swedish hero repaired next to Poland, with a design of depriving Peter I. of his crown. But the fortune of Charles began to change, and on the 27th of June, 1709, was fought the battle of Poltava: repulsed and wounded, he passed the Dnieper, and sought for an asylum in the territories of the Turks; his enemies soon took advantage of his misfortunes. Augustus recovered Poland; Peter seized upon Livonia, Estonia, Ingria, and a part of Finland; and the king of Denmark, Frederic IV. landed an army in Scandinavia. To resist so many enemies was difficult. The Swedes, however, made efforts, and the danger in which they beheld their country inspired them with courage. Count de Stenback, having in haste collected a body of peasants, opposed them to the Danes, who were beat at Helsinborg, in 1710. Charles, in the mean time, was carrying on an unsuccessful negociation at the Porte. Being solicited to quit the Turkish dominions, he obstinately refused; maintained a siege against an army sent to attack him; was taken prisoner, and conducted by force to Demotica. At length, finding that it was impossible for him to accomplish his end, he set out with one of his generals, and arrived at the gates of Stralsund, so harassed by fatigue, that his subjects did not know him. Two other powers, England and Prussia, having declared against Sweden, George I. and Frederick William I. united themselves with the enemies of Charles. This monarch, however, always firm and undaunted, shut himself up in the city of Stralsund, which he defended for some time. Being at length forced to abandon it, he went on board a small bark, and set out for Sweden; but instead of going to Stockholm, he undertook an expedition to Norway, and afterwards returned to Scandinavia. A second expedition into Norway became fatal to him; he laid siege to Frederickshalt, and going to reconnoitre one of the trenches, was killed by a musket bullet, on the 30th of November, 1718. When the States assembled, they decreed the crown to Ulrica Eleonora, his youngest sister, on condition that she renounced sovereignty. The duke of Holstein, a young prince, endowed with many engaging qualities, and who married Charles's eldest sister, had a legal right to the throne, and found many partisans. But the efforts which they made in his favour were not attended with success. Peace was at length concluded, but on very disadvantageous terms. Sweden lost Bremen, Verden, part of Pomerania, and a right to the duties of the Sound; and by way of indemnification, received some millions of crowns. In the mean time, the diet having assembled at Stockholm, on the 24th of January, 1720, Ulrica Eleonora proposed to abdicate the throne, and resign it to Frederic of Hesse Cassel, her husband, who indeed became king, by renouncing some more of the royal prerogatives, and ceding Livonia, Estonia, Ingria, part of Carelia, and Finland, to Russia. An alliance entered into with France, in 1738, inveterate national hatred, and several other causes of discontent, produced a fresh rupture with Russia. At a peace which was concluded at Abo, in the year 1743, Sweden ceded part of Finland, and Adolphus Frederic, of the family of Holstein-Gottorp, and descended by the female line from the family of Vasa, was declared successor to the throne. In the year 1772, Gustavus III. contrived to make his government despotic. In the year 1792, he was assassinated at a ball, by a nobleman, of the name of Ankerstrom, a captain of the guards, who confessed himself the person who had endeavoured to deliver the country from a monster and a tyrant. The productions of Sweden will be seen in the account of each province. The doctrine of Luther was early introduced into Sweden, and is the national religion. Sweden is covered with forests, which abound, above all, in Nordland and Finland. There are few kinds of fish, which are not found in the waters by which Sweden is surrounded or intersected. That species named strœmming, in the language

of the country, and known no-where elſe, is ſo abundant in ſeveral parts of the Baltic, that it forms the principal part of the food of the inhabitants. The herrings, which for ſome centuries had deſerted the coaſts of Sweden, again made their appearance there about fifty years ago. The principal fiſheries are in the province of Bahus: they produce annually about 300,000 tons, each of which contains 1000 herrings. The Swediſh herrings, however, are never ſo good as thoſe of Holland: when they arrive on the northern coaſts they are old and worn out with the fatigues of their voyage; beſides this, Swedes are not ſo well acquainted with the art of ſalting and packing them as the Dutch. A natural ſource of wealth ſtill more important to Sweden, is its mines. The richeſt iron-mine in the kingdom, that of Danmora, is ſituated in the province of Upland, which in every reſpect is one of the beſt in Sweden. This mine, the greateſt depth of which is eighty fathoms, occupies a conſiderable extent of territory, and the ore is conveyed to the ſurface of the earth, through ſeveral pits or openings made for that purpoſe, by means of caſks fixed to large cables, which are put in motion by horſes. The workmen, ſtanding upon the edges of theſe caſks, and having their arms claſped round the cable, deſcend and aſcend with the utmoſt compoſure: they remain in the mine no longer than the time required for their daily labour. The water is drawn from the bottom of it by a wheel twenty-two yards in diameter, and is afterwards conveyed along an aqueduct 2500 yards in length. At certain diſtances from Danmora, are ſeveral furnaces with villages, well built and extremely populous. There are iron mines in the greater part of the provinces of this vaſt kingdom, but they cannot be opened without hurting other branches of national induſtry; beſides, ſome of them are ſituated in ſuch a manner, that the expences of working them would be too conſiderable. Thoſe wrought at preſent produce annually upwards of 57,000 tons of iron. Theſe mines employ in the whole kingdom, about 25,600 perſons, and it has been calculated that the furnaces and forges of the kingdom, which give iron that degree of perfection which is neceſſary before it can be uſed, conſume annually 2,400,000 loads of charcoal. In the province of Dalecarlia, at a ſmall diſtance from the town of Fahlun, are ſituated thoſe gloomy and obſcure caverns, which contain the beſt copper in Europe. Hemp, flax, and tobacco, are much cultivated; rearing of cattle is well underſtood, and agriculture owes much to the Royal Academy, at Stockholm. Manufactures were long unknown, at preſent the troops are clothed with cloth made in the country: the making of hats was introduced at a vaſt expence, but was not attended with ſucceſs: the manufacture of ſilk is in a languiſhing ſtate, thoſe of cotton ſucceed better, as likewiſe that of Morocco leather: but the art of preparing timber and metals is a buſineſs the Swedes beſt underſtand, and moſt approve. The number of inhabitants is eſtimated at near 3,000,000.

SWEDENBORG (Emanuel), was born at Stockholm on the 29th of January, 1689. His father was biſhop of Weſt-Gothia; member of a ſociety for the propagation of the goſpel, formed on the plan of that of England; and preſident of the Swediſh church in Pennſylvania and London. To this laſt office he was appointed by Charles XII. who ſeems to have had a great regard for the biſhop, and to have continued that regard to his ſon.

Of the courſe of young Swedenborg's education we have no account; but from the character of the father, it may be ſuppoſed to have been pious; and by his appearing with reputation as an author when but 20 years of age, it is proved to have been ſucceſsful. His firſt work was publiſhed in 1709; and the year following he ſent into the world a collection of pieces on different ſubjects, in Latin verſe, under the title of *Ludus Heliconius, ſive Carmina Miſcellanea quæ variis in locis cecinit.* The ſame year he began his travels, firſt into England, and afterwards into Holland, France, and Germany; and returning to Stockholm in 1714, he was two years afterwards appointed to the office of aſſeſſor in the Metallic College by Charles XII. who honoured him with frequent converſations, and beſtowed upon him a large ſhare of his favour. At this period of his life Swedenborg devoted his attention principally to phyſic and mathematical ſtudies; and in 1718 he accompanied the king to the ſiege of Frederickſhall, where he gave an eminent proof that he had not ſtudied in vain. Charles could not ſend his heavy artillery to Frederickſhall from the badneſs of the roads, which were then rendered much worſe than uſual by being deeply covered with ſnow. In this extremity, Swedenborg brought the ſciences to the aid of valour. By the help of proper inſtruments he cut through the mountains, and raiſed the valleys which ſeparated Sweden from Norway, and then ſent to his maſter two galleys, five large boats, and a ſloop, loaded with battering pieces, to be employed in the ſiege. The length of this canal was about two miles and a half. The execution of this great work, however, did not occupy all his time. In 1716 he had begun to publiſh eſſays and obſervations on the mathematical and phyſical ſciences, under the title of *Dædalus Hyperboreus*; and he found leiſure during the ſiege to complete his intended collection, and alſo in the ſame year to publiſh an introduction to algebra, under the whimſical title of *The Art of the Rules.*

At the ſiege of Frederickſhall he loſt his patron Charles; but found another in Ulrica Eleonora, the ſiſter and ſucceſſor of that hero, by whom in 1719 he was ennobled, and took of courſe his ſeat among the ſenators of the equeſtrian order in the triennial aſſemblies of the ſtates. His promotion did not leſſen his ardour for the ſciences; for he publiſhed in the ſame year *A Method to fix the Value of Money, and to determine the Swediſh Meaſures in ſuch a way as to ſuppreſs all the Fractions and facilitate the Calculation.* About the ſame time he gave the public a treatiſe on *the Poſition and Courſe of the Planets*; with another on *the Height of the Tides, and Flux and Reflux of the Sea*; which, from information gathered in different parts of Sweden, appeared to have been greater formerly than when he wrote.

As Swedenborg continued, under the new ſovereign, to hold the office of aſſeſſor to the Metallic College, he thought it neceſſary, for the diſcharge of his duty, to make a ſecond journey into foreign countries, that he might himſelf examine their mines, particularly thoſe of Saxony and Harts. During theſe travels, which were undertaken for the improvement of the manufactures of his native country, he printed at Amſterdam, 1. *Prodromus principiorum Naturalium, ſive novorum tentaminum, Chemiam et Phyſicam experimentalem geometrice explicandi.* 2. *Nova obſervata & inventa circa Ferrum & Ignem, præcipue naturam Ignis Elementarium, una cum nova Camini inventione.* 3. *Methodus nova inveniendi Longitudines locorum terræ marique ope Lunæ.* 4. *Modus conſtruendi receptacula navalia, vulgo en Suedois, Dockybynadder.* 5. *Nova conſtructio aggeris aquatici.* 6. *Modus explorandi virtutes Navigiorum.* And at Leipſic and Hamburg, 7. *Miſcellanea obſervata circa res naturales, præſertim Mineralia, Ignem, & Montium ſtrata.*

This journey was made, and theſe tracts publiſhed, in the compaſs of a year and a half; and perhaps there has not been another man, Linnæus excepted, who has done ſo much in ſo ſhort a time. After his return in 1722, Swedenborg divided his time ſo equally between the duties of his office and his private ſtudies, that in 1733 he finiſhed his grand

work, entitled *Opera Philoſophica & Mineralia,* and had it printed under his own direction in 1734, part at Dreſden and part at Leipſic; in which year he alſo went to inſpect the mines of Auſtria and Hungary. This work is divided into three volumes folio; the title of the firſt is *Principia rerum Naturalium ſive novorum tentaminum, Phænomena Mundi elementaris philoſophice explicandi.* The ſecond, *Regnum ſubterraneum ſive Minerale de Ferro*; and the third, *Regnum ſubterraneum ſive Minerale de Cupro, & Orichalco*; all of them written with great ſtrength of judgment, and ornamented with plates, to facilitate the comprehenſion of the text.

In the year 1729 he was enrolled among the members of the Society of Sciences at Upſal, and was, probably about the ſame time, made a Fellow of the Royal Academy of Sciences at Stockholm; nor were ſtrangers leſs willing than his own countrymen to acknowledge the greatneſs of his merit. Wolfius, with many other learned foreigners, were eager to court his correſpondence. The Academy of St. Peterſburg ſent him, on the 17th of December, 1734, a diploma of aſſociation as a correſpondent member; and ſoon afterwards the editors of the *Acta Eruditorum* at Leipſic found in his works a valuable ſupplement to their own collection.

By many perſons the approbation of learned academies would have been highly valued; but by Baron Swedenborg it was conſidered as of very little importance. "Whatever of worldly honour and advantage may appear to be in the things before mentioned, I hold them (ſays he) but as matters of low eſtimation, when compared to the honour of that holy office to which the Lord himſelf hath called me, who was graciouſly pleaſed to manifeſt himſelf to me, his unworthy ſervant, in a perſonal appearance, in the year 1743, to open in me a ſight of the ſpiritual world, and to enable me to converſe with ſpirits and angels; and this privilege has continued with me to this day. From that time I began to print and publiſh various unknown *Arcana,* which have been either ſeen by me or revealed to me, concerning heaven and hell, the ſtate of men after death, the true worſhip of God, the ſpiritual ſenſe of the Scriptures, and many other important truths tending to ſalvation and true wiſdom."

We ſhall not affront the underſtandings of our readers by making upon this account of the Baron's *call* ſuch reflections as every perſon of a ſound mind will make for himſelf; but it is rather remarkable, that a man who had devoted the better part of his life to the ſtudy of ſuch ſciences as generally fortify the mind againſt the deluſions of fanaticiſm, and who had even excelled in theſe ſciences, ſhould have fallen into ſuch a reverie as this. After this extraordinary call, the Baron dedicated himſelf wholly to the great work which, he ſuppoſed, was aſſigned him, ſtudying diligently the word of God, and from time to time publiſhing to his fellow-creatures ſuch important information as was made known to him concerning another world. Such was his zeal in the propagation of his whimſical and ſometimes *ſenſual* doctrines, that he frequently left his native country to viſit diſtant cities, particularly London and Amſterdam, where all his theological works were printed at a great expence, and with little probability of a reimburſement. He was frantic, yet an inoffenſive viſionary. He died in London, March 29th, 1772; and after lying in ſtate, his remains were depoſited in a vault at the Swediſh church, near Radcliff-Highway.

Though Baron Swedenborg's followers appear not to have been numerous during his life, they have increaſed ſince his death; and a ſect ſubſiſts at preſent in England which derives its origin from him, and is called *the New Jeruſalem Church.* The diſcriminating tenets of this ſect ſeem to be the following: "Holding the doctrine of one God, they maintain that this one God is no other than Jeſus Chriſt, and that he always exiſted in a human form; that for the ſake of redeeming the world, he took upon himſelf a proper human or material body, but not a human ſoul; that this redemption conſiſts in bringing the hells or evil ſpirits into ſubjection, and the heavens into order and regulation, and thereby preparing the way for a new ſpiritual church; that without ſuch redemption no man could be ſaved, nor could the angels retain their ſtate of integrity; that their redemption was effected by means of trials, temptations, or conflicts with evil ſpirits; and that the laſt of them, by which Chriſt glorified his humanity, perfecting the union of his divine with his human nature, was the paſſion of the croſs. Though they maintain that there is but one God, and one divine perſon, they hold that in this perſon there is a real Trinity; conſiſting of the divinity, the humanity, and the operation of them both in the Lord Jeſus; a Trinity which did not exiſt from all eternity, but commenced at the incarnation. They believe that the Scriptures are to be interpreted not only in a literal but in a ſpiritual ſenſe, not known to the world till it was revealed to Swedenborg; and that this ſpiritual ſenſe extends to every part of Scripture, except the Acts of the Apoſtles. They believe that there are angels attending upon men, reſiding, as Swedenborg ſays, in their affections; that temptation conſiſts in a ſtruggle between good and bad angels within men; and that by this means God aſſiſts men in theſe temptations, ſince of themſelves they could do nothing. Indeed Swedenborg maintains, that there is an univerſal influx from God into the ſouls of men, inſpiring them eſpecially with the belief of the divine unity. This efflux of divine light on the ſpiritual world he compares to the efflux of the light from the ſun in the natural world.

"There are (ſays Swedenborg) two worlds, the natural and the ſpiritual, entirely diſtinct, though perfectly correſponding to each other; that at death a man enters into the ſpiritual world, when his ſoul is clothed with a body, which he terms *ſubſtantial,* in oppoſition to the preſent *material* body, which, he ſays, is never to riſe out of the grave."

SWEEP, in the ſea-language, is that part of the mould of a ſhip where ſhe begins to compaſs in the rung-heads; alſo when the hauſer is dragged along the bottom of the ſea to recover any thing that is ſunk, they call this action *ſweeping for it.*

SWEET, in the wine trade, denotes any vegetable juice, whether obtained by means of ſugar, raiſins, or other foreign or domeſtic fruit, which is added to wines with a deſign to improve them.

SWEIN-MOT. See *Foreſt Courts.*

SWERTIA, MARSH GENTIAN, in botany. A genus of plants belonging to the claſs of *pentandria,* and to the order of *digynia*; and in the natural ſyſtem ranging under the 20th order, *rotaceæ.* The corolla is wheel-ſhaped. There are nectariferous pores at the baſes of the ſegments of the corolla. The capſule is unilocular and bivalve. There are ſix ſpecies; the perennis, difformis, rotata, carinthiaca, corniculata, dichotoma. The perennis is a native of England. It is diſtinguiſhed by radical oval leaves. It flowers in Auguſt.

SWIETENIA, MAHOGANY, in botany: A genus of plants belonging to the claſs of *decandria,* and to the order of *monogynia*; and in the natural ſyſtem arranged under the 54th order, *Miſcellaneæ.* The calyx is quinquefid. There are five petals; the nectarium is cylindrical, ſupporting the antheræ with its mouth. The capſule is five-celled, woody, and opening at the mouth. The ſeeds are imbricated and

winged. There is only one species, the mahagoni, which is a native of the warmest parts of America, and grows also in the island of Cuba, Jamaica, Hispaniola, and the Bahama islands. It abounded formerly in the low lands of Jamaica, but it is now found only on high hills and places difficult of access.

It thrives in most soils, but varies in texture and grain according to the nature of the soil. On rocks it is of a smaller size, but very hard and weighty, of a close grain, and beautifully shaded; while the produce of the low and richer lands is observed to be more light and porous, of a paler colour and open grain; and that of mixed soils to hold a medium between both. The tree grows very tall and straight, and is usually four feet in diameter; the flowers are of a reddish or saffron colour, and the fruit of an oval form, and about the size of a turkey's egg.

The wood is generally hard, takes a fine polish, and is found to answer better than any other sort in all kinds of cabinet ware. It is now universally esteemed, and sells at a good price; but it is pity that it is not cultivated in the more convenient waste lands of Jamaica. It is a very strong timber, and answers very well in beams, joists, plank, boards, and shingles; and has been frequently put to those uses in Jamaica in former times. It is said to be used sometimes in ship building; a purpose for which it is remarkably adapted, if not too costly, being very durable, capable of resisting gun-shots, and burying the shots without splintering.

The seed-vessels are of a curious form, consisting of a large cone splitting into five parts, and disclosing its winged seeds, disposed in the regular manner of those of an apocynum. The seeds being winged, are dispersed on the surface of the ground, where some falling into the chinks of the rocks, strike root; then creep out on the surface of it, and seek another chink, into which they creep and swell to such a size and strength, that at length the rock splits, and is forced to admit of the root's deeper penetration; and with this little nutriment the tree increases to a stupendous size in a few years.

SWIFT, (Dr. Jonathan), an illustrious English wit, and justly celebrated for his political knowledge, was descended from a very ancient family, and born Nov. 30, 1667. His grandfather, Mr. Thomas Swift, was vicar of Goodrich in Herefordshire, and married Mrs. Elizabeth Dryden, aunt of Dryden the poet; by whom he had six sons, Godwin, Thomas, Dryden, William, Jonathan, and Adam. Thomas was bred at Oxford, but died young; Godwin was a barrister of Gray's-Inn; and William, Dryden, Jonathan, and Adam, were attornies. Godwin having married a relation of the old Marchioness of Ormond, the old Duke of Ormond made him attorney-general in the palatinate of Tipperary in Ireland. Godwin likewise determined to attempt the acquisition of a fortune in that kingdom, and the same motive induced his four brothers to go with him. Jonathan, at the age of about twenty-three, and before he went into Ireland, married Mrs. Abigail Erick, a gentlewoman of Leicestershire; and about two years after left her a widow with one child, a daugher, and pregnant with another, having no means of subsistance but an annuity of 20l. which her husband had purchased for her in England, immediately after his marriage. In this distress she was taken into the family of Godwin, her husband's eldest brother; and there, about seven months after his death, delivered of a son, whom she called Jonathan, in remembrance of his father, and was afterwards the celebrated dean of St. Patrick's.

At about six years of age he was sent to the school of Kilkenny, and having continued there eight years, he was admitted a student of Trinity College in Dublin. Here applying himself to books of history and poetry, to the neglect of academic learning, he was, at the end of four years, refused his degree of bachelor of arts for insufficiency; and was at last admitted *speciali gratiâ*, which is there considered as the highest degree of reproach and dishonour. Stung with the disgrace, he studied eight hours a-day, for seven years following. He commenced these studies at the university of Dublin, where he continued them three years; and during this time he drew up the first sketch of his "Tale of a Tub."

In 1688 his uncle Godwin was seized with a lethargy, and soon deprived both of his speech and memory; by which accident Swift being left without support, took a journey to Leicester, that he might consult with his mother what course of life to pursue. At this time Sir William Temple was in high reputation, and honoured with the confidence and familiarity of King William. His father, Sir John Temple, had been master of the Rolls in Ireland, and contracted an intimate friendship with Godwin Swift, which continued till his death; and Sir William, who inherited his title and estate, had married a lady to whom Mrs. Swift was related: she therefore advised her son to communicate his situation to Sir William, and solicit his directions what to do. Sir William received him with great kindness, and Swift's first visit continued two years. Sir William had been ambassador and mediator of a general peace at Nimeguen before the Revolution; in which character he became known to the Prince of Orange, who frequently visited him at Sheen, after his arrival in England, and took his advice in affairs of the utmost importance. Sir William being then lame with the gout, Swift used to attend his majesty in the walks about the garden, who admitted him to much familiarity, and once offered to make him a captain of horse; but Swift had fixed his mind upon an ecclesiastical life. About this time a bill was brought into the house for triennial parliaments, to which the king was very averse, he sent however to consult Sir William Temple, who soon afterwards sent Swift to Kensington with the whole account in writing, to convince the king how ill he was advised. This was Swift's first embassy to court, who, though he understood English history, and the matter in hand very well, did not prevail.

About a year after his return from Ireland, he thought it expedient to take his master of arts degree at Oxford; and accordingly was admitted *ad eundum* in 1692, with many civilities. From Oxford he returned to Sir William Temple, and assisted him in revising his works: he also corrected and improved his own "Tale of a Tub," and added the Digressions. From the conversation of Sir William, Swift greatly increased his political knowledge; but, suspecting Sir William of neglecting to provide for him, merely that he might keep him in his family, he at length resented it so warmly, that in 1694 a quarrel ensued, and they parted.

His resolution was now to take orders; and he soon after obtained a recommendation to Lord Capel, then lord deputy of Ireland, who gave him the prebend of Kilroot, in the diocese of Connor, worth about 100l. per annum. But Sir William, who had been used to the conversation of Swift, soon found that he could not be content to live without him; and therefore urged him to resign his prebend in favour of a friend, promising to obtain preferment for him in England, if he would return. Swift consented; and Sir William was so much pleased with this act of kindness, that during the remainder of his life, which was about four years, his behaviour was such as had produced the utmost harmony between them. Swift, as a testimony of his friendship and esteem, wrote the "Battle of the Books," of which Sir William is the hero; and Sir William, when he died, left him a pecuniary legacy,

and his posthumous works. After his death, Swift applied, by petition to King William, for the first vacant prebend of Canterbury or Westminster, for which the royal promise had been obtained by his late patron, whose posthumous works he dedicated to his majesty, to facilitate the success of that application. But it does not appear, that, after the death of Sir William, the king took the least notice of Swift. After this he accepted an invitation from the Earl of Berkeley, appointed one of the lords justices of Ireland, to attend him as chaplain and private secretary; but he was soon removed from this post, upon a pretence that it was not fit for a clergyman. This disappointment was presently followed by another: for when the deanery of Derry became vacant, and it was the Earl of Berkeley's turn to dispose of it, Swift, instead of receiving it as an atonement for his late usage, was put off with the livings of Laracor and Rathbeggin, in the diocese of Meath, which together did not amount to half its value. He went to reside at Laracor, and performed the duties of a parish priest with the utmost punctuality and devotion.

During Swift's residence at Laracor he invited to Ireland a lady whom he has celebrated by the name of Stella. With this lady he became acquainted while he lived with Sir William Temple; she was the daughter of his steward, whose name was Johnson; and Sir William when he died, left her 1000l. in consideration of her father's faithful services. She was in the 18th year of her age, when at Swift's invitation she left England, accompanied by Mrs. Dingley, a lady who was fifteen years older. Whether Swift at this time desired the company of Stella as a wife, or a friend, it is not certain: but the reason she and her companion then gave for their leaving England was, that in Ireland the interest of money was higher, and provisions were cheaper. But, whatever was Swift's attachment to Miss Johnson, every possible precaution was taken to prevent scandal: they never lived in the same house; when Swift was absent, Miss Johnson and her friend resided at the parsonage; when he returned, they removed either to his friend Dr. Raymond's, or to a lodging; neither were they ever known to meet but in the presence of a third person.

In 1701, Swift took his doctor's degree, and in 1702, soon after the death of King William, he went into England for the first time after his settling at Laracor; a journey which he frequently repeated during the reign of Queen Anne. Miss Johnson was once in England in 1705, but returned in a few months, and never crossed the channel afterwards. He soon became eminent as a writer, and in that character was known at least to both Whigs and Tories. He had been educated among the former, but at length attached himself to the latter. He published in 1701, "A Discourse of the Contests and Dissentions between the Nobles and Commons in Athens and Rome, with the Consequences they had upon both those States;" this was in behalf of King William and his ministers, against the violent proceedings of the House of Commons: but from that year to 1708 he did not write any political pamphlet.

In 1710, being then in England, he was empowered by the primate of Ireland to solicit the queen to release the clergy from paying the twentieth part and first-fruits; and upon this occasion his acquaintance with Mr. Harley commenced. Swift presently became acquainted with the rest of the ministers, who appear to have courted and caressed him with uncommon assiduity. He dined every Saturday at Mr. Harley's, with the lord-keeper, Mr. Secretary St. John, and Lord Rivers: on that day no other person was for some time admitted; but this select company was at length enlarged to sixteen, all men of the first class, Swift included. From this time he supported the interest of his new friends with all his power, in pamphlets, poems, and periodical papers: his intimacy with them was so remarkable, that he was thought not only to defend, but in some degree to direct their measures; and such was his importance in the opinion of the opposite party, that many speeches were made against him in both houses of parliament: a reward was also offered, for discovering the author of the "Public Spirit of the Whigs."

Amidst all the business and honours that crowded upon him, he wrote every day an account of what occurred to Stella; and sent her a journal regularly, dated every fortnight, during the whole time of his connection with Queen Anne's ministry. Nov. 27, 1711, he published the "Conduct of the Allies;" a piece which he confesses cost him much pains, and which succeeded even beyond his expectations. From this time to 1713, he exerted himself with unwearied diligence in the service of the ministry; and while he was at Windsor, just at the conclusion of the peace of Utrecht, he drew the first sketch of "An History of the Four last Years of Queen Anne." This he afterwards finished, and came into England to publish, but was persuaded from it by Lord Bolingbroke, who told him the whole was so much in the spirit of party-writing, that, though it might have made a seasonable pamphlet in the time of their administration, it would be a dishonour to just history. Swift seems to have been extremely fond of this work; but, since his friend did not approve it, he resolved to cast it into the fire. However, it did not undergo this fate, but was published by Dr. Lucas, to the disappointment of all those who expected any thing great from it.

During all this time he received no gratuity or reward till 1713; and then he accepted the deanery of St. Patrick's, Dublin. He immediately crossed the channel, to take possession of his new dignity; but did not stay in Ireland more than a fortnight, being urged by an hundred letters to hasten back, and reconcile the lords Oxford and Bolingbroke. When he returned, he found their animosity increased; and, having predicted their ruin from this very cause, he laboured to bring about a reconciliation, as that upon which the whole interest of their party depended. Having attempted this by various methods in vain, he went to a friend's house in Berkshire, where he continued till the queen's death; and, while he was at this place, wrote a discourse called "Free Thoughts on the present State of Affairs," which however was not published till some time after.

Among other persons with whom he was intimately acquainted during the gay part of his life, was Mrs. Vanhomrigh, a widow, whose husband was a merchant of repute in Dublin. In 1709 she and two young daughters came to England, where they were visited by persons of the first quality; and Swift, lodging near them, used to be much there, coming and going without any ceremony, as if he had been one of the family. During this familiarity, he became insensibly a kind of preceptor to the young ladies, particularly the elder, who was then about twenty years old, was much addicted to reading, and a great admirer of poetry. Hence admiring, as was natural, such a character as that of Swift, she soon passed from admiration to love; and, urged a little perhaps by vanity, ventured to make the doctor a proposal of marriage. He affected first to believe her in jest, then to rally her on so whimsical a choice, and at last to put her off without absolute refusal; and, while he was in this situation, he wrote the poem called "Cadenus and Vanessa." It was written in 1713, a short time before he left Vanessa and the rest of his friends in England. In 1714 Mrs. Vanhomrigh died; and, having lived very high, left some debts, which it

not being convenient for her daughters, who had also debts of their own, to pay at present, to avoid an arrest, they followed the dean into Ireland.

Upon his arrival to take possession of his deanery, he had been received with great kindness and honour; but now, upon his return after the queen's death, he experienced every possible mark of contempt and indignation. The tables were turned; the power of the Tories and the dean's credit were at an end; and as a design to bring in the Pretender had been imputed to the queen's ministry, so Swift lay now under much odium, as being supposed to have been a well-wisher in that cause. As soon as he was settled at Dublin, Miss Johnson removed from the country to be near him, but they still lived in separate houses: his residence being at the deanery, and hers in lodgings on the other side of the river Liffy. The dean kept two public days every week, on which the dignity of his station was sustained with the utmost elegance and decorum, under the direction of Miss Johnson.

The first remarkable event of his life, after his settlement at the deanery, was his marriage to Miss Johnson, in 1716, after a most intimate friendship of more than sixteen years. But whatever were the motives to this marriage, the dean and the lady continued to live afterwards just in the same manner as they had lived before. Till this time the dean had continued his visits to Vanessa, who preserved her reputation and friends, and was visited by many persons of rank, character, and fortune, of both sexes; but now his visits were less frequent. In 1717 her sister died; and the whole remains of the family fortune centering in Vanessa, she retired to Selbridge, a small house and estate about twelve miles from Dublin, which had been purchased by her father. From this place she wrote frequently to the dean, and he answered her letters: she pressed him to marry her, but he rallied, and still avoided a positive denial. She pressed him still more, either to accept or refuse her as a wife; upon which he wrote an answer, and delivered it with his own hand. The receipt of this, which probably communicated the fatal secret of his marriage with Stella, the unhappy lady did not survive many weeks: however, she was sufficiently composed to cancel a will she had made in the dean's favour, and to make another, in which she left her fortune to her two executors, Dr. Berkeley, bishop of Cloyne, and Mr. Marshall, one of the king's serjeants at law.

From 1716 to 1720 is a chasm in the dean's life which it has been found difficult to fill up; this time it is supposed he employed upon "Gulliver's Travels." He wrote "A Proposal for the Use of Irish Manufactures," which made him very popular; the more so, as it immediately raised a violent flame, so that a prosecution was commenced against the printer. In 1724 he wrote the "Drapier's Letters;" which added not a little to his reputation. He was several times in England on a visit to Mr. Pope, after his settlement at the deanery, particularly in 1726 and 1727. Jan. 28, 1727, died his beloved Stella, in her 44th year, regretted by the dean with such excess of affection as the keenest sensibility only could feel, and the most excellent character excite; she had been declining from 1724. The dean's life now became much retired, and the austerity of his temper increased: he could not enjoy his public days; these entertainments were therefore discontinued, and he sometimes avoided the company of his most intimate friends. Thus living in solitude, he frequently amused himself with writing; and it is very remarkable, that although his mind was greatly depressed, and his principal enjoyment at an end when Miss Johnson died, yet there is an air of levity and trifling in some of the pieces he wrote afterwards, that is not to be found in any other: such in particular are his "Directions to Servants," and several of his letters to his friend Dr. Sheridan. In 1733, when the attempt was made to repeal the test act in Ireland, the Dissenters often affected to call themselves brother-protestants, and fellow-christians, with the members of the established church. Upon this occasion the dean wrote a short copy of verses, which so provoked one Bettersworth, a lawyer and member of the Irish parliament, that he swore, in the hearing of many persons, to revenge himself either by murdering or maiming the author; and, for this purpose, he engaged his footman, with two ruffians, to secure the dean wherever he could be found. This being known, thirty of the nobility and gentry, within the liberty of St. Patrick's, waited upon the dean in form, and presented a paper subscribed with their names, in which they solemnly engaged, in behalf of themselves and the rest of the liberty, to defend his person and fortune, as the friend and benefactor of his country. When this paper was delivered, Swift was in bed, deaf and giddy, yet made a shift to dictate a proper answer. These fits of deafness and giddiness, which were the effects of a surfeit of fruit before he was twenty years old, became more frequent and violent, in proportion as he grew into years: and in 1736, while he was writing a satire on the Irish parliament, which he called "The Legion Club," he was seized with one of these fits, the effect of which was so dreadful, that he left the poem unfinished, and never afterwards attempted a composition, either in verse or prose, that required a course of thinking, or perhaps more than one sitting to finish. From this time his memory was perceived gradually to decline, and his passions to pervert his understanding. Early in 1742 his reason was subverted, and his rage became absolute madness. He died in Oct. 1745, aged 78.

By his will, dated in May 1740, just before he ceased to be a reasonable being, he left about 1200l. in legacies; and the rest of his fortune, which amounted to about 11,000l. to erect and endow an hospital for ideots and lunatics. He was buried in the great aisle of St. Patrick's cathedral, under a stone of black marble, inscribed with a Latin epitaph, written by himself, which shews a most unhappy misanthropic state of mind.

Swift, in ornithology. See Hirundo.

SWIMMING, the art of suspending one's self on water, and at the same time making a progressive motion through it. As swimming is not natural to man, it is evident that at some period it must have been unknown among the human race. Nevertheless there are no accounts of its origin to be found in the history of any nation; nor are there any nations so barbarous but that the art of swimming is known among them, and that in greater perfection than among civilized people. It is probable, therefore, that the art, though not absolutely natural, will always be acquired by people in a savage state from imitating the brute animals, most of whom swim naturally. Indeed so much does this appear to be the case, that very expert swimmers have recommended it to those who wished to learn the art, to keep some frogs in a tub of water constantly beside them, and to imitate the motions by which they move through that element.

The *theory* of swimming depends upon one very simple principle; namely, that if a force is applied to any body, it will always move towards that side where there is the least resistance. As to the *practice*, there are but few directions which can be given. The great obstacle is the natural dread which people have of being drowned; and this it is impossible to overcome by any thing but accustoming ourselves to go into the water. With regard to the real danger of being drowned, it is but little; and on innumerable occasions arises entirely from the terror above mentioned, as will appear from the following observations by Dr. Franklin.

"1st, That though the legs, arms, and head, of a human

body, being solid parts, are specifically somewhat heavier than fresh water, yet the trunk, particularly the upper part, from its hollowness, is so much lighter than water, as that the whole of the body, taken together, is too light to sink wholly under water, but some part will remain above until the lungs become filled with water; which happens from drawing water into them instead of air, when a person in the fright attempts breathing while the mouth and nostrils are under water.

"2dly, That the legs and arms are specifically lighter than salt water, and will be supported by it; so that a human body would not sink in salt water though the lungs were filled as above, but from the greater specific gravity of the head.

"3dly, That therefore a person throwing himself on his back in salt water, and extending his arms, may easily lie so as to keep his mouth and nostrils free for breathing; and by a small motion of his hands may prevent turning, if he should perceive any tendency to it.

"4thly, That in fresh water, if a man throws himself on his back near the surface, he cannot long continue in that situation, but by a proper action of his hands on the water. If he uses no such action, the legs and lower part of the body will gradually sink till he comes into an upright position; in which he will continue suspended, the hollow of the breast keeping the head uppermost.

"5thly, But if in this erect position the head is kept upright above the shoulders, as when we stand on the ground, the immersion will, by the weight of that part of the head that is out of the water, reach above the mouth and nostrils, perhaps a little above the eyes; so that a man cannot long remain suspended in water with his head in that position.

"6thly, The body continued suspended as before, and upright, if the head be leaned quite back, so that the face looks upwards, all the back part of the head being then under water, and its weight consequently in a great measure supported by it, the face will remain above water quite free for breathing, will rise an inch higher every inspiration, and sink as much every expiration, but never so low as that the water may come over the mouth.

"7thly, If therefore a person unacquainted with swimming, and falling accidentally into water, could have presence of mind sufficient to avoid struggling and plunging, and to let the body take this natural position, he might continue long safe from drowning, till perhaps help would come; for as to the clothes, their additional weight while immersed is very inconsiderable, the water supporting it; though when he comes out of the water, he would find them very heavy indeed."

The method of learning to swim is as follows: The person must walk into water so deep that it will reach to the breast. He is then to lie down gently on the belly, keeping the head and neck perfectly upright, the breast advancing forward, the thorax inflated, and the back bent; then withdrawing the legs from the bottom, and stretching them out, strike the arms forwards in unison with the legs. Swimming on the back is somewhat similar to that on the belly; but with this difference, that although the legs are employed to move the body forwards, the arms are generally unemployed, and the progressive motion is derived from the movement of the legs. In diving, a person must close his hands together, and, pressing his chin upon his breast, make an exertion to bend with force forwards. While in that position, he must continue to move with rapidity under the surface; and whenever he chooses to return to his former situation, he has nothing to do but bend back his head, and he will immediately return to the surface.

It is very common for novices in the art of swimming to make use of corks or bladders to assist in keeping the body above water. Some have utterly condemned the use of these; however, Dr. Franklin allows that they may be of service for supporting the body while one is learning what is called the *stroke*, or that manner of drawing in and striking out the hands and feet that is necessary to produce progressive motion. "But (says he) you will be no swimmer till you can place confidence in the power of the water to support you: I would therefore advise the acquiring that confidence in the first place, especially as I have known several who, by a little of the practice necessary for that purpose, have insensibly acquired the stroke, taught as it were by nature.

"The practice I mean is this: choosing a place where the water deepens gradually, walk coolly into it till it is up to your breast: then turn round your face to the shore, and throw an egg into the water, between you and the shore; it will sink to the bottom, and be easily seen there, if the water is clear. It must lie in the water so deep as that you cannot reach it to take it up but by diving for it. To encourage yourself in order to do this, reflect that your progress will be from deeper to shallower water; and that at any time you you may, by bringing your legs under you, and standing on the bottom, raise your head far above the water: then plunge under it with your eyes open, throwing yourself towards the egg, and endeavouring, by the action of your hands and feet against the water, to get forward till within reach of it. In this attempt you will find that the water buoys you up against your inclination; that it is not so easy a thing to sink as you imagined; that you cannot but by active force get down to the egg. Thus you feel the power of the water to support you, and learn to confide in that power; while your endeavours to overcome it, and to reach the egg, teach you the manner of acting on the water with your feet and hands; which action is afterwards used in swimming to support your head higher above water, or to go forward through it."

As swimming is a healthy exercise and a pleasant amusement, and as a dexterity in it may frequently put it in a man's power to save his own life and the lives of his fellow-creatures, perhaps of his dearest friends, it can neither be a useless nor uninteresting accomplishment.

SWIMMING *of Fish*. A great proportion of the inhabitants of the waters have an air bladder, by which they poise themselves. Their movements chiefly depend upon their tail. See COMPARATIVE ANATOMY, and ICHTHYOLOGY.

SWINDLER, a word which has been lately adopted into the English language, derived from the German word *schwindel*, "to cheat." Swindling has now become so common in several of the great towns of this country, that it is unfortunately too well known to require any description.

SWINE, in zoology. See SUS.

SWINE-*Stone*. See *Swine*-STONE.

SWINGING, a kind of exercise strongly recommended to persons in consumption by some physicians, and disapproved of by others.

SWING-TREE of a waggon, is the bar fastened across the fore-guide, to which the traces of the horses are fastened.

SWING-WHEEL, in a royal pendulum, that wheel which drives the pendulum. In a watch or balance clock it is called the crown-wheel.

SWINGLE, in the fire-works in England, the wooden spoke which is fixed to the barrel that draws the wire, and which, by its being forced back by the cogs of the wheel, is the occasion of the force with which the barrel is pulled.

SWITZ, or SCHWEITS, the capital of one of the cantons of Switzland, to which it gives name, seated on the east side of the lake Lucern, in N. Lat. 46. 55. E. Long. 8. 30.

SWITZERLAND, or SWISSERLAND. Under this name

modern geographers include all the country occupied not only by the Swifs, Or Thirteen Cantons of the league, but by other eftates in alliance with or fubject to them; in which fenfe the greateft extent from eaft to weft will be about 180 miles, and from north to fouth 140. On the north it is bounded by Swabia, on the eaft by the Tyrolefe and Auftrian Swabia, on the fouth by Savoy and Italy, and on the weft by France. Switzerland may juftly be confidered as fome of the elevated land in Europe, as many principal rivers take their rife here, and run in different directions to the extremity. The greater part is compofed of mountains, with narrow valleys between: thefe mountains are compofed of ftupendous rocks, two, four, or fix maffes, piled on each other, and from four to ten thoufand feet in perpendicular height. One peak, on a mountain called the *St. Gothard*, is, by Du Crest, computed at 16,500 French feet. The lower part of thefe high mountains are covered with woods and paftures, the herbage in which is of a remarkable length and richnefs. The middle confifts of Alps or Alpinges, abounding in a great variety of odoriferous herbs, thickets, and bufhes, with excellent fprings, in fummer reforted to by herdfmen, with their cattle. The third part of thefe mountains confifts almoft entirely of craggy and inacceffible rocks, fome of which are quite bare, without herbage growing upon them, or even fo much as grafs, whilft others are continually covered with fnow and ice. The valleys between thefe icey and fnowy mountains form an appearance like fo many fmooth frozen lakes, and from them vaft fragments of ice, called glaciers or firns, often fall down into the intervals of the more fruitful eminences. It is from thefe maffes and the thawing of the ice in general, that the greateft part of the ftreams and rivers in Switzerland are derived The ice hills begin in the canton of Glarus, and after paffing through the territory of the Grifons, and thence into the canton of Uri, terminate in the diftrict of Bern. The higheft of thefe mountains are thofe in the canton of Uri, namely, St. Gothard, Firka, Crifpalt, and Luckmanier, which fend forth rivers towards all parts of Europe. This is the moft dreary part of all Switzerland, and on the fummits of the mountains one eternal cold almoft prevails, with hard gales of wind and very damp fogs, whereas the valleys, excepting fome towns and villages, with a few fields, and ftill fewer vineyards, thick woods, and rich paftures, are overun with lakes and other waters, and the fummer heats there are frequently fo infupportable, that the inhabitants betake themfelves up to the mountains: though in winter the houfes again are almoft buried with fnow. In many places, within a fmall compafs, the four feafons are feen at once, and fometimes fummer and winter are fo near each other, that one hand may take up fnow, and the other gather growing flowers. During the greateft part of the year, the clouds lie beneath the peaks of the higheft mountains, infomuch, that from thence they appear like a fea, the peaks projecting among them like iflands. Sometimes, too, they break, and thus difplay a view of the country beneath. From the rifing and finking of thefe clouds, the inhabitants form pretty certain conjectures with refpect to the weather. Not one of the above mountains is without a cataract or waterfall, and as the eye, by reafon of the intervention of the clouds, is not always able to reach the beginning of them, they look as if poured down from heaven upon the rocks. Among thefe mountains are many excellent fprings, fome of which are medicinal, others warm, and others again cold baths, celebrated for their extraordinary virtues. Of thefe fummits, too, fome form a part of the Alps, fo frequently mentioned in the Greek and Roman writers, the Appennine (or Alpes Summæ, now St. Gothard and Crifpalt), with the Alpes Lepontiæ, the Alpes Rhetiæ, &c. Very different from this is the remaining and fmaller part of Switzerland, including the county of Thurgau, which is a part of the cantons of Zurich, Schafhaufen, Bern, Bale, Soleure, and Friburgh, for though this diftrict is not without mountains, fome of which are even 2000 or 2500 feet high, yet it is much more level than the above-mentioned part, and the lower parts of the mountains, and fometimes alfo the very fummits, are covered with vineyards, corn-fields, meadows, and pafture-grounds. Here are, likewife, no Alps, nor rocky precipices, no cataracts, few trees, and in fummer neither fnow or ice. The mountains, inftead of being interrupted by vaft chafms or abyffes, are generally entire, and compofed of a few fmall eminences, the fummits of which, far from fhooting out into peaks, are flat or round, to the extent of many miles, without any confiderable inequality, and frequently afford not only pafturage, but alfo arable ground. It is only during long rains, that in thefe parts the clouds fink below the eminences. Great numbers of petrifactions, more particularly of marine fhells and plants, are found among them. The fields, too, though generally ftony, are fertile, and the meadows in moft places are planted with fruit-trees. This more level part of Switzerland is watered only by a few rivers, but thofe large. Slate, black and variegated marble, porphyry, gypfum, alabafter, cryftal, faltpetre, falt, coal, &c. abound here, with filver, copper, lead, and iron ores. Gold-duft is found in the fands of feveral rivers. The levels and valleys produce grain, but that not in a fufficiency to anfwer all their demands of home confumption. Barley is fowed on the very ice mountains, the oats in a warmer foil, rye in a warmer ftill, and the warmeft of all is affigned to fpelt. In moft parts a threefold produce is accounted a tolerable harveft. Flax, hemp, and tobacco, are much cultivated and worked, though not in fufficient quantity. The Vaudois, the cantons of Bern and Schafhaufen, the Valteliæ, and the Valais, produce the beft wines in Switzerland, and of various forts. Apples, pears, nuts, cherries, plums, and cheftnuts, are plentiful; and the part towards Italy abounds in peaches, morelles, almonds, figs, citrons, pomegranates, and others of the more delicate fruits: faffron is cultivated in the Valais. The inhabitants derive their principal fubfiftence from their cattle; both the valleys and Alps, or middle parts of their enormous mountains, yielding excellent fodder. In the beginning of the fummer, the cattle are driven up among the Alps, and there committed to the care of certain perfons ftyled Sennes, who are either accountable to the owners for the milk, butter, and cheefe, or agree to pay them a certain fum for the temporary profit thereof. The Sennes on all the Alps, likewife, keep hogs, which are fed with the whey after making the butter and cheefe. The Swifs cheefe is much efteemed in other parts of Europe, but the beft is that of Bern, and Griers in the canton of Friberg. Great numbers of horfes are brought up here for the French cavalry. Of wild animals, the chamois and the marmozet are the moft remarkable. Among the Alps is found a fpecies of hares, which in fummer perfectly refemble other hares, but in winter become all over white, infomuch that they are fcarce diftinguifhable among the fnow. Here are, alfo, yellow and white foxes in great numbers, which in winter come down to the valleys. The lammergeyer, which delights in the higheft peaks, is a large bird of the eagle kind, and its wings are fourteen feet in breadth. This bird preys alike on wild and tame animals. There are befides feveral edible fowls here, fuch as the morcock, the rail, the fnipe, the partridge, and fome others. The principal rivers are the Rhine, the Rhône, the Reufs, the Aar, the Adda, and the Tefino, with many others that join them. The principal lakes are thofe of Geneva, Neufchâtel, Biel, Zurich, the

Waldſtatter, Thun, and Brien, with many more. That part of the lake of Conſtance which waters the borders of Thurgau and the abbey of St. Gall, belongs alſo to Switzerland. Switzerland is better cultivated and more populous than foreigners uſually imagine, though, in proportion to its extent, the number of towns, villages, and people, here falls much ſhort of that in many other European countries. In ſeveral provinces there is not ſo much as one ſingle town, and in the whole country very little more than a hundred. The Proteſtant cantons are ſaid to be better inhabited, and more wealthy, than the Roman-catholic. The total number of the inhabitants is computed at two millions; which are divided into three claſſes, the peaſants, nobles, and burghers. The inhabitants in general ſpeak German, and this is likewiſe the language in which all their ſtate and public affairs are tranſacted, as alſo thoſe in the republic of the Griſons and the Valais. In a part of the town of Friburgh and its dependences, with thoſe of Bern and the city of Geneva, as alſo in part of the Upper and all the Lower Valais and the principality of Neufchâtel, the French is uſed, but that generally the Patois, or a corrupted language. In ſeveral diſtricts of the Griſons they ſpeak the Romanſh. In the Upper Griſons, and ſeveral diſtricts, as alſo in the Valteline, Chiavenna, and Bormio, the Italian language prevails, with different degrees of purity. The ſciences are cultivated in Switzerland, with an application equal to that of any other nation, and the many eminent ſcholars it has produced are illuſtrious proofs of genius. The manufactures of Switzerland are various, and conſiderable in linen, ſilk, cotton and woollen, leather, hats, gloves, paper, pottery, clocks, watches, hardware, toys, and many others; beſides which the principal exports are cheeſe, butter, cattle, ſheep, horſes, and ſome wine, conveyed from place to place by means of pack-horſes, the roads often being impracticable for carriages. The imports are principally grain, hemp, flax, wine, ſalt, and ſome manufactures. The ancient Helvetians were a Gauliſh or Celtic people, and Helvetia, which received its name from them, was divided into four cantons or territories. Julius Cæſar was the firſt who reduced the inhabitants under the dominion of the Romans, and theſe founded colonies here under the names of Julia Equeſtris, Auguſta Raurocorum, and Aventicum. Their dominion continued till the 5th century, when the country was over-run by the Burgundians and Germans; but ſoon after the Franks made themſelves entire maſters of it. On the deceaſe of Louis I. king of the Franks, and emperor of the Romans, the ſouth or Burgundian part of Helvetia devolved to the emperor Lotharius, and the northern, or that of Allemain, to king Louis the German. Lotharius II. ſon to the former, and king of Auſtraſia, retained the ſouth part of Helvetia, which, together with Burgundy, or Franche Comté, was ſtyled the Leſſer Burgundy. After his demiſe, this ſouthern part alſo devolved to Louis the German, who thus became poſſeſſed of all Switzerland, and from him it deſcended to his ſon, Charles the Fat. In 888, Rodolphus, duke of the Leſſer Burgundy, took on him the title of king, but the north part of Switzerland continued under the dominion of the emperor Arnolphus. Rodolphus II. ſon to the former, obtained a grant of the Argau from the emperor Henry I. This prince was ſucceeded by his ſon Conrad, as the latter again was by his ſon Rodolphus III. who, in 1032, by a formal will, bequeathed his kingdom of the Leſſer Burgundy to the emperor Conrad II. whereby all Switzerland once more became united to the German empire. In the 13th century, it became a third time a nominal province of the German empire, which, however, was poſſeſſed of little real authority here. A great part of the country was in the hands of the clergy, and the remainder in general of particular nobles. The inhabitants of Uri, Schweitz, Unterwald, and the territory of Haſli, were, from time immemorial, poſſeſſed of the right of being governed by their own magiſtrates, with other important privileges, and, in the 12th century, the three firſt entered into an alliance, which they ſolemnly renewed every tenth year. They had always declared themſelves averſe to the authority of the emperor's ſtadtholder in Switzerland, till, in 1209, Otho IV. compelled them to receive Rodolphus III. count of Habſburgh, as his repreſentative, though he was to take an oath that he would govern according to law and equity, and make no encroachments upon their rights and liberties. This nobleman ſeems to have been little obſervant of that engagement; for, in 1231, we find them unanimouſly addreſſing the emperor, Henry VII. to recal him, which he accordingly did, farther confirming to them all their privileges. In 1249, the like was done by his ſucceſſor, Frederick. In 1257, during the interregnum, in conſideration of his great power, they choſe for their protector Rodolphus V. count of Habſburgh, who, in 1273, became emperor of Germany. At the ſolicitation of his ſon, Albert, duke of Auſtria, he intended to have erected a particular dukedom in Switzerland, which deſign did not tranſpire till ſeveral years after, when it appeared that he had purchaſed of the abbot of Murbach the town of Lucern, with his revenues, and prerogatives in ſeveral villages in the territory of Schweitz. Theſe three diſtricts, on the death of Rodolphus, faithfully adhered to his ſucceſſor, the emperor Adolphus, which gave ſo much offence to his ſon, duke Albert, that on his acceſſion to the crown of Germany, on the death of the latter, he diſplayed his reſentment in more than one inſtance, not only refuſing peremptorily to confirm their privileges, without vouchſafing to allege any reaſon for his refuſal, but likewiſe ſetting over them two noblemen of the moſt infamous character for avarice and arrogance, whoſe adminiſtration became quite inſupportable. On this, ſeeing that nothing leſs was in agitation than the total deprivation of their liberties, and the bringing them under the yoke of Auſtria, they united in a firm reſolution to defend themſelves to the laſt extremity. They accordingly choſe for commanders three gentlemen of approved courage and abilities; namely, Werner (or Gerhard) Stauffach, of Schweitz, Walthur Furſt, of Uri, and Arnold Melchthal of Unterwald; who ſecretly agreed together, that on the firſt day of the year 1308, they ſhould ſurpriſe and demoliſh the caſtles in which the Imperial governors reſided. This reſolution being effected, theſe three places joined again in a league for ten years, which gave birth to the Helvetian confederacy. Schweitz being the moſt powerful of the three confederate places, and the firſt meeting of the confederates held at Brunnen, in its territories, as alſo the firſt league concluded there, and after that the firſt battle, by the ſucceſs of which the liberty of the confederates was retrieved, being fought within its juriſdiction, its name was given to the general confederacy. The emperor Albert thinking this was the ſeaſon for totally reducing theſe three places by force of arms, haſtened to Baden, to begin the preparations, but being, on his return, murdered by his brother's ſon, John of Habſburgh, the deſign was dropped; ſtill not long after, the houſe of Auſtria invented another pretence for falling on the United Cantons. For theſe and other parts of Switzerland, adhering to the emperor Louis of Bavaria, his competitor, Frederic of Auſtria, was ſo extremely irritated at it, that the Schweitzers having, during their conteſts with the abbey of Einſidlen, made ſome of its monks priſoners, put them under the ban, to which the biſhop of Conſtance added excommunication. The former was taken off again by the emperor Louis, and the latter by the archbiſhop of Mentz. Leopold, duke of Auſtria, by virtue alſo of a commiſſion from his brother Frederic above mentioned, in 1315, attacked

the confederates with a powerful army, but was defeated by them at Morgarten. Hereupon, on the 8th of December of the same year, they entered into a perpetual alliance, which proved the origin of the present Helvetian confederacy. In the year 1332, Lucern acceded to it; in 1351, Zurich and Glarus; and in 1352 their number was increased by the coalition of Zug and Bern. For the space of 125 years, this confederacy was composed only of these eight territories or cantons, on which account, they are to this day called the Old Cantons. In the year 1481, Friburg and Soleure; and in 1501, Bâle and Schafhausen were admitted in the confederacy; and in 1513 Appenzell also acceded to it. These thirteen towns and countries, which properly constitute the Helvetian republic, are united by a reciprocal convention, which, though not in all places the same, and the unions of the eight old, and five later cantons differing in certain respects, yet in the principal points nearly agree: the first and chief article, relating to the succours, assistance, and protection, to be given to any one of them in case of any unjust violence, and determining in what manner, and by whom the reasons for any military enterprise shall be discussed, as also how and where such succour shall be given, and stating both the expences of the war, and the distribution of any acquisitions. The second article regulates their procedure in accommodating any differences which may arise between two or more towns or cantons, &c. In some leagues, and particularly in those of the old towns, it is permitted to enter into any other connections at pleasure, provided such connections do not affect the original confederacy; but in the conventions with the later towns and cantons, it is expressly stipulated that they shall not contract any engagements without the privity, advice, and consent of the old ones. The federal union, however, extends no farther than to the succours stipulated in the leagues, and other cases set forth in the same; in all other incidental affairs relative to the confederacy, the majority of votes is not obligatory to the whole body; particularly with respect to the making of alliances with foreign powers, wherein every town and canton is at liberty to act as a contracting party or not, and that even though such alliance should have been approved of by all the other towns and cantons. Thus the whole Helvetian body consists properly of thirteen distinct republics or free states, united by oath for their mutual security and maintenance. It has now for some centuries supported itself in an absolute freedom and independency, enjoyed all the privileges of majesty, made wars, concluded treaties, received and sent envoys from and to the several European powers, entered into alliances with them, given what form they thought proper to their constitution, enacted laws and ordinances both in temporal and spiritual affairs, and exercised all the various prerogatives of sovereignty. Accordingly, at the peace of Westphalia, in 1648, it was acknowledged to be a free state, even by the emperor and empire. The form of government in the several states of the Helvetian republic, is in some monarchical, in others aristocratical, and in others again democratical. Their sovereigns are the princes of the empire, such as the bishop of Bâle, and the abbot of St. Gall. The aristocratical governments are, the cantons of Zurich, Bâle, and Schafhausen, with some incorporate places, for example, the towns of St. Gall, Muhlhausen and Biel, the cantons of Bern, Lucern, Friburg and Soleure, over which are appointed Schultherszen or justiciaries, and Neufchatel and Geneva. The democratical form of government prevails in the six cantons of Uri, Schweitz, Underwalden, Zug, Glarus, and Appenzell, which are under the direction of Landammans; as also, though with some variation in the Grisons and the Valais, but in all, every male of the age of sixteen has a vote; with respect to their military establishment, the only regular forces here, are those of the garrisons of Zurich, Bern, Bâle, Geneva, and Aarburg; but every burgher, peasant, and subject, is diligently to exercise himself in the use of arms, to appear on the stated days for shooting at a mark, to furnish himself with proper clothing, accoutrements, powder and ball, to be always ready for the defence of his country, and punctually to comply with every article of war. Switzerland is well provided with arsenals, particularly at Bern; but the only fortified places in it are Geneva, Soleure, Zurich, Bern, Bâle, and Aarburg. The Switzers engage in the service of foreign princes and states, either merely as guards, or as marching regiments: in the latter case, the government permits the enlisting volunteers, though only in such states as they are in alliance, or have entered into a previous agreement with; and no subject is to be forced into foreign service, nor even to be enlisted, without the concurrence of the magistracy. All the advantages arising to the regencies from these levies, are usually only an annual subsidy paid by the state in whose favour the levies are thus granted; and perhaps a promise of reciprocal aid when necessary. A public benefit, however, attending this custom, is, that these men returning home after a long service abroad, are a great improvement to the standing militia of their country. The protestant cantons are Zurich, Bern, Bâle, and Schafhausen. The Roman-catholic cantons are Lucern, Uri, Schweitz, Underwalden, Zug, Friburg and Soleure. The mixed are Glarus and Appenzel. The confederates are the abbot of St. Gall and the Valais, Roman-catholic. The Grisons, towns of Geneva, St. Gall, Bienne, Muhlhausen, and Neufchâtel, Protestants; and bishopric of Bâle, mixed. The independent states under the protection of the states or the allies are Gerisau, Engelberg, and Kapperschwiel, Roman-catholics; and Haldenstein, Protestants. The subjects are Baden, Morat, Granson, Echalen, Orbe, Schwartzenburg, Werdenberg, and Bienne, Protestants; the free bailiwicks, Utznach, Gaster, the Italian bailiwicks, Roman-catholics; and the Thurgau, Rheinthal, Sargans, and Tockenburg, mixed. This once happy country has lately been deprived of its independence by the French.

SWIVELS, a kind of ring made to turn round in a staple or other ring. These are used when a ship lies at her moorings; also in tedders for cattle, that they may turn round without unwarping the tedder.

Swivel-*Cannon*, is a small piece of artillery belonging to a ship of war, which carries a shot of half a pound, and is fixed in a socket on the top of the ship's side, stern, or bow, and also in her tops. The trunnions of this piece are contained in a sort of iron crotch, of which the lower end terminates in a cylindrical pivot resting in the socket, so as to support the weight of the cannon. The socket is bored in a strong piece of oak, reinforced with iron hoops, in order to enable it to sustain the recoil. By means of this frame, which is called the *swivel*, and an iron handle on its cascable, the gun may be directed by the hand to any object, it is therefore very necessary in the tops, particularly when loaded with musket-balls, to fire down on the upper decks of the adversary in action.

SWORD, an offensive weapon worn at the side, and serving either to cut or stab. Its parts are, the handle, guard, and blade; to which may be added the bow, scabbard, pummel, &c.

Sword *of State*, which is borne before the king, lords, and governors of counties, cities, or boroughs, &c. For or before the king, it ought to be carried upright; the hilt as low as the bearer's waist, the blade up between his eyes. For or before a duke, the blade must decline from the head, and carried between the neck and the right shoulder. For or before an earl, the blade is to be carried between the point of

the ſhoulder and the elbow: and for or before a baron, the blade is to be borne in the bend of the arm. This ceremonial form no leſs denotes the dignity of a governor than the coronet ſet on his coat of arms.

SWORD-*Fiſh* See XIPHIAS.

SWORN BROTHERS *(fratres jurati)*, perſons who, by mutual oath, covenanted to ſhare each other's fortune. Formerly, in any notable expedition to invade and conquer an enemy's country, it was the cuſtom for the more eminent ſoldiers to engage themſelves by reciprocal oaths to ſhare the rewards of their ſervice. This practice gave occaſion to the proverb of *ſworn brothers* or *brethren in iniquity*, becauſe of their dividing plunder and ſpoil.

SYCAMORE-TREE, in botany. See ACER.

SYCOPHANT, an appellation given by the ancient Athenians to thoſe who informed of the exportation of figs contrary to law; and hence is is ſtill uſed in general for all inmers, paraſites, flatterers, cheats, &c.

SYDENHAM (Dr. Thomas), an excellent Engliſh phyſician, was the ſon of William Sydenham of Winford Eagle in Dorſetſhire, and was born there about the year 1624. He ſtudied at Magdalen-hall, Oxford; but left that univerſity when Oxford was garriſoned for King Charles I. and went to London: where, becoming acquainted with Dr. Thomas Cox, an eminent phyſician, that gentleman perſuaded him to apply himſelf to the ſtudy of phyſic; accordingly, after the garriſon was delivered up to the parliament, he retired again to Magdalen-hall, entered on the ſtudy of medicine, and in 1648 was created bachelor of phyſic. Soon after, he was made a fellow of All-Souls College, and continued there ſeveral years: when, leaving the univerſity, he ſettled at Weſtminſter, became doctor of his faculty at Cambridge; grew famous for his practice; and was the chief phyſician in London from the year 1660 to 1670; at which period he began to be diſabled by the gout. He died in 1689. His works are highly eſteemed both at home and abroad. He was famous for his cool regimen in the ſmall-pox; for giving the bark after the paroxyſm in agues; and for his uſe of laudanum. He regulated his practice more by his own obſervations and inquiries, than by the method either of his predeceſſors or contemporaries.

SYDEROPŒCILUS, in natural hiſtory, the name of a ſtone mentioned by the ancients. It was found in Arabia, and ſeems to have obtained this name from its being ſpotted with a ferruginous colour. The deſcriptions of the ancients are, however, in this, as in many other inſtances, too ſhort to ſuffer us to gueſs what ſtone they meant.—This might poſſibly be a granite with ſpots of this peculiar colour.

SYENE, an ancient city of Egypt, ſituated, according to Mr. Bruce, in north latitude 24° 0′ 45″. Pliny and Strabo both ſay that it lay directly under the tropic of Cancer. Whether Mr. Bruce's authority be ſufficient to overturn the evidence of Pliny and Strabo, we ſhall leave to others to determine. Syene is remarkable for being the place where the firſt attempt was made to meaſure the circumference of the earth. This was done by Eratoſthenes, whom Ptolemy Euergetes had invited from Athens to Alexandria. In this attempt two poſitions were aſſumed, viz. that Alexandria and Syene were exactly 5000 ſtadia diſtant from each other, and that they were preciſely under the ſame meridian: but both theſe are denied by Mr. Bruce, who has made many obſervations on the ſubject, which our limits will not allow us to take notice of at preſent. He tells us, that there is at Aſum an obeliſk erected by Ptolemy Euergetes, the patron of Eratoſthenes, without hieroglyphics, directly facing the ſouth, with its top firſt cut into a narrow neck, then ſpread out like a fan into a ſemicircular form, with pavements curiouſly levelled to receive the ſhade, and make the ſeparation of the true ſhadow from the penumbra as diſtinct as poſſible. This is ſuppoſed by Mr. Bruce to have been conſtructed with a deſign to vary the experiment of Eratoſthenes with a larger radius; and the inquiry concerning the dimenſions of the earth, in our author's opinion, was the occaſion of many obeliſks being erected in this kingdom; a demonſtration of which is, that the figure of the top is varied; being ſometimes very ſharp, and ſometimes a portion of a circle, in order to get rid of the great impediment ariſing from the penumbra, which makes it difficult to determine the length of the ſhadow with preciſion. It is now called *Aſſouan*.

SYLLA (Lucius Cornelius), was deſcended from the illuſtrious family of the Scipios. His behaviour in his younger years by no means correſponded with the excellent education which he had received. But debauchery, inſtead of bringing along with it infamy and ruin, its uſual attendants, ſerved only to increaſe the wealth of this fortunate Roman; for Nocopolis, a rich courtezan, whoſe affections he had gained, left him heir to her great eſtate.—He learned the art of war under Marius, whom he attended to Numidia in quality of queſtor. His warlike exploits are recorded in the Roman hiſtory. Before he retired from public affairs he held the office of dictator for two years. After a life of cruelty and debauchery, he died of the morbus pedicularis, in the 60th year of his age. His body, according to his orders, was burnt. A little before his death he wrote his epitaph; the tenor of which was, that no man had ever exceeded him in doing good to his friends or injury to his enemies. It was Sylla who recovered the works of Ariſtotle at the taking of Athens.

SYLLABLE, in grammar, one or more letters pronounced by a ſingle impulſe of the voice, forming a complete ſound, and conſtituting a word or a part of a word. No ſingle letter can form a ſyllable except a vowel. The longeſt ſyllable in the Engliſh language is the word *ſtrength*. The moſt natural way of dividing words into ſyllables is, to ſeparate all the ſimple ſounds of which any word conſiſts, ſo as not to divide thoſe letters which are joined cloſe together according to the moſt accurate pronunciation.

SYLLABUB, a well-known compound uſually drank in the ſummer ſeaſon; ordinarily made of white wine and ſugar, into which is ſquirted new milk, by milking it from the cow.

SYLLABUS, in matters of literature, denotes a table of contents, or an index of the chief heads of a book or diſcourſe.

SYLLOGISM, in logic, an argument or term of reaſoning, conſiſting of three propoſitions, the two firſt of which are called *premiſes*, the laſt, the *concluſion*. See Logic.

SYLVIA, in natural hiſtory, a new genus of birds, belonging to the order of paſſeres, formed by Dr. Latham by limiting the motacilla to the wagtail, and arranging the other ſpecies, formerly claſſed under that genus, under the ſylvia. The motacilla he thus deſcribes: the beak is ſubulated, ſlender, and ſomewhat indented at the point. The tongue ſeems torn at the end, and the tail is long. He thus characterizes the ſylvia: the beak is ſubulated, ſtraight, and ſmall; the mandibles are nearly equal. The noſtrils are obovate, and a little depreſſed. The exterior toe is joined at the under part to the baſe of the middle one. The tongue is cloven, and the tail is ſmall. He makes 13 ſpecies of the motacilla, and 174 ſpecies of the ſylvia. See MOTACILLA.

SYMBOL, a ſign or repreſentation of ſomething moral, by the figures or properties of natural things. Hence ſymbols are of various kinds; as hieroglyphics, types, enigmas, parables, fables, &c.

SYMMACHUS, a citizen and ſenator of ancient Rome, and conſul in the year 391, has left us ten books of epiſtles; from which, as well as from other things, we collect, that

he was a warm oppoſer of the chriſtian religion. He was baniſhed from Rome by Valentinian on ſome account or other, but afterwards recalled and received into favour by Theodoſius. Ammianus Marcellinus ſpeaks of him as a man of great learning and modeſty. Scioppius, Pareus, and other learned men, have written notes upon the epiſtles of Symmachus: we know of no later edition of them than that of Frankfort, 1642, 8vo. Ambroſe, biſhop of Milan, wrote againſt Symmachus, and ſo did the chriſtian poet, Prudentius.

SYMMETRY, the juſt proportion of the ſeveral parts of any thing, ſo as to compoſe a beautiful whole.

SYMONDSBOROUGH, a remarkably large barrow of Flints, near Wellington in Devonſhire, in the northern extremity of Hemyock. The common people have a notion that a king called *Symon* was buried here. The tradition of the country plainly ſhows that it was the burial-place of ſome perſon or perſons of eminence.

SYMPATHETIC, ſomething that acts or is acted upon by ſympathy. Thus we ſay, ſympathetic diſeaſes, inks, &c.

SYMPATHETIC *Inks*. See INK, *Sympathetic*.

SYMPATHY, an agreement of affections and inclinations, or a conformity of natural qualities, humours, temperaments, which make two perſons delighted and pleaſed with each other.

SYMPATHY, alſo denotes the quality of being affected by the affection of another; and may ſubſiſt either between different perſons or bodies, or between different parts of the ſame body. It is either ſimilar or diſſimilar; ſimilar, when the affection or action in the ſympathiſer is ſimilar to the affection or action in the ſympathant; and diſſimilar, when thoſe are different.—Sympathy, too, is often an imitative faculty, ſometimes involuntary, frequently without conſciouſneſs: thus we yawn when we ſee others yawn, and are made to laugh by the laughing of another. The moſt agreeable as well as odious objects operate in a ſecondary way, in producing thoſe ſympathetic impreſſions and actions which they commonly give riſe to. An increaſed ſecretion of ſaliva often takes place at the ſight of a favourite diſh: and the running of water from a bottle, or otherwiſe, will ſometimes affect individuals of a particular temperament, with an involuntary propenſity to void urine. Many have attempted to account for the remarkable ſympathy which takes place between parts of the body ſeemingly unconnected with each other; but as theſe attempts are merely conjectures, without any ſolid principles to reſt on, we paſs them over as the dreams of ingenious men. It would be fortunate for ſcience, if men would confine themſelves to thoſe ſubjects which can be known, and never draw concluſions till they have eſtabliſhed principles.

SYMPHONIA, in botany; a genus of plants, belonging to the claſs of *monodelphia*, and order of *pentandria*.—There is one piſtil. The corolla is globular, and the berry five-celled. There is only one ſpecies yet diſcovered, the globulifera.

SYMPHONY, in muſic, properly denotes a conſonance or concert of ſeveral ſounds agreeable to the ear, whether vocal or inſtrumental, called alſo *harmony*. See HARMONY.

SPMPHYSIS, in anatomy, one of the kinds of junctures or articulation of the bones. See ANATOMY.

Cutting the SYMPHYSIS *of the Pubes*. See MIDWIFERY.

SYMPHYTUM, COMFREY, in botany: a genus of plants belonging to the claſs of *pentandria*, and order of *monogynia*; and in the natural ſyſtem ranging under the 41ſt order *aſperifoliæ*. The limb of the corolla is tubular and ventricoſe, and the throat is ſhut with awl-ſhaped rays. There are three ſpecies; the officinale, tuberoſum, and orientale.—The officinale is a Britiſh plant. The ſtem is about two feet high, round, branched, green, and rough. The radical leaves are very large and rough; thoſe on the ſtalk are decurrent, and alternate. The flowers grow on looſe ſpikes, and are either of a yellowiſh or purple colour. It grows on the banks of rivers, and flowers from May to October.

SYMPLOCE, συμπλοκη, in rhetoric, a figure, where the ſame word is repeated ſeveral times in the beginning and end of a ſentence, including the ANAPHORA and EPITROPHE: thus, *Quis legem tulit? Rullus. Quis majorem populi partem ſuffragiis privavit? Rullus. Quis comitiis præfuit? Idem Rullus.*

SYMPLOCOS, in botany: a genus of plants belonging to the claſs of *polyadelphia*, and to the order of *polyandria*; and in the natural ſyſtem ranging under thoſe the order of which has not been determined. The calyx is quinquefid and inferior: the corolla is pentapetalous: the ſtamina are attached to the tube of the corolla in a fourfold ſeries. Only one ſpecies, the martinicenſis, is mentioned by Linnæus; but l'Heritier of the Academy of Sciences at Paris had added four more, the ciponima, arechea, tinctoria, and alſtonia.

SYMPOSIARCH, in antiquity, the director or manager of an entertainment. This office was ſometimes performed by the perſon at whoſe charge the entertainment was provided; ſometimes by another named by him; and at other times, eſpecially in entertainments provided at the common expence, he was elected by lot, or by the ſuffrages of the gueſts.

SYMPTOM, in medicine, any circumſtance which indicates the exiſtence, nature, or ſtage of a diſeaſe. Pain, waking, drowſineſs, convulſions, ſuppreſſion of urine, difficulties of breathing and ſwallowing, coughs, diſtaſtes, nauſeas, thirſts, ſwoonings, faintings, looſeneſs, coſtiveneſs, dryneſs and blackneſs of the tongue, are the principal *ſymptoms* of diſeaſes. See MEDICINE.

SYMPTOMATICAL, in medicine, is a term often uſed to denote the difference between the primary and ſecondary cauſes in diſeaſes: thus a fever from pain is ſaid to be ſymptomatical, becauſe it riſes from pain only.

SYNÆRESIS, CONTRACTION, in grammar, a figure whereby two ſyllables are united in one; as *vemens* for *vehemens*.

SYNAGOGUE, among the Jews, was a place where people met to worſhip God. Authors are not agreed about the time when the Jews firſt began to have ſynagogues:—Some will have them as old as the Ceremonial Law, and others fix their beginning to times after the Babyloniſh captivity. They erected ſynagogues not only in towns and cities, but alſo in the country, eſpecially near rivers, that they might have water for their purifications and ceremonious waſhings. No ſynagogue was built in any town, unleſs there were ten perſons of leiſure in it; but there might be many in one town, or in one quarter of a town, provided it was very populous. Jeruſalem is ſaid to have contained 480. The chief things belonging to a ſynagogue were, 1. The ark or cheſt, made after the model of the ark of the covenant, containing the *Pentateuch*. 2. The pulpit and deſk in the middle of the ſynagogue, in which he that was to read or expound the law ſtood. 3. The ſeats or pews for the people. 4. The lamps to give light at evening ſervice, and the feaſt of dedication. 5. Rooms or apartments for the utenſils and alms-cheſts. The ſynagogue was governed by a council or aſſembly, over whom was a preſident, called *The Ruler of the Synagogue*. Theſe are ſometimes called *Chiefs of the Jews*, *The Rulers*, *The Prieſts* or *Elders*, *The Governors*, *The Overſeers*, *The Fathers of the Synagogue*. Their buſineſs was to

punish the disobedient by censures, by excommunication, or by penalties, such as fines and scourging; to take care of the alms, which are frequently called by the name of righteousness. The chief ruler, or one of the rulers, gave leave to have the law read and expounded, and appointed who should do it. In every synagogue, there were several ministers who had different offices assigned to them. Service was performed three times a-day, viz. in the morning, in the afternoon, and at night; at the time of morning sacrifice, evening sacrifice, and after the evening sacrifice on Mondays, Thursdays, and Saturdays, there was a more forcible obligation upon the people to attend than upon the other days. There are synagogues at London, Amsterdam, Rotterdam, Avignon, Metz, &c.

SYNALŒPHA, in grammar, a contraction of syllables, performed principally by suppressing some vowel or diphthong at the end of a word, on account of another vowel or diphthong at the beginning of the next. As, *ill' ego*, for *ille ego*, &c. It is called by the Latins *collisio*.

SYNCELLUS, or SINCELLUS, an ancient officer in the family of the patriarchs, and other prelates of the eastern church. The word, in the corrupt Greek, συγκηλλος, signifies a person who lies in the chamber with another; a *chamber-fellow*, or *chum*. The syncellus was an ecclesiastic, who lived with the patriarch of Constantinople, to be a witness of his conduct; whence it is, that the syncellus was also called the *patriarch's eye*, because his business was to observe and watch. The other prelates had also their syncelli, who were clerks living in the house with them, and even lying in the same chamber, to be witnesses of the purity of their manners. Afterwards the office degenerated into a mere dignity; and there were made syncelli of churches—At last it became a title of honour, and was bestowed by the emperor on the prelates themselves; whom they called *pontifical syncelli*, and *syncelli Augustales*.

SYNCHRONISM denotes the happening of several things at the same time. See CHRONOLOGY.

SYNCOPATION, in music, denotes a striking or beating of time, whereby the distinction of the several times or parts of the measure is interrupted. However, it is more properly used for the connecting the last note of any measure, or bar, with the first of the following measure, so as only to make one note of both. A syncope is sometimes also made in the middle of a measure. Syncopation is also used when a note of one part ends or terminates on the middle of a note of the other part. This is otherwise denominated *binding*. It is likewise used for a driving note; that is, when some shorter note at the beginning of a measure, or half measure, is followed by two, three, or more longer notes before another short note occurs, equal to that which occasioned the driving, to make the number even, *e. gr.* when an odd crochet comes before two or three minims, or an odd quaver before two, three, or more crochets. In syncopated or driving notes, the hand or foot is taken up, or put down, while the note is sounding.

SYNCOPE, FAINTING; a deep and sudden swooning, wherein the patient continues without any sensible heat, motion, sense, or respiration, and is seized with a cold sweat over the whole body; all the parts, in the mean time, turning pale and cold, as if he were dead.

SYNCOPE, in grammar, an elision or retrenchment of a letter or syllable out of the middle of a word, as *caldus* for *calidus*.

SYNDIC, in government, and commerce, an officer, in divers countries, intrusted with the affairs of a city or other community, who calls meetings, makes representations and solicitations to the ministry, magistracy, &c. according to the exigency of the case.

SYNECDOCHE, in rhetoric, a kind of trope frequent among orators and poets. See ORATORY.

SYNECPHONESIS, in grammar, a coalition, whereby two syllables are pronounced as one; being much the same as SYNALOEPHA and SYNÆRESIS.

SYNGENESIA (συν and γενεσις, "congeneration)," the name of the 19th class in Linnæus's artificial system; comprehending those plants which have the anthers united into a cylinder. The orders are six: 1. Polygamia æqualis. 2. Polygamia superflua. 3. Polygamia frustranea. 4. Polygamia necessaria. 5. Polygamia segregata. 6. Monogamia. The five first orders contain the compound flowers, and form a class truly natural.

SYNGNATHUS, PIPE-FISH, according to Linnæus, a genus belonging to the class of *amphibia*, and order of *nantes*, but arranged by Gmelin more properly under the class of *pisces*, and order of *branchiostegi*. The head is small; the rostrum somewhat cylindrical, long, and turned up at the point, where the mouth is placed, which is covered with a lid or valve. The gills are covered in the same manner. The body is covered with a strong crust, and has no ventral fins. There are eight species; the tetragonus, typhele, acus, pelagicus, æquoreus, ophidion, barbarus, and hippocampus. Three of these are found in the British seas, *viz.*

1. The *barbarus*, or longer pipe-fish. One described by Sir Robert Sibbald was two feet in length; that examined by Mr. Pennant only 16 inches. The nose was an inch long, compressed sidewise, and the end of the lower mandible turned up; the aperture of the mouth was very small. The irides were red; behind each eye was a deep brown line. The body, in the thickest part, was about equal to a swan's quill, hexangular from the end of the dorsal fin; from thence to the tail, quadrangular. The belly was slightly carinated, and marked along the middle with a dusky line. Under the tail, commencing at the anus, is a sulcus or groove six inches and a half long, covered by two longitudinal valves, which concealed a multitude of young fish. On crushing this part, hundreds may be observed to crawl out.

2. The *acus*, or shorter pipe-fish, is thicker than the former, yet it has been seen of the length of 16 inches. The middle of the body in some is hexangular, in others heptangular. The mouth is formed like that of the former: the irides are yellow: close behind the head are the pectoral fins, which are small and short. On the lower part of the back is one narrow fin; beyond the vent the tail commences, which is long and quadrangular. At the extremity is a fin round and radiated. The body is covered with a strong crust, elegantly divided into small compartments. The belly is white; the other parts are brown.

3. The *ophidion*, or little pipe-fish, seldom exceeds five inches in length, is very slender, and tapers off to a point. It wants both the pectoral and tail fins; is covered with a smooth skin, not with a crust as the two former kinds are. The nose is short, and turns a little up; the eyes are prominent. On the back is one narrow fin. This species is not viviparous: on the belly of the female is a long hollow, to which adhere the eggs, disposed in two or three rows. They are large, and not numerous. The synonym of *serpent* is used in several languages to express these fish: the French call one species *orueul*, from a sort of snake not unlike the blindworm: the Germans call it *meherschlange*; and the Cornish the *sea-adder*.

The Sea-horse, which was classed by Artedi under the Syngnathus, is now, by later ichthyologists, arranged under Trichecus; which see.

SYNOCHA, and Synochus, in medicine, the names of two species of continued fever. See Medicine.

SYNOD, in astronomy, a conjunction or concourse of two or more stars or planets, in the same optical place of the heavens.

Synod signifies also a meeting or assembly of ecclesiastical persons to consult on matters of religion. Of these there are four kinds, viz. 1. *General*, or *œcumenical*, where bishops, &c. meet from all nations. These were first called by the emperors, afterwards by christian princes; till in later ages the pope usurped to himself the greatest share in this business, and by his legates presided in them when called. 2. *National*, where those of one nation only come together, to determine any point of doctrine or discipline. The first of this sort which we read of in England, was that of Herudford or Hertford, in 673, and the last was that held by Cardinal Pole, in 1555. 3. *Provincial*, where those only of one province meet, now called the *convocation*. 4. *Diocesan*, where those of but one diocese meet, to enforce canons made by general councils, or national and provincial *synods*, and to consult and agree upon rules of discipline for themselves. These were not wholly laid aside, till by the act of submission, 25 Hen. VIII. c. 19. it was made unlawful for any *synod* to meet, but by royal authority. See Council and Convocation.

Synods, *Provincial, in the Government of the Church of Scotland*. See Presbyterians.

SYNODALS, or Synodies, were pecuniary rents (commonly of two shillings), paid to the bishop, or archdeacon, at the time of their Easter visitation, by every parish priest. They were thus called, because usually paid in synods; because anciently bishops used to visit and hold their diocesan synods once.—For the same reason, they are sometimes also denominated *synodalica*; but more usually, *procurations*.

SYNODICAL, something belonging to a synod. Thus, synodical epistles are circular letters written by the synods to the absent prelates and churches; or even those general ones directed to all the faithful, to inform them of what had passed in the synod.

SYNOECIA, in Grecian antiquity, a feast celebrated at Athens in memory of Theseus's having united all the petty communities of Attica into one single commonwealth; the seat whereof was at Athens, where all the assemblies were to be held. This feast was dedicated to Minerva; and, according to the scholiast on Thucydides, it was held in the month *Metagitnion*.

SYNONYMOUS, is applied to a word or term that has the same import or signification with another. Several works have been composed for the express purpose of explaining synonymous words. In 1777 a work was published on the Latin synonyma at Paris by M. Gardin Dumesnil. The abbé Girard published one on the synonymous terms of the French language many years ago. Another was published on the same subject in the year 1785 by the abbé Roband. An account of the English synonyma was published by an anonymous author in 1766; which is a close imitation, and in some parts a literal translation, of the abbé Girard's *Synonemes François*. We recollect, too, of seeing some essays of Mrs. Piozzi on the same subject.

SYNOVIA, in medicine, a term used by Paracelsus and his school for the nutritious juice proper and peculiar to each part. The synovia of the joints is a liquor which lubricates and facilitates motion in them.

SYNTAX, in grammar, the proper construction or due disposition of the words of a language into sentences and phrases. See Grammar and Language.

SYNTHESIS, in logic, denotes a branch of method, opposite to analysis. In the synthesis or synthetic method, we pursue the truth by reasons drawn from principles before established or assumed, and propositions formerly proved; thus proceeding by a regular chain, till we come to the conclusion. Such is the method in Euclid's Elements, and most demonstrations of the ancient mathematicians, which proceed from definitions and axioms, to prove propositions, &c. and from those propositions proved to prove others. This method we also call *composition*, in opposition to *analysis* or *resolution*. See Analysis.

SYPHILIS, the same as lues venerea. See Medicine.

SYPHON. See Hydrostatics. Some uncommon phenomena in nature may be accounted for upon the principles of the syphon; as, for instance, that of reciprocating springs. See Pneumatics.

SYRACUSA, a sea-port town of Sicily, in the valley of Noto, and formerly a superb city and flourishing republic; but war, tyranny, and earthquakes, have nearly destroyed it. Of four grand quarters of which the city was composed, only one, Ortygia, which was the smallest, now remains: the other parts are covered with ruins, intermixed with vineyards, fields, and gardens. It is however the see of a bishop, and has a good harbour. In the year 1735 it was taken by the Spaniards: seventy-one miles S. Messina, and 115 S.E. Palermo. Lon. 39. 56. E. Ferro. Lat. 35. 5. N.

SYRIA, a province of Asiatic Turkey; this name is given to the whole space contained between two lines drawn, the one from Alexandretta to the Euphrates, and the other from Gaza, in the desert of Arabia; bounded on the east by this desert, and on the west by the Mediterranean: the Arabians call it *Barr el Sham*. This country is, in some measure, only a chain of mountains, which distribute themselves, in various directions, from one leading branch; and such, in fact, is the appearance it presents, whether we approach it from the side of the sea, or by the immense plains of the desert. These mountains, as they vary their levels and situation, are also greatly changed in their form and appearance. Between Alexandretta and the Orontes, the firs, larches, oaks, box-trees, laurels, yews, and myrtles, with which they abound, give them an air of liveliness which delights the traveller. On some declivities, he even meets with cottages, environed with fig-trees and vineyards; and the sight of these repays the fatigues he has endured on a road which, by rugged paths, leads him from the bottom of valleys to the tops of hills, and from the tops of hills to the bottoms of valleys. The inferior branches, which extend to the northward of Aleppo, on the contrary, present nothing but bare rocks, without verdure or earth. To the south of Antioch, and on the sea coast, the hill sides are proper for the cultivation of tobacco, olives, and vines; but, on the side of the desert, the summits and declivities of this chain are almost one continued series of white rocks. Towards Lebanon, the mountains are lofty, but are covered in many places with as much earth as fits them for cultivation, by industry and labour. There, amid the crags of the rocks, may be seen, the no very magnificent remains of the boasted cedars; but a much greater number of firs, oaks, brambles, mulberry-trees, figs, and vines. As we leave the country of the Druses, the mountains are no longer so high, nor so rugged, but become fitter for tillage; they rise again to the south-east of Mount Carmel, are covered with woods, and afford very pleasant prospects; but, as we advance toward Judea, they lose their verdure, their valleys

grow narrower, they become dry and ſtony, and terminate at the Dead Sea in a pile of deſolate rocks, full of precipices and caverns; while to the weſt of Jordan, and the lake; another chain of rocks, ſtill higher, and more rugged, preſents a ſtill more gloomy proſpect, and announces, afar off, the entrance of the deſert, and the end of the habitable lands. It is an opinion pretty generally received, that Syria is a very hot country; but it will be neceſſary to make ſeveral diſtinctions: firſt, on account of the difference of latitude, which, from one extremity to the other, is not leſs than ſix degrees: ſecondly, from the natural diviſion of the country into low and flat, and high and mountainous, which diviſion occaſions a ſtill more ſenſible difference; for, while Reaumur's thermometer ſtands at twenty-five and twenty-ſix degrees upon the coaſt, it hardly riſes to twenty or twenty-one among the mountains. Syria unites different climates under the ſame ſky, and collects, within a narrow compaſs, pleaſures and productions, which nature has elſewhere diſperſed at great diſtances of times and places. In France, for inſtance, ſeaſons are ſeparated by months, there, we may ſay, they are only ſeparated by hours. If Saide or Tripoli are incommoded by the heats of July, at the diſtance of ſix hours the neighbouring mountains are in the temperature of March; or, on the other hand, if chilled by the froſts of December at Beſharrai, a day's journey brings the traveller back to the coaſt, amid the flowers of May. In ſpite of the barbariſm of a government, which is an enemy to all induſtry and improvement, we are aſtoniſhed at the variety this province affords: beſides wheat, rye, barley, beans, and the cotton-plant, which is cultivated every-where, we find a multitude of uſeful and agreeable productions, appropriated to different ſituations. Paleſtine abounds in ſeſamum, from which oil is procured, and doura as good as that of Egypt. Maize thrives in the light ſoil of Balbek, and even rice is cultivated with ſucceſs. They have lately began to plant ſugar-canes in the gardens of Saide and of Bairout, and they find them equal to thoſe of the Delta. Indigo grows, without cultivating, on the banks of the Jordan, and only requires care to make it of an excellent quality. The hill ſides of Latakia produce tobacco, which is the principal article of its commerce with Damietta and Cairo: this is now cultivated throughout all the mountains. As for the trees, the olive-tree of Provence grows at Antioch and Ramla to the height of the beech; the white mulberry-tree conſtitutes the wealth of the whole country of the Druſes, by the beautiful ſilks which are produced on it, while the vine, ſupported on poles, or winding round the oaks, ſupplies grapes which afford red and white wines, that might rival thoſe of Bordeaux. Gaza produces dates and pomegranates; Tripoli affords oranges; Bairout figs and bananas, not inferior to thoſe of St. Domingo; Aleppo enjoys the excluſive advantage of producing piſtachios; and Damaſcus of poſſeſſing all the fruits known in the milder climates of Europe. On the mountains, and in all elevated plains, which ſtretch to the eaſtward, the air is light, pure, and dry; while on the coaſt, and eſpecially from Alexandretta to Jaffa, it is moiſt and heavy, and exceedingly unwholeſome. In the courſe of a whole ſummer, few clouds are ſeen, and ſtill leſs rain, which only begins about the end of October, and then is neither long nor plentiful: the huſbandmen wiſh for it to ſow what they call their winter crop, that is, their wheat and barley. In December and January the rain becomes more frequent and heavier, and ſnow often falls in the higher country: it ſometimes rains alſo in March and April; and the huſbandman avails himſelf of it for his ſummer crop of ſeſamum, doura, tobacco, cotton, beans, and water-melons. The remainder of the year is uniform, and drought is more frequently complained of than too much wet. Within two thouſand five hundred years we may reckon ten invaſions, which have introduced into that country a ſucceſſion of foreign nations: firſt, the Aſſyrians of Nineveh, who paſſing the Euphrates about the year 750 before the chriſtian æra, within ſixty years obtained poſſeſſion of almoſt the whole country lying to the north of Judea; next the Chaldæans of Babylon, who having deſtroyed the power on which they were dependent, ſucceeded, as by hereditary right, to its poſſeſſions, and completed the conqueſt of Syria, except only the Iſle of Tyre. The Chaldæans were followed by the Perſians, under Cyrus, and the Perſians by the Macedonians, under Alexander. It then ſeemed as if Syria was about to ceaſe being a vaſſal to foreign powers. and to obtain a diſtinct and independent government, according to the natural right of every country; but the people, who found in the Seleucidæ only cruel deſpots and oppreſſors, ſeeing themſelves reduced to the neceſſity of bearing ſome yoke, preferred the lighteſt; and Syria, yielding to the arms of Pompey, became a province of the Roman empire. Five centuries after, when the ſons of Theodoſius divided their immenſe patrimony, this country changed the capital to which it was to appertain without changing its maſters, and was annexed to the empire of Conſtantinople: ſuch was its ſituation, when, in the year 622, the Arabian tribes, collected under the banners of Mahomet, ſeized, or rather laid it waſte. Since that period, torn to pieces by the civil wars of the Fatemites and the Ommiades, wreſted from the califs by their rebellious governors, taken from them by the Turkmen ſoldiery, invaded by the European cruſaders, retaken by the Mamlukes of Egypt, and ravaged by Tamerlane and his Tartars, it has, at length, fallen into the hands of the Ottoman Turks, who have been its maſters near three centuries. The inhabitants may be divided into three principal claſſes: the poſterity of the people conquered by the Arabs, that is, the Greeks of the Lower Empire; the poſterity of the Arabian conquerors; the preſent ruling people, the Ottoman Turks; of theſe three claſſes the former muſt be again ſubdivided, in conſequence of ſeveral diſtinctions which have taken place among them. The Greeks, then, muſt be divided into Greeks Proper, vulgarly called Schiſmatics, or ſeparated from the Romiſh communion. Latin Greeks reunited to that communion, Maronites, or Greeks of the ſect of the monk Maron, formerly independent of the two communions, but at preſent united to the latter. The Arabs muſt be divided into the proper deſcendants of the conquerors, who have greatly intermixed their blood, and are conſiderably the moſt numerous; Motoualis, diſtinguiſhed from theſe by their religion; the Druſes, diſtinct likewiſe from the ſame reaſon; the Anſarians, who are alſo deſcended from the Arabs. To theſe people, who are the cultivators and ſettled inhabitants of Syria, muſt ſtill be added three other wandering tribes, or paſtors, viz. the Turkmen, the Curds, and the Bedouin Arabs: ſuch are the different races diſperſed over the country, between the ſea and the deſert, from Gaza to Alexandretta. In this enumeration, it is remarkable that the ancient inhabitants have no remaining repreſentative; their diſtinguiſhing character is loſt and confounded in that of the Greeks; who, in fact, by a continued reſidence from the days of Alexander, have had a ſufficient time entirely to take place of the ancient people; the country alone, and a few traits of manners and cuſtoms, preſerve the veſtiges of diſtant ages. Syria is divided into five governments, or pachalies, viz. the pachalie of Aleppo, Tripoli, Damaſcus, Acre, and Paleſtine: the whole of which is, by a modern traveller,

computed to bring into the Grand Signior's treasury the sum of 312,500l. sterling. All the troops of the five pachalics united, amount to no more than 5700 men.

SYRINGA, the Lilac, in botany: a genus of plants belonging to the class of *diandria*, and order of *monogynia*; and in the natural system ranging under the 44th order, *Sepiariæ*. The corolla is quadrifid, and the capsule is bilocular. There are three species, the vulgaris, persica, and suspensa. The two first are natives of Persia, and the last of Japan.—The *vulgaris*, which is distinguished by ovate heart-shaped leaves, was cultivated in Britain about the year 1597 by Mr. John Gerard.—The *persica*, which has lanceolate leaves, was cultivated in 1658; but how long both species might have been introduced into Britain before these dates, it is perhaps impossible to ascertain.

SYRINGE, a well-known instrument, serving to imbibe or suck in a quantity of fluid, and to squirt or expel the same with violence. The word is formed from the Greek συριγξ, or the Latin *syrinx* "a pipe"—A syringe is only a single pump, and the water ascends in it on the same principle as in the common sucking-pump. See Hydrostatics.

SYRUP, in pharmacy, a saturated solution of sugar, made in vegetable decoctions or infusions. See Pharmacy.

SYSTEM, in general, denotes an assemblage or chain of principles and conclusions, or the whole of any doctrine, the several parts whereof are bound together, and follow or depend on each other; in which sense we say a *system of philosophy*, a *system of divinity*, &c. The word is formed from the Greek συστημα "composition, compages."

System, in the animal economy, the *vascular*, the *nervous*, and the *cellular*. See Anatomy.

System, in music, an assemblage of the rules for harmony, deduced from some common principle by which they are reunited; by which their connection one with another is formed; from whence, as from their genuine source, they natively flow; and to which, if we would account for them, we must have recourse. See the articles Chromatic, Diatonic, Enharmonic, Harmony, Interval, and Music.

System, in botany. See Botany.

System, in astronomy. See Astronomy.

SYSTOLE, in anatomy, the contraction of the heart, whereby the blood is drawn off its ventricles into the arteries; the opposite state to which is called the *diastole*, or *dilatation of the heart*. See Anatomy.

SYSTYLE, in architecture, that manner of placing columns where the space between the two shafts consists of two diameters or four modules.

SYZYGY, Syzygia, in astronomy, a term equally used for the conjunction and opposition of a planet with the sun. The word is formed from the Greek συζυγια, which properly signifies *conjunctio*. On the phenomena and circumstances of the syzygies a great part of the lunar theory depends. See Astronomy.

T.

T or t, the 19th letter and 16th consonant of our alphabet; the sound whereof is formed by a strong expulsion of the breath through the mouth, upon a sudden drawing back of the tongue from the fore-part of the palate, with the lips at the same time open. The proper sound of *t* is expressed in most words beginning or ending with that letter; as in *take, tell, hot, put*. *Ti* before a vowel has the sound of *si*, or rather of *shi*, as in *creation*, except when *s* precedes, as in *question*; and in derivatives from words ending in *ty*, as, *mighty, mightier*. *Th* has two sounds; the one soft, as *thou, father*; and the other hard, as *thing, think*. The sound is soft in these words, *then, thence*, and *there*, with their derivatives and compounds; and in the words *that, this, thus, thy, they, though*; and in all words in which *th* comes between two vowels, as, *whether, rather*; and between *r* and a vowel, as *burthen*.

In abbreviations, amongst the Roman writers, T. stands for *Titus, Titius*, &c.; Tab. for *Tabularius*; Tab. P. H. C. *Tabularius Provinciæ Hispaniæ Citerioris*; Tar. *Tarquinius*; Ti. *Tiberius*; Ti. F. *Tiberii filius*; Ti. L. *Tiberii libertus*; Ti. N. *Tiberii Nepos*; T. J. A. V. P. V. D. *tempore judicem arbitrumve postulat ut det*; T. M. P. *terminum posuit*; T. M. D. D. *terminum dedicavit*; Tr. *trans, tribunus*; Tr. M. or Mil. *tribunus militum*; TR. PL. DES. *tribunus plebis designatus*; TR. AER. *tribunus ærarii*; TRV. CAP. *triumviri capitales*; T. P. or TRIB. POT. *tribunicia potestate*; Tul. H. *Tullus Hostilius*.

Amongst the ancients, T. as a numeral, stood for *one hundred and sixty*; and with a dash at top, thus, T̄, it signified *one hundred and sixty thousand*. In music T stands for *tutti*, "all, or altogether."

TABANUS, the breese-fly; a genus of insects belonging to the order of *diptera*. The mouth is extended in a fleshy proboscis, terminated by two lips. The rostrum is furnished with two pointed palpi placed on each side of the proboscis, and parallel to it. Gmelin has enumerated 38 species; of which three only are found in Great Britain, the bovinus, pluviatilis, and cæcutiens.

1. The *bovinus*, or great horse fly, has a grey head; the eyes almost of a black brown, occupying the greatest part of it. The thorax is of a grey colour; the abdomen is yellowish, with a triangular white spot on the middle of every ring, which constitutes a longitudinal band of spots, the point of which is directed towards the thorax. The thighs are blackish, and the legs yellow. The wings are somewhat dusky, with brown veins of a deeper dye. This insect is the terror of horned cattle, horses, &c. Its mouth is armed with two sharp hooks which penetrate their hide; while with its proboscis, which is shaped like a sting, it sucks their blood, of which it is very greedy. The puncture of the tabanus is keen and painful. The insect is very common in damp woods and meadows, especially during the great heats, when it is most troublesome. The horned cattle are sometimes so molested by their stings, that they go mad, run down precipices, tear themselves on the stumps of trees, stones, &c.

2. The *pluviatilis* is of an ashen grey colour; its eyes are green, with brown streaks. The thorax is brown, marked with about seven longitudinal grey lines; the wings, which are brown and ash-coloured, are dotted over with small white spots, and have a black spot on the margin; the legs are surrounded with brown and white rings alternately. This species is very common in meadows, and is about four lines in length.

3. The *cacutions* has a brown head; eyes green and brown, with black ſpots; the thorax brown with black ſpots; the abdomen above, yellow with triangular brown ſpots; yellow legs, and white wings with black and brown ſpots. The length is four lines and a half.

TABARCA, a little iſland lying oppoſite to a ſmall town of that name, which divides the maritime coaſts of Tunis and Algiers, in Africa, two miles from the land, in poſſeſſion of the noble family of the Lamellini of Genoa, who have here a governor and a garriſon of 200 men to protect the coral fiſhery. N. Lat. 36. 50. E. Long. 9. 16.

TABASHEER, a Perſian word, ſignifying a hard ſubſtance found in the cavities of the bamboo or Indian reed, and highly valued as a medicine in the Eaſt Indies. Though ſome account was given of the tabaſheer by the Arabian phyſicians, no accurate knowledge of it was obtained till Dr. Ruſſel favoured the public with his obſervations on it.

From his experiments, it appears, that the tabaſheer is the juice of the bamboo thickened and hardened to a certain degree. Its chemical qualities, as far as we have heard, have not yet been minutely examined. The following obſervations on its medical effects were taken from a Perſian work, entitled the "Tofut ul Monein of Mahommed Monein Hoſemy," by Mr. Williams, a ſurgeon in the ſervice of the Eaſt-India company. The tabaſheer puts a ſtop to bilious vomitings and to the bloody flux. It is alſo of ſervice in caſes of palpitation of the heart, in faintings, and for ſtrengthening thoſe members of the body that are weakened by heat. It is uſeful alſo for the piles, and for acute or burning fevers, and for puſtules in the mouth (thruſh); and, given with oxymel, is of ſervice againſt reſtleſſneſs, melancholy, and hypochondriacal affections. The habitual internal uſe of it is prejudicial to the virile powers. It is alſo ſaid to be prejudicial to the lungs. Its correctives are the gum of the pine and honey. The doſe of it is to the weight of two d'herems, or ſeven maſhás.

TABBY, in commerce, a kind of rich ſilk which has undergone the operation of tabbying.

TABBYING, the paſſing a ſilk or ſtuff under a calendar, the rolls of which are made of iron or copper variouſly engraven, which bearing unequally on the ſtuff renders the ſurface thereof unequal, ſo as to reflect the rays of light differently, making the repreſentation of waves thereon.

TABELLIO, in the Roman law, an officer or ſcrivener, much the ſame with our notaries-public, who are often called *tabelliones*.

TABERNACLE, among the Hebrews, a kind of building, in the form of a tent, ſet up, by expreſs command of God, for the performance of religious worſhip, ſacrifices, &c. during the journeying of the Iſraelites in the wilderneſs; and, after their ſettlement in the land of Canaan, made uſe of for the ſame purpoſe till the building of the temple of Jeruſalem. It was divided into two parts; the one covered, and properly called the *tabernacle*; and the other open, called the *court*. The curtains which covered the tabernacle were made of linen, of ſeveral colours, embroidered. There were ten curtains, twenty-eight cubits long and four in breadth. Five curtains faſtened together made up two coverings, which covered up all the tabernacle. Over theſe there were two other coverings; the one of goat's hair, the other of ſheep's ſkins. The holy of holies was parted from the reſt of the tabernacle by a curtain made faſt to four pillars, ſtanding ten cubits from the end. The length of the whole tabernacle was 32 cubits, that is, about 50 feet; and the breadth 12 cubits, or 19 feet. The court was a ſpot of ground 100 cubits long, and 50 in breadth, encloſed by 20 columns, each 20 cubits high and 10 in breadth, covered with ſilver, and ſtanding on copper baſes, five cubits diſtant from one another; between which there were curtains drawn, and faſtened with hooks. At the eaſt end was an entrance, 20 cubits wide, covered with a curtain hanging looſe.

Feaſt of TABERNACLES, a ſolemn of feſtival of the Hebrews, obſerved after harveſt, on the 15th day of the month Tiſri, inſtituted to commemorate the goodneſs of God, who protected the Iſraelites in the wilderneſs, and made them dwell in booths, when they came out of Egypt. On the firſt day of the feaſt, they began to erect booths of the boughs of trees, and in theſe they were obliged to continue ſeven days. The booths were placed in the open air, and were not to be covered with cloths, nor made too cloſe by the thickneſs of the boughs; but ſo looſe that the ſun and the ſtars might be ſeen, and the rain deſcend through them. For further particulars of the celebration of this feſtival, ſee LEVIT. ch. xxiii.

TABERNÆ (anc. geog.) See TRES *Tabernæ*.

TABERNÆMONTANA, in botany: A genus of plants belonging to the claſs of *pentandria*, and order of *monogynia*; and in the natural ſyſtem arranged under the 30th order, *Contortæ*. There are two horizontal follicles, and the ſeeds are immerſed in pulp. There are eight ſpecies, all of foreign growth.

TABLE, a moveable piece of furniture, uſually made of wood or ſtone, and ſupported on pillars or the like, for the commodious reception of things placed thereon. This term is alſo uſed for the *fare* or *entertainment* ſerved up.

TABLE, in mathematics, ſyſtems of numbers calculated to be ready at hand for the expediting aſtronomical, geometrical, and other operations.

TABLE-*Book*. See WRITING.

TABLE-*Mountain*, a mountain of Africa, being the moſt weſterly cape or promontory in that part of the world, and near the Cape of Good Hope. The bay which is formed thereby is called the *Table-bay*.

Laws of the Twelve TABLES, were the firſt ſet of laws of the Romans; thus called either becauſe the Romans then wrote with a ſtyle on thin wooden tablets covered with wax; or rather, becauſe they were engraved on tables or plates of copper, to be expoſed in the moſt noted part of the public forum. After the expulſion of the kings, as the Romans were then without any fixed or certain ſyſtem of law, at leaſt had none ample enough to take in the various caſes that might fall between particular perſons, it was reſolved to adopt the beſt and wiſeſt laws of the Greeks. One Hermodorus was firſt appointed to tranſlate them, and the decemviri afterwards compiled and reduced them into ten tables. After a world of care and application, they were at length enacted and confirmed by the ſenate and an aſſembly of the people, in the year of Rome 303. The following year they found ſomething wanting therein, which they ſupplied from the laws of the former kings of Rome, and from certain cuſtoms which long uſe had authorized; all theſe being engraven on two other tables, made the law of the twelve tables, ſo famous in the Roman juriſprudence, the ſource and foundation of the civil or Roman law.

TABLES *of the Law*, in Jewiſh antiquity, two tables on which were written the decalogue, or ten commandments, given by GOD to Moſes on mount Sinai.

TABOO, a word uſed by the South Sea iſlanders, nearly of the ſame import as prohibited or interdicted. It applies equally to perſons and things, and is alſo expreſſive of any thing ſacred, devoted, or eminent.

TABOR, a mountain of Paleſtine, mentioned in Scripture. This mountain is of the figure of a broken cone, eight hundred or a thouſand yards in height. The ſummit is two-thirds of a league in circumference. Formerly it had a citadel, of which now only a few ſtones remain. From hence we diſcover to the ſouth, a ſeries of valleys and mountains, which extend as far as

Jerusalem; while, to the east, the Valley of Jordan, and Lake Tabaria, appear as if under our feet; the Lake seems as if inclosed in the crater of a volcano.

TACAMAHACA, in pharmacy, a solid resin, improperly called a *gum* in the shops. It exudes from a species of poplar; and is in repute for mitigating pain and aches, and is also reckoned a vulnerary.

TACCA, in botany: a genus of plants belonging to the class of *dodecandria*, and order of *trigynia*. The flower is above. The corolla has six petals, and is vaulted. The calyx is hexaphyllous; the fruit a dry, angular, three-celled berry. There is only one species known, the pinnatifida.

TACITUS (Caius Cornelius), a Roman historian, of whose ancestors nothing is known, so that it is probable the dignity of his family began in his own person; at least, that it was not very considerable before him. His first employ is said to have been that of procurator to Vespasian in Gallia Belgica. Upon his return to Rome, Titus advanced him to a more honourable post; it is not mentioned what; but it is supposed to be the quæstorship, or adileship, as Domitian advanced him to the prætorship. Lastly, he was made consul under Nerva: he was substituted in the place of the excellent Virginius Rufus, who died in his third consulship; and he honoured Rufus with a funeral oration. We know but few circumstances of the life of Tacitus, besides what have been related, only that he married the daughter of Julius Agricola, famous for his exploits in Britain, whose life he has written. Some have pretended that Domitian banished him; but there is no foundation for this fact in history, and Mr. Bayle explodes it as an idle fancy. Lipsius has conjectured, and Mr. Bayle approves the conjecture, that Tacitus was born either in the last year of the reign of Claudius, or in the first of that of Nero; and supposes him to have died in the reign of Hadrian. The time of his death is not known; but all agree that he lived to be old. The remains of Tacitus shew, that the ancients did not think of him more highly than he deserved. He was the greatest orator and statesman of his time; he had long frequented the bar with infinite applause; he had passed through all the high offices of state; he was ædile, prætor, consul; but all these gave him little glory, compared with that which he acquired by the performances of his pen. His "History," which extended from the reign of Galba inclusively, to the reign of Nerva exclusively, was highly esteemed; and his "Annals" equally so. Besides these, there remain of Tacitus "A Treatise of the Situation, Customs, and People of Germany," and a "Life of Julius Agricola;" for as to the Dialogue "De oratoribus, sive de causis corruptæ eloquentiæ," though commonly printed with Tacitus's works, and by some ascribed to him, it is generally, and with reason, supposed to have been written by some other person.

TACK, a rope used to confine the foremost lower corners of the courses and stay-sails in a fixed position, when the wind crosses the ship's course obliquely. The same name is also given to the rope employed to pull out the lower corner of a studding-sail or driver to the extremity of its boom. The main-sail and fore-sail of a ship are furnished with a tack on each side, which is formed of a thick rope tapering to the end, and having a knot wrought upon the largest end, by which it is firmly retained in the clue of the sail. By this means one tack is always fastened to windward, at the same time that the sheet extends the sail to the leeward.

TACK, is also applied, by analogy, to that part of any sail to which the tack is usually fastened. A ship is said to be on the starboard or larboard tack, when she is close-hauled, with the wind upon the starboard or larboard side; and in this sense the distance which she sails in that position is considered as the length of the tack; although this is more frequently called *board*. See that article.

To TACK, to change the course from one board to another, or turn the ship about from the starboard to the larboard tack, in a contrary wind. Thus a ship being close-hauled on the larboard tack, and turning her prow suddenly to windward, receives the impression of the wind on her head-sails, by which she falls off upon the line of the starboard-tack. Tacking is also used in a more enlarged sense, to imply that manœuvre in navigation by which a ship makes an oblique progression to the windward, in a zig-zag direction. This, however, is more usually called *beating*, or *turning to windward*. See NAVIGATION, SAILING, and *Naval* TACTICS.

TACKLE, among seamen, denotes all the ropes or cordage of a ship used in managing the sails, &c.

TACKSMAN. See TENURE.

TACTICS, in the art of war, is the method of disposing forces to the best advantage in order of battle, and of performing the several military motions and evolutions. See WAR.

Naval TACTICS, the art of ranging fleets in such order or disposition as may be judged most convenient, either for attacking, defending, or retreating, to the greatest advantage; and to regulate their several movements accordingly. It is not a science established on principles absolutely invariable, but founded on such reasons as the alteration and improvement of arms must necessarily occasion in a course of time and experience; from which also will naturally result a difference in the construction of ships, in the manner of working them, and, in fine, in the total disposition and regulation of fleets and squadrons. It would be very desirable cursorily to run through this succession and change of arms, &c. to the present improvement of our lines of battle, in order to make us the more sensible of the reasons which have induced the moderns to prefer so advantageous a choice as they now follow in the arrangement of their ships, but the subject is much too copious for the limits of our work.

The ancient galleys were so constructed as to carry several banks of oars, very differently disposed from those in our modern galleys, which, however, vary the least of any others from their ancient model. Advanced by the force of their oars, the galleys ran violently aboard of each other, and by the mutual encounter of their beaks and prows, and sometimes of their sterns, endeavoured to dash in pieces, or sink their enemies.

The prow, for this purpose, was commonly armed with a brazen point or trident, nearly as low as the surface of the sea, in order to pierce the enemy's ships under the water. Some of the galleys were furnished with large turrets, and other accessions of building, either for attack or defence. The soldiers also annoyed their enemies with darts and slings, and, on their nearer approach, with swords and javelins; and in order that their missive weapons might be directed with greater force and certainty, the ships were equipped with several platforms, or elevations above the level of the deck. The sides of the ship were fortified with a thick fence of hides, which served to repel the darts of their adversaries, and to cover their own soldiers, who thereby annoyed the enemy with greater security.

As the invention of gunpowder has rendered useless many of the machines employed in the naval wars of the ancients, the great distance of time has also consigned many of them to oblivion: some few are, nevertheless, recorded in ancient authors, of which we shall endeavour to present a short description. And, 1. The Δελφιν was a large and massy piece of lead or iron, cast in the form of a dolphin. This machine being suf-

pended by blocks at their maſt-heads or yard-arms, ready for a proper occaſion, was let down violently from thence into the adverſe ſhips; and either penetrated through their bottom, and opened a paſſage for the entering waters, or by its weight immediately ſunk the veſſel. 2. The Δρεπανον was an engine of iron crooked like a ſickle, and fixed on the top of a long pole. It was employed to cut aſunder the ſlings of the ſail-yards, and, thereby letting the ſails fall down, to diſable the veſſel from eſcaping, and incommode her greatly during the action. Similar to this was another inſtrument, armed at the head with a broad two-edged blade of iron, wherewith they uſually cut away the ropes that faſtened the rudder to the veſſel. 3. Δορατα ναυμαχα, a ſort of ſpears or maces of an extraordinary length, ſometimes exceeding twenty cubits, as appears by the 15th Iliad of Homer, by whom they are alſo called μακρα. 4. Κεραιαι were certain machines uſed to throw large ſtones into the enemy's ſhips.

Vegetius mentions another engine which was ſuſpended to the main-maſt, and reſembled a battering-ram; for it conſiſted of a long beam and an head of iron, and was with great violence puſhed againſt the ſides of the enemy's galleys. They had alſo a grappling-iron, which was uſually thrown into the adverſe ſhip by means of an engine: this inſtrument facilitated the entrance of the ſoldiers appointed to board, which was done by means of wooden bridges, that were generally kept ready for this purpoſe in the fore-part of the veſſel. See the article Corvus.

The arms uſed by the ancients rendered the diſpoſition of their fleets very different, according to the time, place, and circumſtances of the engagement. They generally conſidered it an advantage to be to windward, and to have the ſun ſhining directly on the front of their enemy. The order of battle chiefly depended on their power of managing the ſhips, or of drawing them readily into form; and on the ſchemes which their officers had concerted. The fleet being compoſed of rowing veſſels, they lowered their ſails previous to the action; they preſented their prows to the enemy, and advanced againſt each other by the force of their oars. Before they joined battle, the admirals went from ſhip to ſhip, and exhorted their ſoldiers to behave gallantly. All things being in readineſs, the ſignal was diſplayed by hanging out of the admiral's galley a gilded ſhield, or a red garment or banner. During the elevation of this, the action continued; and by its depreſſion, or inclination towards the right or left, the reſt of the ſhips were directed how to attack or retreat from their enemies. To this was added the ſound of trumpets; which began in the admiral's galley, and continued round the whole fleet. The fight was alſo begun by the admiral's galley, by grappling, boarding, and endeavouring to overſet, ſink, or deſtroy the adverſary, as we have above deſcribed. Sometimes, for want of grappling irons, they fixed their oars in ſuch a manner as to hinder the enemy from retreating. If they could not manage their oars as dexterouſly as their antagoniſt, or fall along-ſide ſo as board him, they penetrated his veſſel with the brazen prow. The veſſels approached each other as well as their circumſtances would permit, and the ſoldiers were obliged to fight hand to hand till the battle was decided: nor indeed could they fight otherwiſe with any certainty, ſince the ſhorteſt diſtance rendered their ſlings and arrows, and almoſt all their offenſive weapons, ineffectual, if not uſeleſs. The ſquadrons were ſometimes ranged in two or three right lines, parallel to each other; being ſeldom drawn up in one line, unleſs when formed into an half-moon. This order indeed appears to be the moſt convenient for rowing veſſels, that engage by advancing with their prows towards the enemy. At the battle of Ecnomus, between the Romans and the Carthaginians, the fleet of the former was ranged into a triangle, or a ſort of wedge in front, and towards the middle of its depth of two right parallel lines. That of the latter was formed into a rectangle, or two ſides of a ſquare, of which one branch extended behind, and as the opening of the other proſecuted the attack, was ready to fall upon the flank of ſuch of the Roman galleys as ſhould attempt to break their line. Ancient hiſtory has preſerved many of theſe orders, of which ſome have been followed in later times. Thus, in a battle A.D. 1340, the Engliſh fleet was formed in two lines, the firſt of which contained the larger ſhips, the ſecond conſiſted of all the ſmaller veſſels, uſed as a reſerve to ſupport the former whenever neceſſary. In 1545, the French fleet under the command of the Mareſchal d' Annebault, in an engagement with the Engliſh in the Channel, was arranged in the form of a creſcent. The whole of it was divided into three bodies, the centre being compoſed of thirty-ſix ſhips, and each of the wings of thirty. He had alſo many galleys; but theſe fell not into the line, being deſigned to attack the enemy occaſionally. This laſt diſpoſition was continued down to the reigns of James I. and Louis XIII.

Meanwhile, the invention of gunpowder in 1330 gradually introduced the uſe of fire-arms into naval war, without finally ſuperſeding the ancient method of engagement. The Spaniards were armed with cannon in a ſea-fight againſt the Engliſh and the people of Poitou abreaſt of Rochelle in 1372; and this battle is the firſt wherein mention is made of artillery in our navies. Many years elapſed before the marine armaments were ſufficiently provided with fire-arms. So great a revolution in the manner of fighting, and which neceſſarily introduced a total change in the conſtruction of ſhips, could not be ſuddenly effected. In ſhort, the ſquadrons of men-of-war are no longer formed of rowing veſſels or compoſed of galleys and ſhips of the line; but entirely of the latter, which engage under ſail, and diſcharge the whole force of their artillery from their ſides. Accordingly they are now diſpoſed in no other form than that of a right line parallel to the enemy; every ſhip keeping cloſe-hauled upon a wind on the ſame tack. Indeed the difference between the force and manner of fighting of ſhips and galleys, rendered their ſervice in the ſame line incompatible. When we conſider therefore the change introduced, both in the conſtruction and working of the ſhips, occaſioned by the uſe of cannon, it neceſſarily follows, that ſquadrons of men-of-war muſt appear in the order that is now generally adopted.

The machines which owe their riſe to the invention of gunpowder have now totally ſupplanted the others; ſo that there is ſcarce any but the ſword remaining, of all the weapons uſed by the ancients. Our naval battles are therefore almoſt always decided by fire-arms, of which there are ſeveral kinds, known by the general name of *artillery*. In a ſhip of war, fire-arms are diſtinguiſhed into cannon mounted on carriages, ſwivel-cannon, grenadoes, and muſquetry. See Cannon, &c. Beſides theſe machines, there are ſeveral others uſed in merchant ſhips and privateers, as cohorns, carabines, fire-arrows, organs, ſtink-pots, &c.

The writers on naval tactics have been but few, indeed, conſidering the importance of the ſubject; and the only countries that have produced writers on this ſubject, ſo far as we know, are France and Britain, particularly the firſt. One would be led to imagine that Britain, from its inſular ſituation, having bred ſo great a number of excellent ſeamen, and having ſo often been engaged in naval conteſts, would naturally have produced a number of writers on this, as well as on ſubjects of much leſs conſequence to it as a nation. The reader will, however, no doubt be ſurpriſed to hear, that we have only one ſcientific treatiſe on naval tactics, entitled *An Eſſay on Naval Tactics, &c.* by John Clerk, eſq. of Elden,

near Edinburgh; all the other treatiſes publiſhed in Britain on this ſubject being either tranſlations from the French, or remarks upon the French authors. Some of the principal French treatiſes on naval tactics are the following: 1. *L'Art des Armées Navales, ou Traité des Evolutions Navales*, par Paul L'Hoſte, one vol. folio, printed at Lyons, 1727. This book was tranſlated and publiſhed by Chriſtopher O'Bryen, eſq.; in 4to. in 1762. 2. *Tactique Navale, ou Traité des Evolutions et des Signaux*, par M. le Viſcompte de Morogues, 4to. Paris, 1763. 3. *Le Manœuvrier*, par M. Bourdé de Villehuet. 4. *L'Art de Guerre en Mer, ou Tactique Navale, &c.* par M. le Viſcompte de Grenier. Tranſlations of the two laſt have appeared in Engliſh in 4to. in 1788, under the name of the *Chevalier de Sauſeuil*; and a tranſlation of parts of the three laſt is in the ſecond volume of the Elements and Practice of Rigging and Seamanſhip, publiſhed at London in 1794. Other books on evolutions and tactics are, *Théorie de la Manœuvre des Vaiſſeaux*, Paris, 1689. *Pitot's Theory of Working Ships applied to Practice*, &c. tranſlated by Stone, 1743. *De la Manœuvre des Vaiſſeaux, ou Traité de Mechanique et de Dynamique, &c* par M. Bouguer. *The Britiſh Mars*, &c. by William Flexney, 1763. *A Sea Manual*, by Sir Alexander Schomberg, 1789. *A View of the Naval Force of Great Britain*, &c. by an Officer of Rank, 1791, &c.

TADCASTER, a town in the Weſt Riding of Yorkſhire, noted for the great plenty of limeſtone dug up near it; and for being one of the firſt places in which a building was erected for Sunday ſchools. It is nine miles from York, and 188 from London.

TADMOR. See PALMYRA.

TADPOLE, a young frog before it has diſengaged itſelf from the membranes that envelope it in its firſt ſtage of life.

TÆNIA, in zoology; a genus of animals belonging to the claſs of *vermes*, and order of *inteſtina*. The body is long, depreſſed, and jointed like a chain, and contains a mouth and viſcera in each joint. According to Gmelin, there are ninety-two ſpecies; all which inhabit the inteſtines of various animals, particularly of quadrupeds.

Seven ſpecies of tænia are peculiar to man. 1. The *viſceralis*, which is incloſed in a veſicle, broad in the fore-part, and pointed in the hinder part, inhabits the liver, the placenta uterina, and the ſack which contains the ſuperfluous fluid of dropſical perſons. 2. The *celluloſæ*, which is incloſed in a cartilaginous veſicle, inhabits the cellular ſubſtance of the muſcles; is about an inch long, half an inch broad, and one-fourth of an inch thick, and is very tenacious of life. 3. The *dentata*, has a pointed head; the large joints are ſtreaked tranſverſely, and the ſmall joints are all dilated; the oſculum or opening in the middle of both margins is ſomewhat raiſed. It is narrow, ten or twelve feet long, and broad in the fore-parts; its ovaria are not viſible to the naked eye; and the head underneath reſembles a heart in ſhape. It inhabits the inteſtines. 4. The *lata*, is white, with joints very ſhort and knotty in the middle; the oſculum is ſolitary. It is from eighteen to 120 feet long; its joints are ſtreaked tranſverſely; its ovaria are diſpoſed like the petals of a roſe. 5. The *vulgaris*, or common tape-worm, has two lateral mouths in each joint; it attaches itſelf ſo firmly to the inteſtines, that it can ſcarcely be removed by the moſt violent medicines; it is ſlender, and has the appearance of being membranaceous; it is ſomewhat pellucid, from ten to ſixteen feet long, and about four and an half lines broad at one end. 6. The *truttæ*, which chiefly inhabits the liver of the trout, but is alſo to be found in the inteſtines of the human ſpecies. 7. The *ſolium*, has a marginal mouth, one on each joint.

The ſtructure and phyſiology of the tænia is curious, and it may be amuſing as well as inſtructive to conſider it with more attention. As the tænia is often the occaſion of diſeaſe, we may be apt to conſider it not only as uſeleſs, but even as naturally hurtful; but it is impoſſible to ſuppoſe that the Benevolent Father of mankind created a ſpecies of animals ſolely for the purpoſe of producing diſeaſe. The creation of the tænia is rather a ſtriking inſtance of that rule which the Deity ſeems to have laid down to himſelf, to leave no place deſtitute of living creatures where they could multiply their ſpecies. He has therefore not only covered the earth with animals, but the ſurface of animals with other animals; and has even peopled ſuch of their internal parts as could ſupply nouriſhment without diſadvantage. Perhaps therefore a certain proportion of theſe animals is conducive to health, juſt as a certain proportion of different fluids is ſo, though an exceſſive increaſe always produces diſeaſe. For there is almoſt in every different ſpecies of quadrupeds a different ſpecies of tænia, which is a full proof that theſe worms have their ſtructure and ſituation determined with as much attention and ſkill as any ſpecies of animals whatever. It is alſo a very curious fact, that thoſe ſpecies of tænia which are peculiar to the human race are alſo peculiar to particular countries. Thus the vulgaris is moſt common in Sweden, the lata in Switzerland and Ruſſia, and the ſolium in Great Britain, Saxony, and Holland.

The tænia appears deſtined to feed upon ſuch juices of animals as are already animalized, and is therefore moſt commonly found in the alimentary canal, and in the upper part, where there is the greateſt abundance of chyle; for chyle ſeems to be the natural food of the tænia. As it is thus ſupported by food which is already digeſted, it is deſtitute of the complicated organs of digeſtion. As the tænia ſolium is moſt frequent in this country, it may be proper to deſcribe it more particularly.

It is from three to thirty feet long, ſome ſay ſixty feet. It is compoſed of a head, in which is a mouth adapted to drink up fluids, and an apparatus for giving the head a fixed ſituation. The body is compoſed of a great number of diſtinct pieces articulated together, each joint having an organ whereby it attaches itſelf to the neighbouring part of the inner coat of the inteſtine. The joints neareſt the head are always ſmall, and they become gradually enlarged as they are farther removed from it; but towards the tail a few of the laſt joints again become diminiſhed in ſize. The extremity of the body is terminated by a ſmall ſemicircular joint, which has no opening in it.

The head of this animal is compoſed of the ſame kind of materials as the other parts of its body; it has a rounded opening at its extremity, which is conſidered to be its mouth. See Plate 30. fig. 1, 2. This opening is continued by a ſhort duct into two canals; theſe canals paſs round every joint of the animal's body, and convey the aliment (fig. 3.). Surrounding the opening of the mouth are placed a number of projecting radii, which are of a fibrous texture, whoſe direction is longitudinal. Theſe radii appear to ſerve the purpoſe of tentacula for fixing the orifice of the mouth, as well as that of muſcles to expand the cavity of the mouth, from their being inſerted along the brim of that opening: (ſee fig. 1.) After the rounded extremity or head has been narrowed into the neck, as is repreſented in fig. 2. the lower part becomes flatted, and has two ſmall tubercles placed upon each flatted ſide; the tubercles are concave in the middle, and appear deſtined to ſerve the purpoſe of ſuckers for attaching the head more effectually. The internal ſtructure of the joints compoſing the body of this animal is partly vaſcular and partly cellular; the ſubſtance itſelf is white, and ſomewhat reſembles in its texture the coagulated lymph of the human blood. The alimentary canal paſſes along each ſide of the animal,

fending a crofs canal over the bottom of each joint, which connects the two lateral canals together. See fig 3.

Mr. Carlifle injected with a coloured fize, by a fingle pufh with a fmall fyringe, three feet in length of thefe canals, in the direction from the mouth downwards. He tried the injection the contrary way, but it feemed to be flopped by valves. The alimentary canal is impervious at the extreme joint, where it terminates without any opening analogous to an anus. Each joint has a vafcular joint occupying the middle part, which is compofed of a longitudinal canal, from which a great number of lateral canals branch off at right angles. Thefe canals contain a fluid like milk.

The tænia feems to be one of the fimpleft vafcular animals in nature. The way in which it is nourifhed is fingular; the food being taken in by the mouth, paffes into the alimentary canal, and is thus made to vifit in a general way the different parts of the animal. As it has no excretory ducts, it would appear that the whole of its alimentary fluid is fit for nourifhment; the decayed parts probably diffolve into a fluid which tranfudes through the fkin, which is extremely porous.

This animal has nothing refembling a brain or nerves, and feems to have no organs of fenfe but that of touch. It is moft probably propagated by ova, which may eafily pafs along the circulating veffels of other animals. We cannot otherwife explain the phenomena of worms being found in the eggs of fowls, and in the inteftines of a fœtus before birth, except by fuppofing their ova to have paffed through the circulating veffels of the mother, and by this means been conveyed to the fœtus.

The chance of an ovum being placed in a fituation where it will be hatched, and the young find convenient fubfiftence, muft be very fmall; hence the neceffity for their being very prolific. If they had the fame powers of being prolific which they now have, and their ova were afterwards very readily hatched, then the multiplication of thefe animals would be immenfe, and become a nuifance to the other parts of the creation.

Another mode of increafe allowed to tænia (if we may call it increafe) is by an addition to the number of their joints. If we confider the individual joints as diftinct beings, it is fo; and when we reflect upon the power of generation given to each joint, it makes this conjecture the more probable. We can hardly fuppofe that an ovum of a tænia, which at its full growth is thirty feet long, and compofed of 400 joints, contained a young tænia compofed of this number of pieces; but we have feen young tænia not half a foot long, and not poffeffed of fifty joints, which ftill were entire worms. We have alfo many reafons to believe, that when a part of this animal is broken off from the reft, it is capable of forming a head for itfelf, and becomes an independent being. The fimple conftruction of the head makes its regeneration a much more eafy operation than that of the tails and feet of lizards, which are compofed of bones and complicated veffels; but this laft operation has been proved by the experiments of Spallanzani and many other naturalifts.

When inteftinal worms produce a difeafed ftate of the animal's body which they inhabit, various remedies are advifed for removing them; many of which are ineffectual, and others very injurious by the violence of their operation. Draftic purges feem to operate upon tænia, partly by irritating the external furface of their bodies, fo as to make them quit their holds, and partly by the violent contractions produced in the inteftine, which may fometimes divide the bodies of tænia, and even kill them by bruifing. Mr. Carlifle propofes the trial of a fimple remedy, which (*à priori*) promifes to be fuccefsful; namely, fmall fhocks of electricity paffed frequently through the regions of the abdomen; the lives of the lower orders of animals feeming to be eafily deftroyed by fuch fhocks of electricity as do not injure the larger and more perfect animals.

Plate 30. fig. 1. fhows the head of the tænia magnified; the mouth is in the middle of the circular plane, where the body becomes flatted and broad; there are two hollow tubercles reprefented by the two dark fhaded fpots. Fig. 2. is the fame head, of its natural bignefs, and which belonged to a tænia twenty feet in length. Fig. 3. fhows the alimentary canals, in a portion of the fame tænia, of their natural bignefs. The dark-fhaded undulating lines are the alimentary canals, which are feen to their full extent in this portion of the worm. Fig. 4. fhows the middle fyftem of veffels, in two joints, which are reprefented by the dark lines. Fig. 5. fhows two joints, from one fide of which a flip was torn down to fhow the veffels underneath, and alfo the direction of the fibres in the flip, which are accumulated into little fafciculi like mufcular fibres. Fig. 6. exhibits three joints, having the ducts leading from the lateral ofcula injected; the dark tranfverfe lines leading from each ofculum fhow the fize, direction, and extent of thefe ducts. Fig. 7. fhows the edge of two joints turned forwards, and the appearance of the ofcula in this point of view. Fig. 8. reprefents the whole of thefe canals in their relative fituations.

For a more complete account of the tænia, we muft refer to Mr. Carlifle's ingenious paper in the Linnæan Tranfactions.

TAFFETY or TAFFETA, in commerce, a fine fmooth filken ftuff, remarkably gloffy. There are taffeties of all colours, fome plain, and others ftriped with gold, filver, &c. others chequered, other flowered, &c. according to the fancy of the workmen.

TAGARA, a city of ancient India, the metropolis of a large diftrict called *Ariaca*, which comprehended the greateft part of the Subah of Aurangabad, and the fouthern part of Concan. Arrian fays, that it was fituated about ten days' journey to the eaftward of Pultanah; which, according to the rate of travelling in that country with loaded carts, might be about 100 Britifh miles. This fixes its fituation at Deoghir, a place of great antiquity, and famous through all India on account of the pagodas of Eloufa. It is now called *Doulet-abad.*

TAGETES, MARYGOLD, in botany: a genus of plants belonging to the clafs of *fyngenefia*, and order of *polygamia fuperflua*; and in the natural fyftem ranging under the 49th order, *Compofitæ*. The receptacle is naked; the pappus confifts of five erect awns or beards; the calyx is monophyllous, quinquedentate, and tubular; and there are four perfiftent florets of the ray. There are three fpecies, the *patula*, *erecta*, and *minuta*; of which the two firft have been cultivated in the Britifh gardens, at leaft, fince the year 1596, for it is mentioned in Gerard's Herbal, which was publifhed that year. They are both natives of Mexico.

The *erecta*, or *African* marygold, has a ftem fubdivided and fpreading, and has formed itfelf into a great many varieties: 1 Pale yellow, or brimftone colour, with fingle, double, and fiftulous flowers. 2. Deep yellow, with fingle, double, and fiftulous flowers. 3. Orange-coloured, with fingle, double, and fiftulous flowers. 4. Middling African, with orange-coloured flowers. 5. Sweet-fcented African. Thefe are all very fubject to vary; fo that unlefs the feeds are very carefully faved from the fineft flowers, they are apt to degenerate: nor fhould the fame feeds be too long fown in the fame garden, for the fame reafon; therefore, thofe who are defirous to have thefe flowers in perfection fhould exchange their feeds with fome perfon of integrity at a diftance, where the foil is of a different nature, at leaft every other year. If this is done, the varieties may be continued in perfection. This plant is fo well

known as to need no defcription. It flowers from the beginning of July till the froft puts a ftop to it. The *patula* has a fimple erect ftem, and the peduncles are fcaly and multiflorous.

It has been long in the Britifh gardens, where it is diftinguifhed from the firft by the title of *French marygold*. The flowers of the fweet fcented fort are generally preferred for planting in fmall gardens.

TAGUS, the largeft river of Spain; which, taking its rife on the confines of Arragon, runs fouth-weft through the provinces of New Caftile and Eftremadura; and paffing by the cities of Aranjuez, Toledo, and Alcantara, and then croffing Portugal, forms the harbour of Lifbon, at which city it is about three miles over; and about eight or ten miles below this it falls into the Atlantic ocean.

TAHOEREWA, one of the Sandwich iflands. It is fmall, deftitute of wood, and its foil fandy and unfertile. It is fituated in north latitude 20° 38′, in eaft longitude 203° 27′. See COOK (Capt.), and SANDWICH-*Iflands*.

TAHOORA, one of the Sandwich iflands in the South Sea. It is uninhabited, and lies in north latitude 21° 43′, and in eaft longitude 199° 36′. See SANDWICH-*Iflands*.

TAJACU, or PECCARY, in zoology, a fpecies of hog. See SUS.

TAI-OUAN, the Chinefe name of the ifland of Formofa. See FORMOSA.—Tai-ouan is alfo the name of the capital of the ifland.

TAIL, the train of a beaft, bird, or fifh; which in land animals ferves to drive away flies, &c. and in birds and fifhes to direct their courfe, and affift them in afcending or defcending in the air or water.

TAIL, or FEE-TAIL, in law, is a conditional eftate or fee, oppofed to *fee-fimple* See FEE. A conditional fee, at the common law, was a fee reftrained to fome particular heirs exclufive of others: as to the heirs of a man's body, by which only his lineal defcendants were admitted, in exclufion of collateral heirs; or to the heirs male of his body, in exclufion both of collaterals and lineal females alfo. It was called a *conditional fee*, by reafon of the condition expreffed or implied in the donation of it, that if the donee died without fuch particular heirs, the land fhould revert to the donor. For this was a condition annexed by law to all grants whatfoever, that on failure of the heirs fpecified in the grant, the grant fhould be at an end, and the land return to its ancient proprietor. Such conditional fees were ftrictly agreeable to the nature of feuds, when they firft ceafed to be mere eftates of life, and were not yet arrived to be abfolute eftates in fee-fimple.

With regard to the condition annexed to thefe fees by the common law, it was held, that fuch a gift (to a man and the heirs of his body) was a gift upon condition that it fhould revert to the donor if the donee had no heirs of his body; but if he had, it fhould then remain to the donee. They therefore called it a *fee-fimple* on condition that he had iffue. Now we muft obferve, that when any condition is performed, it is thenceforth entirely gone; and the thing to which it was before annexed becomes abfolute and wholly unconditional. So that as foon as the grantee had any iffue born, his eftate was fuppofed to become abfolute by the performance of the condition; at leaft for thefe three purpofes: 1. To enable the tenant to alienate the land, and thereby to bar not only his own iffue, but alfo the donor, of his intereft in the reverfion. 2. To fubject him to forfeit it for treafon: which he could not do till iffue born longer than for his own life, left thereby the inheritance of the iffue and reverfion of the donor might have been defeated. 3. To empower him to charge the land with rents, commons, and certain other encumbrances, fo as to bind his iffue. And this was thought the more reafonable, becaufe, by the birth of iffue, the poffibility of the donor's reverfion was rendered more diftant and precarious: and his intereft feems to have been the only one which the law, as it then ftood, was folicitous to protect, without much regard to the right of fucceffion intended to be vefted in the iffue. However, if the tenant did not in fact alienate the land, the courfe of defcent was not altered by this performance of the condition: for if the iffue had afterwards died, and then the tenant or original grantee had died, without making any alienation, the land, by the terms of the donation, could defcend to none but the heirs of his body; and therefore, in default of them, muft have reverted to the donor. For which reafon, in order to fubject the lands to the ordinary courfe of defcent, the donees of thefe conditional fee-fimples took care to alienate as foon as they had performed the condition by having iffue; and afterwards repurchafed the lands, which gave them a fee-fimple abfolute, that would defcend to the heirs general, according to the courfe of the common law. And thus ftood the old law with regard to conditional fees: which things, fays Sir Edward Coke, though they feem ancient, are yet neceffary to be known, as well for the declaring how the common law ftood in fuch cafes, as for the fake of annuities, and fuch-like inheritances, as are not within the ftatutes of entail, and therefore remain as the common law. The inconveniences which attended thefe limited and fettered inheritances were probably what induced the judges to give way to this fubtle fineffe (for fuch it undoubtedly was), in order to fhorten the duration of thefe conditional eftates. But, on the other hand, the nobility, who were willing to perpetuate their poffeffions in their own families, to put a ftop to this practice, procured the ftatute of Weftminfter the fecond (commonly called the ftatute *de donis conditionalibus*) to be made; which paid a greater regard to the private will and intentions of the donor, than to the propriety of fuch intentions, or any public confiderations whatfoever. This ftatute revived in fome fort the ancient feodal reftraints which were originally laid on alienations, by enacting, that from thenceforth the will of the donor be obferved; and that the tenements fo given (to a man and the heirs of his body) fhould at all events go to the iffue, if there were any; or if none fhould revert to the donor.

Upon the conftruction of this act of parliament, the judges determined that the donee had no longer a conditional fee fimple, which became abfolute and at his own difpofal the inftant any iffue was born; but they divided the eftate into two parts, leaving in the donee a new kind of particular eftate, which they denominated a *fee-tail*: and vefting in the donor the ultimate fee-fimple of the land, expectant on the failure of iffue; which expectant eftate is what we now call a *reverfion*. And hence it is that Littleton tells us, that tenant in fee-tail is by virtue of the ftatute of Weftminfter the fecond. The expreffion *fee-tail*, or *feodum talliatum*, was borrowed from the feudifts (fee Crag. *l. s. t.* 10. § 24, 25.), among whom it fignified any mutilated or truncated inheritance, from which the heirs general were cut off; being derived from the barbarous verb *taliare*, to cut; from which the French *tailler* and the Italian *tagliare* are formed (Spelm. *Gloff.* 531.)

Having thus fhown the original of eftates tail, we now proceed to confider what things may or may not be entailed under the ftatute *de donis*. Tenements is the only word ufed in the ftatute: and this Sir Edward Coke expounds to comprehend all corporeal hereditaments whatfoever; and alfo all incorporeal hereditaments which favour of the reality, that is, which iffue out of corporeal ones, or which concern or are annexed to or may be exercifed within the fame; as rents, efto-

vers, commons, and the like. Alſo offices and dignities, which concern lands, or have relation to fixed and certain places, may be entailed. But mere perſonal chattels, which ſavour not at all of the reality, cannot be entailed. Neither can an office, which merely relates to ſuch perſonal chattels; nor an annuity, which charges only the perſon, and not the lands of the granter. But in theſe laſt, if granted to a man and the heirs of his body, the grantee hath ſtill a fee conditional at common law as before the ſtatute, and by his alienation may bar the heir or reverſioner. An eſtate to a man and his heirs for another's life cannot be entailed; for this is ſtrictly no eſtate of inheritance, and therefore not within the ſtatute *de donis*. Neither can a copyhold eſtate be entailed by virtue of the ſtatute; for that would tend to encroach upon and reſtrain the will of the lord: but, by the ſpecial cuſtom of the manor, a copyhold may be limited to the heirs of the body; for here the cuſtom aſcertains and interprets the lord's will.

As to the ſeveral ſpecies of eſtates-tail, and how they are reſpectively created; they are either general or ſpecial. Tail-general is where lands and tenements are given to one, and the heirs of his body begotten: which is called *tail-general*; becauſe, how often ſoever ſuch donee in tail be married, his iſſue in general, by all and every ſuch marriage, is, in ſucceſſive order, capable of inheriting the eſtate-tail *per formam doni*. Tenant in *tail-ſpecial* is where the gift is reſtrained to certain heirs of the donee's body, and does not go to all of them in general. And this may happen ſeveral ways. We ſhall inſtance in only one; as where lands and tenements are given to a man and the heirs of his body, on Mary his now wife to be begotten. Here no iſſue can inherit but ſuch ſpecial iſſue as is engendered between them two; not ſuch as the huſband may have by another wife; and therefore it is called *ſpecial tail*. And here we may obſerve, that the words of inheritance (to him and his heirs) give him an eſtate in fee; but they being heirs to be by him begotten, this makes it a fee-tail; and the perſon being alſo limited, on whom ſuch heirs ſhall be begotten (viz. Mary his preſent wife), this makes it a fee-tail ſpecial.

Eſtates in general and ſpecial tail are farther diverſified by the diſtinction of ſexes in ſuch entails; for both of them may either be in tail male or tail female. As if lands be given to a man, and his heirs-male of his body begotten, this is an eſtate in tail male general; but if to a man, and the heirs-female of his body on his preſent wife begotten, this is an eſtate in tail female ſpecial. And in caſe of an entail male, the heirs-female ſhall never inherit, nor any derived from them; nor *e converſo*, the heirs male in caſe of a gift in tail female. Thus, if the donee in tail male hath a daughter, who dies leaving a ſon, ſuch grandſon in this caſe cannot inherit the eſtate-tail: for he cannot deduce his deſcent wholly by heirs-male. And as the heir-male muſt convey his deſcent wholly by males, ſo muſt the heir-female wholly by females. And therefore if a man hath two eſtates tail, the one in tail male and the other in tail female, and he hath iſſue a daughter, which daughter hath iſſue a ſon; this grandſon can ſucceed to neither of the eſtates, for he cannot convey his deſcent wholly either in the male or female line.

As the word *heirs* is neceſſary to create a fee, ſo, in farther imitation of the ſtrictneſs of the feodal donation, the word *body*, or ſome other words of procreation, are neceſſary to make it a fee-tail, and aſcertain to what heirs in particular the fee is limited. If, therefore, either the words of inheritance or words of procreation be omitted, albeit the others are inſerted in the grant, this will not make an eſtate-tail. As if the grant be to a man and the iſſue of his body, to a man and his ſeed, to a man and his children or offspring; all theſe are only eſtates for life, there wanting the words of inheritance, "his heirs." So, on the other hand, a gift to a man, and his heirs male or female, is an eſtate in fee-ſimple and not in fee-tail; for there are no words to aſcertain the body out of which they ſhall iſſue. Indeed, in laſt wills and teſtaments, wherein greater indulgence is allowed, an eſtate-tail may be created by a deviſe to a man and his ſeed, or to a man and his heirs-male, or by other irregular modes of expreſſion.

There is ſtill another ſpecies of entailed eſtates, now indeed grown out of uſe, yet ſtill capable of ſubſiſting in law; which are eſtates *in libero maritagio*, or FRANKMARRIAGE. See that article.

The incidents to a tenancy in tail, under the ſtatute Weſtminſter ſecond are chiefly theſe: 1. That a tenant in tail may commit waſte on the eſtate tail, by felling timber, pulling down houſes, or the like, without being impeached or called to account for the ſame. 2. That the wife of the tenant in tail ſhall have her dower, or thirds of the eſtate-tail. 3. That the huſband of a female tenant in tail may be tenant by the curteſy of the eſtate-tail. 4. That an eſtate-tail may be barred, or deſtroyed, by a fine, by a common recovery, or by lineal warranty deſcending with aſſets to the heir. See ASSETS.

Thus much for the nature of eſtates-tail: the eſtabliſhment of which family-law (as it is properly ſtyled by Pigott) occaſioned infinite difficulties and diſputes. Children grew diſobedient when they knew they could not be ſet aſide: farmers were ouſted of their leaſes made by tenants in tail; for if ſuch leaſes had been valid, then, under colour of long leaſes, the iſſue might have been virtually diſinherited: creditors were defrauded of their debts; for, if a tenant in tail could have charged his eſtate with their payment, he might alſo have defeated his iſſue, by mortgaging it for as much as it was worth: innumerable latent entails were produced to deprive purchaſers of the lands they had fairly bought, of ſuits in conſequence of which our ancient books are full: and treaſons were encouraged, as eſtates tail were not liable to forfeiture longer than for the tenant's life. So that they were juſtly branded as the ſource of new contentions and miſchiefs unknown to the common law; and almoſt univerſally conſidered as the common grievance of the realm. But as the nobility were always fond of this ſtatute, becauſe it preſerved their family-eſtates from forfeiture, there was little hope of procuring a repeal by the legiſlature; and therefore, by the connivance of an active and politic prince, a method was deviſed to evade it.

About 200 years intervened between the making of the ſtatute *de donis*, and the application of common recoveries to this intent, in the 12th year of Edward IV.; which were then openly declared by the judges to be a ſufficient bar of an eſtate tail. For though the courts had, ſo long before as the reign of Edward III. very frequently hinted their opinion that a bar might be effected upon theſe principles, yet it was never carried into execution; till Edward IV. obſerving (in the diſputes between the houſes of York and Lancaſter) how little effect attainders for treaſon had on families whoſe eſtates were protected by the ſanctuary of entails, gave his countenance to this proceeding, and ſuffered Taltarum's caſe to be brought before the court: wherein, in conſequence of the principles then laid down, it was in effect determined, that a common recovery ſuffered by tenant in tail ſhould be an effectual deſtruction thereof. Theſe common recoveries are fictitious proceedings, introduced by a kind of *pia fraus*, to elude the ſtatute *de donis*, which was found ſo intolerably miſchievous, and which yet one branch of the legiſlature would not then conſent to repeal: and that theſe recoveries, however clan-

deftinely begun, are now become by long ufe and acquiefcence a moft common affurance of lands; and are looked upon as the legal mode of conveyance, by which a tenant in tail may difpofe of his lands and tenements: fo that no court will fuffer them to be fhaken or reflected on, and even acts of parliament have by a fide-wind countenanced and eftablifhed them.

This expedient having greatly abridged eftates-tail with regard to their duration others were foon invented to ftrip them of other privileges. The next that was attacked was their freedom from forfeitures for treafon. For, notwithftanding the large advances made by recoveries, in the compafs of about threefcore years, towards unfettering thefe inheritances, and thereby fubjecting the lands to forfeiture, the rapacious prince then reigning, finding them frequently refettled in a fimilar manner to fuit the convenience of families, had addrefs enough to procure a ftatute whereby all eftates of inheritance (under which general words eftates-tail were covertly included) are declared to be forfeited to the king upon any conviction of high-treafon.

The next attack which they fuffered in order of time, was by the ftatute 32 Hen. VIII. c. 28. whereby certain leafes made by tenants in tail, which do not tend to the prejudice of the iffue, were allowed to be good in law, and to bind the iffue in tail But they received a more violent blow in the fame feffion of parliament, by the conftruction put upon the ftatute of fines, by the ftatute 32 Hen. VIII. c. 36. which declares a fine duly levied by tenant in tail to be a complete bar to him and his heirs, and all other perfons claiming under fuch entail. This was evidently agreeable to the intention of Henry VII. whofe policy it was (before common recoveries had obtained their full ftrength and authority) to lay the road as open as poffible to the alienation of landed property, in order to weaken the overgrown power of his nobles. But as they, from the oppofite reafons, were not eafily brought to confent to fuch a provifion, it was therefore couched, in his act, under covert and obfcure expreffions. And the judges, though willing to conftrue that ftatute as favourably as poffible for the defeating of entailed eftates, yet hefitated at giving fines fo extenfive a power by mere implication, when the ftatute *de donis* had exprefsly declared that they fhould not be a bar to eftates-tail. But the ftatute of Henry VIII. when the doctrine of alienation was better received, and the will of the prince more implicitly obeyed than before, avowed and eftablifhed that intention. Yet, in order to preferve the property of the crown from any danger of infringement, all eftates-tail created by the crown, and of which the crown has the reverfion, are excepted out of this ftatute. And the fame was done with regard to common recoveries, by the ftatute 34 and 35 Hen. VIII. c. 20. which enacts, that no feigned recovery had againft tenants in tail, where the eftate was created by the crown, and the remainder or reverfion continues ftill in the crown, fhall be of any force and effect. Which is allowing, indirectly and collaterally, their full force and effect with refpect to ordinary eftates tail, where the royal prerogative is not concerned.

Laftly, by a ftatute of the fucceeding year, all eftates-tail are rendered liable to be charged for payments of debts due to the king by record or fpecial contract; as fince, by the bankrupt-laws, they are alfo fubjected to be fold for the debts contracted by a bankrupt. And, by the conftruction put on the ftatute 43 Eliz. c. 4. an appointment by tenant in tail of the lands entailed to a charitable ufe is good without fine or recovery.

Eftates-tail being thus by degrees unfettered, are now reduced again to almoft the fame ftate, even before iffue born, as conditional fees were in at common law, after the condition was performed by the birth or iffue. For firft, the tenant in tail is now enabled to alienate his lands and tenements by fine, by recovery, or by certain other means; and thereby to defeat the intereft as well of his own iffue, though unborn, as alfo of the reverfioner, except in the cafe of the crown: fecondly, he is now liable to forfeit them for high-treafon: and, laftly, he may charge them with reafonable leafes, and alfo with fuch of his debts as are due to the crown on fpecialties, or have been contracted with his fellow-fubjects in a courfe of extenfive commerce.

TALAPOINS or Talopins, priefts of Siam.—They enjoy great privileges, but are enjoined celibacy and aufterity of life. They live in monafteries contiguous to the temples: and what is fingular, any one may enter into the priefthood, and after a certain age may quit it to marry, and return to fociety. There are talapoineffes too, or nuns, who live in the fame convents, but are not admitted till they have paffed their fortieth year. The talapoins educate children; and at every new and full moon explain the precepts of their religion in their temples; and during the rainy feafon they preach from fix in the morning till noon, and from one in the afternoon till five in the evening. They drefs in a very mean garb, go bareheaded and barefooted; and no perfon is admitted among them who is not well fkilled in the Baly language. They believe that the univerfe is eternal; but admit that certain parts of it, as this world, may be deftroyed and again regenerated. They believe in a univerfal pervading fpirit, and in the immortality and tranfmigration of the foul; but they extend this laft doctrine, not only to all animals, but to vegetables and rocks. They have their good and evil genii, and particular local deities, who prefide over forefts and rivers, and interfere in all fublunary affairs. For the honour of human nature, we are happy to find fo pure a fyftem of morality prevail among thefe people: it not only forbids its followers to do ill, but enjoins the neceffity of doing good, and of ftifling every improper thought or criminal defire. Thofe who wifh to perufe a more particular account of the talapoins, may confult *Voyage de M. de la Loubere;* Sketches relating to the Hiftory, &c. of the Hindoos; or Payne's Geography.

TALC, in mineralogy, a fpecies of foffils arranged under the magnefian earths. In Magellan's edition of Cronftedt's Mineralogy, it is confidered as a fpecies of Mica, and has accordingly been mentioned by us under that article. On the other hand, Dr. Kirwan has claffed the mica under the filiceous earths, while he places talc under the magnefian. According to the analyfis of Dr. Kirwan, "talc confifts of pure magnefia, mixed with nearly twice its weight of filex, and lefs than its own weight of argil." It is compofed of broad, flat, and fmooth lamina, or plates. There are two varieties of it, the Venetian talc and Mufcovy talc.

The Venetian talc has not derived its name from being a production of the territories of Venice (for it is not often to be met with in that country), but probably from being an article of Venetian commerce. It abounds in England, Norway, Hungary, Bohemia, Spain, and in many countries of Afia. Venice talc, with half its weight of alkaline falt, may, in a ftrong fire, be brought into perfect fufion, though not to perfect tranfparency: with equal its weight, or lefs, of borax, it runs into a beautiful, pellucid, greenifh yellow glafs. Talc does not melt with any other earth, nor even bake or cohere with any but the argillaceous: mixtures of it with them all are neverthelefs brought into fufion by a remarkably lefs quantity of faline matter than the ingredients feparately would require. Thus equal parts of talc and chalk, with only one-fourth their weight of borax, melt in no very vehement heat into a fine tranfparent greenifh glafs, of confiderable hardnefs and great luftre. On fubftituting gypfeous earths to chalk,

the fuſion was as eaſy, and the glaſs as beautiful; in colour not green, but yellow like the topaz. Talc, with half its weight of ſand, and a quantity of nitre equal to both, yielded alſo a tranſparent topaz yellow glaſs. Several further experiments on talc may be ſeen in a memoir by Mr. Pott in the *Mem. de l'Acad. de Berlin*, 1746.

Muſcovy talc, called alſo *lapis ſpecularis*, is found in many parts. The iſland of Cyprus abounds with it. It is very common alſo in Ruſſia, and has of late been diſcovered to abound in the Alps, the Apennines, and many of the mountains of Germany. It is imported in large quantities into England, and is uſed by the lanthorn-makers inſtead of horn in their nicer works, by the painters to cover miniature pictures and the microſcope-makers to preſerve ſmall objects for viewing by glaſſes. The ancients uſed it inſtead of glaſs in their windows. Some take the lapis ſpecularis to have been a ſpecies of gypſum, and compoſed of the acid of vitriol and calcareous earth. It came into uſe at Rome in the age of Seneca; and ſoon after its introduction was applied not only to lighten apartments, but to protect fruit-trees from the ſeverity of the weather; and it is recorded that the emperor Tiberius was enabled, principally by its means, to have cucumbers at his table during almoſt every month in the year. Dr. Watſon apprehends it is ſtill uſed in ſome countries in the place of glaſs: however, it is well known, that it was ſo uſed in the time of Agricola; for he mentions two churches in Saxony which were lighted by it. Agricola eſteemed it to have been a ſpecies of plaſter-ſtone; and in ſpeaking of it he remarks, that though it could bear, without being injured, the heat of ſummer and the cold of winter, yet the largeſt maſſes of it were waſted by the rain. It differs from plaſter-ſtone in this property, that it does not, after being calcined and wetted with water, ſwell and concrete into a hard ſtony ſubſtance.

Although we have treated of Muſcovy talc and lapis ſpecularis as the ſame, we are not ignorant that a diſtinction has been made between them by ſome chemiſts: but as we have found a greater degree of confuſion on this ſubject in ſeveral valuable ſyſtems of mineralogy than we had reaſon to expect, we continue the old names as formerly, till a more ſatisfactory analyſis make it proper to apply them differently.

Talc is employed, in thoſe places where it is found in any conſiderable quantity, in compoſitions for earthen veſſels; and by ſome for teſts and cupels. From its ſmoothneſs, unctuoſity, and brightneſs, it has been greatly celebrated as a coſmetic; and the chemiſts have ſubmitted it to a variety of operations, for procuring from it oils, ſalts, tinctures, magiſteries, &c. for that intention. But all their labours have been in vain; and all the preparations ſold under the name of talc have either contained nothing of that mineral, or only a fine powder of it.

TALENT, ſignifies both a weight and a coin very common among the ancients, but very different among different nations. The common Attic talent of weight contains 60 Attic minæ, or 6000 Attic drachmæ; and weighed, according to Dr. Arbuthnot, 56 lbs. 11 oz. $17\frac{1}{7}$ gr. Engliſh troy weight. There was another Attic talent, by ſome ſaid to conſiſt of 80, by others of 100 minæ. The Egyptian talent was 80 minæ; the Antiochian alſo 80; the Ptolemaic of Cleopatra $86\frac{2}{3}$; that of Alexander 96; and the Inſular talent 120. In the valuation of money, the Grecian talent, according to Dr. Arbuthnot, was equal to 60 minæ, or, reckoning the mina at 3l. 4s. 7d. equal to 193l. 15s. The Syrian talent in this valuation conſiſted of 15 Attic minæ; the Ptolemaic of 20; the Antiochian of 60; the Euboic of 60; the Babylonic of 70; the Greater Attic of 80; the Tyrian of 80; the Eginean of 100; the Rhodian of 100; and the Egyptian of 80 minæ.

There is another talent much more ancient, which Dr. Arbuthnot calls the *Homeric talent* of gold, which ſeems to have weighed ſix Attic drachms or three darics, a daric weighing very little more than a guinea. According to this talent, ſome reckon the treaſure of King David, particularly that mentioned 1 Chron. xxii. 14. which, according to the common reckoning, would amount in gold talents to the value of 547,500,000l. and the ſilver to above 342,000,000l; or, reckoning according to the decuple proportion of gold to ſilver, the two ſums would be equal. As David reigned in Judæa after the ſiege of Troy, it is not improbable but Homer and he might uſe the ſame numeral talent of gold.

Among the Romans there were two kinds of talents, the *little* and the *great* talent: the little was the common talent; and whenever they ſay ſimply *talentum*, they are to be underſtood of this. The little talent was 60 minæ or Roman pounds; the mina or pound eſtimated at 100 drachmæ or denarii: it was alſo eſtimated at 24 great ſeſterces, which amounted to 60 pounds.

The great talent exceeded the leſs by one-third part. Budæus computes, that the little talent of ſilver was worth 75l. ſterling, and the greater 99l. 6s. 8d. ſterling. The greater of gold was worth 1125l. ſterling.

TALENT, as a ſpecies of money, among the Hebrews, was ſometimes uſed for a gold coin, the ſame with the ſhekel of gold, called alſo *ſtater*, and weighing only 4 drachms. The Hebrews reckoned by theſe talents as we do by pounds, &c. Thus a million of gold, or million of talents of gold, among them, was a million of ſhekels or nummi; the nummus of gold being the ſame weight with the ſhekel, viz. four drachms. But the Hebrew talent weight of ſilver, which they called *cicar*, was equivalent to that of 3000 ſhekels, or 113lb. 10 oz. 1 dwt. $10\frac{2}{7}$ gr. Engliſh Troy weight, according to Arbuthnot's computation.

TALIACOTIUS (Gaſpar), chief ſurgeon to the great duke of Tuſcany, was born at Bononia in Italy in 1553. He wrote a Latin treatiſe entitled *Chirurgia Nota de Curtis Membris*, in which he teaches the art of engrafting noſes, ears, lips, &c. giving repreſentations of the inſtruments and proper bandages; though many are of opinion that he never put his art in practice. However, his doctrine is not ſingular; for he ſhows that Alexander Benedictus, a famous chirurgical writer, deſcribed the operation before.

TALLIO (*lex talionis*), a ſpecies of puniſhment in the Moſaic law, whereby an evil is returned ſimilar to that committed againſt us by another; hence that expreſſion, "Eye for eye, tooth for tooth." This law was at firſt inſerted in the twelve tables amongſt the Romans; but afterwards ſet aſide, and a power given to the prætor to fix upon a ſum of money for the damage done.

TALISMANS, magical figures cut or engraved with ſuperſtitious obſervations on the characteriſms and configurations of the heavens, to which ſome aſtrologers have attributed wonderful virtues, particularly that of calling down celeſtial influences. The taliſmans of Samothrace, ſo famous of old, were pieces of iron formed into certain images, and ſet in rings; theſe were eſteemed preſervatives againſt all kinds of evils. There were likewiſe taliſmans taken from vegetables, and others from minerals.

TALLAGE (*tallagium*), from the French *taille*, is metaphorically uſed for a part or ſhare of a man's ſubſtance carved out of the whole, paid by way of tribute, toll, or tax.

TALLOW, in commerce, the fat of certain animals melted and clarified. It is procured from moſt animals, but chiefly from bullocks, ſheep, hogs, and bears. Some kinds of tallow are uſed as unguents in medicine, ſome for making ſoap and dreſſing leather, and ſome for making candles.

TALLOW *Tree.* See CROTON.

TALLY, is a ſtick cut in two parts, on each whereof is marked, with notches or otherwiſe, what is due between debtor and creditor, as now uſed by brewers, &c. And this was the ancient way of keeping all accounts, one part being kept by the creditor, the other by the debtor, &c. Hence the tallier of the exchequer, whom we now call the *teller.* But there are two kinds of tallies mentioned in our ſtatutes to have been long uſed in the exchequer. The one is termed *tallies of debt*, which are in the nature of an acquittance for debts paid to the king, on the payment whereof theſe tallies are delivered to the debtors, who carrying them to the clerk of the pipe-office, have there an acquittance in parchment for their full diſcharge. The other are *tallies of reward* or allowance, being made to ſheriffs of counties as a recompenſe for ſuch matters as they have performed to their charge, or ſuch money as is caſt upon them in their accounts of courſe, but not leviable, &c. In the exchequer there is a tally-court, where attend the two deputy-chamberlains of the exchequer and the tally-cutter: and a tally is generally the king's acquittance for money paid or lent, and has written on it words proper to expreſs on what occaſion the money is received.

TALLY-*Man*, a perſon that ſells or lets goods, clothes, &c. to be paid by ſo much a-week.

TALMUD, a collection of Jewiſh traditions. There are two works which bear this name, the Talmud of Jeruſalem, and the Talmud of Babylon. Each of theſe is compoſed of two parts; the Miſhna, which is the text, and is common to both, and the Gemara or commentary. (See MISHNA and GEMARA.) The Miſhna, which comprehends all the laws, inſtitutions, and rules of life, which, beſide the ancient Hebrew ſcriptures, the Jews thought themſelves bound to obſerve, was compoſed, according to the unanimous teſtimony of the Jews, about the cloſe of the ſecond century. It was the work of Rabbi Jehuda (or Juda) Hakkadoſh, who was the ornament of the ſchool at Tiberias, and is ſaid to have occupied him forty years. The commentaries and additions which ſucceeding rabbis made were collected by Rabbi Jochanan Ben Eliezer, ſome ſay in the fifth, others ſay in the ſixth, and others in the ſeventh century, under the name of *Gemara*, that is, *completion*; becauſe it completed the Talmud. A ſimilar addition was made to the Miſhna by the Babyloniſh doctors in the beginning of the ſixth century according to Enfield, and in the ſeventh according to others.

The Miſhna is divided into ſix parts, of which every one which is entitled *order* is formed of treatiſes, every treatiſe is divided into chapters, and every chapter into miſhnas or aphoriſms. In the *firſt* part is diſcuſſed whatever relates to ſeeds, fruits, and trees: in the *ſecond*, feaſts: in the *third*, women, their duties, their diſorders, marriages, divorces, contracts, and nuptials: in the *fourth* are treated the damages or loſſes ſuſtained by beaſts or men, of things found, depoſits, uſuries, rents, farms, partnerſhips in commerce, inheritance, ſales and purchaſes, oaths, witneſſes, arreſts, idolatry; and here are named thoſe by whom the oral law was received and preſerved: in the *fifth* part are noticed what regards ſacrifices and holy things: and the *ſixth* treats on purifications, veſſels, furniture, clothes, houſes, leproſy, baths, and numerous other articles. All this forms the Miſhna.

As the learned reader may wiſh to obtain ſome notion of rabbinical compoſition and judgment, we ſhall gratify his curioſity ſufficiently by the following ſpecimen: "Adam's *body* was made of the earth of Babylon, his *head* of the land of Iſrael, his other *members* of other parts of the world. R. Meir thought he was compact of the earth gathered out of the whole earth; as it is written, *thine eyes did ſee my ſubſtance.* Now it is elſewhere written, *the eyes of the Lord are over all the earth.* R. Aha expreſsly marks the twelve hours in which his various parts were formed. His ſtature was from one end of the world to the other; and it was for his tranſgreſſion that the Creator, laying his hand in anger on him, leſſened him; for before (ſays R. Eleazar), 'with his hand he reached the firmament.' R. Jehuda thinks his ſin was hereſy; but R. Iſaac thinks that 'it was nouriſhing his foreſkin.'"

The Talmud of Babylon is moſt valued by the Jews; and this is the book which they mean to expreſs when they talk of the Talmud in general. An abridgment of it was made by Maimonides in the 12th century, in which he rejected ſome of its greateſt abſurdities. The Gemara is ſtuffed with dreams and chimeras, with many ignorant and impertinent queſtions, and the ſtyle very coarſe. The Miſhna is written in a ſtyle comparatively pure, and may be very uſeful in explaining paſſages of the New Teſtament where the phraſeology is ſimilar. This is indeed the only uſe to which Chriſtians can apply it; but this renders it valuable. Lightfoot has judiciouſly availed himſelf of ſuch information as he could derive from it. Some of the popes, with a barbarous zeal, and a timidity of ſpirit for the ſucceſs of the chriſtian religion, which the belief of its divinity can never excuſe, ordered great numbers of the Talmud to be burned. Gregory IX. burned about twenty cart-loads, and Paul IV. ordered 12,000 copies of the Talmud to be deſtroyed. The laſt edition of the Talmud of Babylon, printed at Amſterdam, is in twelve volumes folio. The Talmud of Jeruſalem is in one large folio.

TALPA, the MOLE; a genus of quadrupeds belonging to the order of *feræ* and claſs of *mammalia*. It has ſix unequal foreteeth in the upper jaw, and eight in the lower; one tuſk on each ſide in each jaw; ſeven grinders on each ſide above, and ſix below. There are ſeven ſpecies; the European, the flava or American, the criſtata, longicaudata, fuſca, rubra, and aurea. The European mole is the only ſpecies of this animal found in Britain. There are ſeveral varieties of it; the black, the variegated, the white, and the grey mole. This ſpecies inhabits the whole of Europe except Ireland, where it is ſaid no moles are found. It is alſo common in the northerly parts of Aſia and Africa. It chiefly frequents moiſt fields that are expoſed to the ſun, meadows, and gardens; through theſe it conſtructs ſubterraneous roads or galleries in every direction in ſearch of worms, on which and the larvæ of inſects it feeds, and not at all on vegetables, though it does great damage by looſening the roots of plants. It is moſt active in its operations before rain, becauſe then the worms are in motion. The penis of the male is exceedingly long in proportion; they ſeem to pair and propagate in ſpring, the female bringing four or five young at a birth, which are placed in neſts made of moſs, leaves, and dried graſs, under the largeſt hillocks of the field; theſe are conſtructed with wonderful ingenuity, conſiſting of an interior hillock, ſurrounded with a ditch, which communicates with ſeveral galleries, on purpoſe to carry off the moiſture; and the neſt is covered over with a dome of earth, like the flat arch of an oven. Moles are deſtroyed by means of a paſte compoſed of palma-chriſti and white hellebore, or by flooding the fields which they infeſt; though, in the latter caſe, they ſometimes eſcape by aſcending trees. This ſpecies is five inches and three quarters in length, and its tail is about one inch long. It has a large head, without any external ears, and eyes ſo very ſmall and ſo completely hid in the fur as to make it vulgarly believed that it has none. As it lives entirely below ground, it has certainly no occaſion for eyes like other quadrupeds; and as it probably finds its food by its ſenſe of ſmell, which is acute, its eyes may ſerve merely as a ſafeguard to warn it when it happens to emerge from the ground to return to its ſubterraneous dwelling

This warning may be given by the light falling upon its eyes, which may produce a painful ſenſation. For the truth of this conjecture, however, we muſt refer to the anatomiſt, who might eaſily determine, from the ſtructure of the eyes, what purpoſe they are fitted to ſerve.

TAMANDAU, in zoology. See MYRMECOPHAGA.

TAMARINDUS, the TAMARIND-TREE, in botany: a genus of plants arranged by Linnæus under the claſs of *triandria* and order of *monogynia*; but Woodville, Schreber, and other late botaniſts, have found that it belongs to the claſs of *monodelphia* and order of *triandria*. In the natural ſyſtem it is ranked under the *Lomentaceæ*. There is only one ſpecies, the *indica*, which is a native of both Indies, of America, of Arabia, and Egypt, and was cultivated in Britain before the year 1633.

The tamarind-tree riſes to the height of thirty or forty feet, ſending off numerous large branches, which ſpread to a conſiderable extent, and have a beautiful appearance; the trunk is erect, and covered with rough bark, of a greyiſh or aſh-colour; the leaves are ſmall and pinnated, and of a yellowiſh green colour: the flowers reſemble the papilionaceous kind, and grow in lateral cluſters: the calyx conſiſts of four leaves, and the corolla of three petals, which are of a yellowiſh hue, and are beautifully diverſified with red veins: the fruit is a pod of a roundiſh compreſſed form, from three to five inches long, containing two, three, or four ſeeds, lodged in a dark pulpy matter. The flowers appear, according to Jacquin, in October and November; but according to Dr. Wright, they continue during the whole of June and July, and then drop off.

The pulp of the tamarind, with the ſeeds connected together by numerous tough ſtrings or fibres, are brought to us freed from the outer ſhell, and commonly preſerved in ſyrup. According to Long, tamarinds are prepared for exportation at Jamaica in the following manner: "The fruit or pods are gathered (in June, July, and Auguſt) when full ripe, which is known by their fragility or eaſy breaking on ſmall preſſure between the finger and thumb. The fruit, taken out of the pod, and cleared from the ſhelly fragments, is placed in layers in a caſk; and boiling ſyrup, juſt before it begins to granulate, is poured in, till the caſk is filled: the ſyrup pervades every part quite down to the bottom, and when cool the caſk is headed for ſale." He obſerves, that the better mode of preſerving this fruit is with ſugar, well clarified with eggs, till a tranſparent ſyrup is formed, which gives the fruit a much pleaſanter flavour: but as a principal medicinal purpoſe of the pulp depends upon its acidity, which is thus counteracted by the admixture of ſugar, it would therefore be of more utility if always imported here in the pods. The fruit produced in the Eaſt Indies is more eſteemed than that of the Weſt, and eaſily to be diſtinguiſhed by the greater length of the pods, and the pulp being dryer and of a darker colour.

This fruit, the uſe of which was firſt learned of the Arabians, contains a larger proportion of acid, with the ſaccharine matter, than is uſually found in the *fructus acidodulcis*, and is therefore not only employed as a laxative, but alſo for abating thirſt and heat in various inflammatory complaints, and for correcting putrid diſorders, eſpecially thoſe of a bilious kind; in which the cathartic, antiſeptic, and refrigerant qualities of the fruit have been found equally uſeful. When intended merely as a laxative, it may be of advantage to join it with manna, or purgatives of a ſweet kind, by which its uſe is rendered more effectual. Three drachms of the pulp are uſually ſufficient to open the body; but to prove moderately cathartic, one or two ounces are required. It is an ingredient in *electuarium e caſſia*, and *electuarium e ſenna* or lenitive electuary.

TAMARIX, the TAMARISK, in botany: a genus of plants belonging to the claſs of *pentandria*, and order of *trigynia*; and in the natural ſyſtem ranging under the 13th order, *Succulentæ*. The calyx is quinquepartite; the petals are five; the capſule is unilocular and trivalvular, and the ſeeds pappous. There are only two ſpecies known; the *gallica* or French tamariſk, and the *germanica* or German tamariſk.

TAMBAC, in the materia medica. See EXCÆCANA.

TAMBOUR, in architecture, a term applied to the Corinthian and Compoſite capitals, as bearing ſome reſemblance to a drum which the French call *tambour*. Some chooſe to call it the *vaſe*, and others *campana* or the bell.

TAMBOUR is alſo uſed for a little box of timber work, covered with a ceiling, withinſide the porch of certain churches; both to prevent the view of perſons paſſing by, and to keep off the wind, &c. by means of folding-doors, &c.

TAMBOUR, alſo denotes a round courſe of ſtone, ſeveral whereof form the ſhaft of a column, not ſo high as a diameter.

TAMBOUR, in the arts, is a ſpecies of embroidery. The tambour is an inſtrument of a ſpherical form, upon which is ſtretched, by means of a ſtring and buckle, or other ſuitable appendage, a piece of linen or thin ſilken ſtuff; which is wrought with a needle of a particular form, and by means of ſilken or gold and ſilver threads, into leaves, flowers, or other figures.

TAMBOURIN, is the name of a dance performed on the French ſtage. The air is lively, and the movements are quick.

TAMERLANE, or TIMUR BEK, a celebrated prince and conqueror. At the age of 25 he attained the higheſt dignities, with ſurpriſing courage, and an ambition aſtoniſhing to all the world. Endeavouring to perfect the great talents which he had received from nature, he ſpent nine years in different countries; where his great ſenſe and elevated genius appeared in councils and aſſemblies, while his intrepidity and valour, whether in perſonal combats or pitched battles, drew upon him the admiration of all mankind. He made himſelf maſter of the three empires of Jagatay Khân, Tuſhi Khân, and Hûlâkû Khân; ſo that his power, riches, and magnificence, were immenſe. There remain vaſt monuments of his grandeur in the cities, towns, caſtles, and walls, which he built; in the rivers and canals which he dug, as well as the bridges, gardens, palaces, hoſpitals, moſques, and monaſteries, which he erected in divers parts of Aſia in ſo great a number, that a king might be accounted very powerful and magnificent, who ſhould have employed 36 years only in building the great edifices which Timûr cauſed to be founded.

Timûr, according to the hiſtorian Arabſhâh, was in his perſon very corpulent and tall. He had a large forehead and big head. His countenance was agreeable, and his complexion fair. He wore a large beard, was very ſtrong, and well-limbed; had broad ſhoulders, thick fingers, and long legs. His conſtitution was amazingly vigorous; but he was maimed in one hand, and lame of the right ſide. His eyes appeared full of fire; his voice was loud and piercing; he feared nothing; and when far advanced in years, his underſtanding was ſound and perfect, his body vigorous and robuſt, his mind conſtant and unſhaken like a rock.

He did not like raillery, and could not bear a lie. There was no joking or fooling before him; for he loved the naked truth, even although it was to his own diſadvantage. He neither grieved if he miſcarried in any attempt, nor appeared overjoyed on any great ſucceſs. The device of his ſeal was, "I am ſincere and plain." He had a clear and ſolid underſtanding, was ſurpriſingly happy in his conjectures; vigilant, active, and unſhaken in his reſolutions. He took great delight in reading hiſtory, and was well verſed in the ſtate of

countries, provinces, and cities. He was penetrating, ſubtle, cloſe, and diſſembling; juſt by inclination, liberal from diſpoſition; but ambition had in a great meaſure extinguiſhed his humanity; war had familiariſed him to blood; and his religious zeal had inſpired him with the moſt cruel, implacable, and pernicious fanaticiſm.

He died on the 1ſt of April 1405, in the 71ſt year of his age and 36th of his reign. When he found death approaching, he ſent for his principal officers, declared his grandſon his heir, and made them ſwear to execute his will. Having recommended brotherly love and concord to the princes his children, he ordered one of the doctors to read the Koran at his bed's head, and often repeat the unity of God. At night he ſeveral times made profeſſion of his belief, " That there is no other God than God," and then expired.

TAMTAM, a flat drum uſed by the Hindoos, reſembling a tabor, but it is larger, and ſounds louder.

TAMUS, BLACK BRIONY, in botany: a genus of plants belonging to the claſs of *diœcia*, and order of *hexandria*; and in the natural ſyſtem ranging under the 11th order, *Sarmentaceæ*. The male and female flowers are both ſexpartite; there is no corolla; the ſtyle is trifid; the berry is trilocular and inferior, and contains two ſeeds. There are only two ſpecies known; the elephantipes, which is a native of the Cape of Good Hope, and we believe was firſt deſcribed by L'Heritier; and the communis. The *communis*, or common black briony, is a native of England, but has not been obſerved growing wild in Scotland. It has a large root, which ſends forth ſeveral long ſlender ſtems: the leaves are large, heart-ſhaped, dark green, and grow on long footſtalks: the flowers are greeniſh, and the berry red. It flowers from May to Auguſt, and is frequent in hedges.

TAN, the bark of the oak after it has been ground and uſed by the tanner. The ſmaller ſort is generally made up in little ſquare cakes called *turf*, and ſold for firing. The coarſer ſort is ſometimes dried in the ſun, and uſed by bakers for heating their ovens, &c. but its chief uſe is for making of hot-beds to raiſe pine-apples and other plants.—William III. introduced the uſe of it from Holland, for the purpoſe of raiſing orange-trees; after which it was diſcontinued for many years: but about 1719, when *ananas* were firſt brought into England, it came into general uſe, and has ever ſince been in great eſtimation with gardeners for all the purpoſes of forcing, &c. on account of its ſtrong and laſting fermentation. The ſmaller the tan the quicker it heats; but the larger ſort acquires heat more gradually and retains it longer: the ſkilful gardener therefore uſes the one or the other, or a mixture of both, according to the time and purpoſe for which it is wanted. It is ſome time after the tan comes out of the tanner's pit before it begins to heat, and therefore it is not fit for immediate uſe; but having lain a week or two, it enters into a ſtate of fermentation, and if put into hot-beds properly prepared, will retain a moderate heat for three or four months. When it becomes uſeleſs for the hot-houſe, it is ſaid by Miller and others to be an excellent manure for ſome kinds of land.

The word *tan* is ſometimes, though improperly, uſed for the *bark* itſelf, which is the chief ingredient in the tanning of leather. Oak bark, on account of its great aſtringency and gummy-reſinous properties, is preferred to all other ſubſtances for the purpoſe of tanning, as it not only preſerves the leather from rotting, but alſo, by condenſing the pores, renders it impervious to water. See TANNING.

TANACETUM, TANSY, in botany: a genus of plants belonging to the claſs of *ſyngeneſia*, and order of *polygamia ſuperflua*; and in the natural ſyſtem ranging under the 49th order, *Compoſitæ*. The receptacle is naked; the pappus ſomewhat emarginated; the calyx imbricated and hemiſpherical; the florets of the radius are trifid, and ſcarcely diſtinguiſhable. Gmelin has enumerated ſeven ſpecies; of which one only is a native of Britain, the *vulgare*. The *vulgare*, or common tanſy, grows three or four feet high; the leaves are bipinnated and ſerrated; the flowers yellow, and terminate the branches in flat umbels. It is found ſometimes on the borders of fields and dry banks: it abounds at Wark, and Ford-caſtle in the neighbourhood of Kelſo, on the borders of Scotland; and on the ſide of Gareloch on the weſtern coaſt of Roſsſhire: it has alſo been found in Breadalbane. It flowers generally in Auguſt. Of this ſpecies there is a variety with curled leaves, which is therefore called *curled tanſy*. The tanſy has a bitter taſte, and an aromatic ſmell diſagreeable to many people. It is eſteemed good for warming and ſtrengthening the ſtomach; for which reaſon the young leaves have obtained a place among the culinary herbs, their juice being an ingredient in puddings, &c. It is rarely uſed in medicine, though extolled as a good emmenagogue. A drachm of the dried flowers has been found very beneficial in hyſteric diſorders ariſing from ſuppreſſion. The ſeeds and leaves were formerly in conſiderable eſteem for deſtroying worms in children, and are reckoned good in colics and flatulencies.

TANÆCIUM, in botany: a genus of the *angioſperma* order, belonging to the *didynamia* claſs of plants; and in the natural method ranking under the 25th order, *Putamineæ*. The calyx is monophyllous, tubulated, truncated, and entire; the corolla long, monopetalous, and white; the tube cylindrical; the lymbi erect, ſpreading, and nearly equal; the fruit a berry covered with a thick bark, large, oblong, internally divided into two parts; in the pulp are contained a number of ſeeds. There are only two ſpecies of this genus; the *jaroba* and *paraſiticum*, both natives of Jamaica. They grow by the ſides of rivers, and climb on trees and buſhes.

TANAGRA, TANAGER, in ornithology, a genus of birds belonging to the order of *paſſeres*. The beak is conical, acuminated, emarginated, almoſt triangular at the baſe, and inclining a little towards the point. Dr. Latham has deſcribed 44 ſpecies, all of which are of foreign extraction.

TANAIS, or DON. See DON.

TANGENT *of an* ARCH, is a right line drawn perpendicularly from the end of a diameter, paſſing to one extremity of the arch, and terminated by a right line drawn from the centre through the other end of that arch, and called the *ſecant*. SEE GEOMETRY.

TANGIER, a port-town of Africa, in the empire of Morocco and kingdom of Fez, ſituated at the entrance of the Straits of Gibraltar, in W. Long. 5. 50. N. Lat. 38. 49. In 1662 this place belonged to the Portugueſe, and was given to king Charles II. upon his marriage with the Infanta of Portugal: but he, growing weary of the charge of keeping it, cauſed it to be blown up and deſtroyed in 1684; ever ſince which time it has been only a poor fiſhing town. Anciently it was called *Tingis*, and gave name to the province of Mauritania Tingitana.

TANK, in the language of Indoſtan, a place incloſed for receiving and retaining the rain. During the periodical rains the tanks are filled, and thus in the dry ſeaſon furniſh water for the rice fields and cattle. Some of them are of great extent, meaſuring 300 or 400 feet on the ſide; they are of a quadrangular form, and lined with granite, deſcending in regular ſteps from the margin to the bottom.

TANNER, one who dreſſes hides by tanning them. See TANNING.

TANNER (Dr. Thomas), an Engliſh prelate and celebrated antiquarian, born in 1674. He was admitted of Queen's College, Oxford, where a ſimilarity of taſte for antiquities produced a cloſe friendſhip between him and Edmund Gibſon

afterwards bifhop of London. In 1697 he was chofen fellow of his college; and having already publifhed fome fpecimens of his fkill in the antiquarian way, foon after became known to Dr. Moore bifhop of Norwich, who made him chancellor of his diocefe. In 1722 he was made archdeacon of Norwich, and in 1731 bifhop of St. Afaph. He died at Oxford in 1735; and after his death was publifhed an elaborate work, faid to have employed him for 40 years, under this title, *Bibliotheca Britannica Hibernica, five de Scriptoribus qui in Anglia, Scotia, et Hibernia, ad fæculi XVII. initium floruerunt*, &c.

TANNING, the art of manufacturing leather from raw hides and fkins. Before we detail the procefs, it may be proper to obferve, that raw hides and fkins being compofed of minute fibres interfecting each other in every direction, the general operation of tanning confifts chiefly in expanding the pores, and diffolving a fort of greafy fubftance contained in them; and then, by means of the aftringency and gummy-refinous properties of oak bark, to fill and reunite them, fo as to give firmnefs and durability to the whole texture. But this theory has been controverted by fome chemifts, who fuppofe that the animal jelly contained in the fkin is not diffolved, but unites during the procefs with the aftringent principle of the bark, and forms a combination infoluble in water. The procefs of tanning varies confiderably, not only in different countries, but even in different parts of the fame country. The following is the method moft approved and practifed in London and its vicinity, where the beft leather is generally allowed to be manufactured. The leather tanned in England confifts chiefly of three forts, known by the name of *butts* or *backs*, *hides*, and *fkins*.

1. *Butts* are generally made from the ftouteft and heavieft ox hides, and are managed as follows: After the horns are taken off, the hides are laid fmooth in heaps for one or two days in the fummer, and for five or fix in the winter: they are then hung on poles, in a clofe room called a *fmoke-houfe*, in which is kept a fmouldering fire of wet tan; this occafions a fmall degree of putrefaction, by which means the hair is eafily got off, by fpreading the hide on a fort of wooden horfe or beam, and fcraping it with a crooked knife. The hair being taken off, the hide is thrown into a pit or pool of water to cleanfe it from the dirt, &c. which being done, the hide is again fpread on the wooden beam, and the greafe, loofe flefh, extraneous filth, &c. carefully fcrubbed out or taken off; the hides are then put into a pit of ftrong liquor called *ooze* or *wooze*, prepared in pits called *letches* or *taps* kept for the purpofe, by infufing ground bark in water; this is termed *colouring*: after which they are removed into another pit called a *fcowering*, which confifts of water ftrongly impregnated with vitriolic acid, or with a vegetable acid prepared from rye or barley. This operation (which is called *raifing*), by diftending the pores of the hides, occafions them more readily to imbibe the ooze, the effect of which is to aftringe and condenfe the fibres, and give firmnefs to the leather. The hides are then taken out of the fcowering, and fpread fmooth in a pit commonly filled with water, called a *binder*, with a quantity of ground bark ftrewed between each. After lying a month or fix weeks, they are taken up; and the decayed bark and liquor being drawn out of the pit, it is filled again with ftrong ooze, when they are put in as before, with bark between each hide. They now lie two or three months, at the expiration of which the fame operation is repeated; they then remain four or five months, when they again undergo the fame procefs; and after being three months in the laft pit, are completely tanned, unlefs the hides are fo remarkably ftout as to want an additional pit or layer.—The whole procefs requires from 11 to 18 months, and fometimes two years, according to the fubftance of the hide, and difcretion of the tanner. When taken out of the pit to be dried, they are hung on poles; and after being compreffed by a fteel pin, and beat out fmooth by wooden hammers called *beetles*, the operation is complete; and when thoroughly dry, they are fit for fale. Butts are chiefly ufed for the foles of ftout fhoes.

2. The leather which goes under the denomination of *hides* is generally made from cow hides, or the lighter ox hides, which are thus managed. After the horns are taken off, and the hides wafhed, they are put into a pit of water faturated with lime, where they remain a few days, when they are taken out, and the hair fcraped off on a wooden beam, as before defcribed; they are then wafhed in a pit or pool of water, and the loofe flefh, &c. being taken off, they are removed into a pit of weak ooze, where they are taken up and put down (which is technically termed *handling*) two or three times a-day for the firft week: every fecond or third day they are fhifted into a pit of frefh ooze, fomewhat ftronger than the former; till at the end of a month or fix weeks they are put into a ftrong ooze, in which they are handled once or twice a-week with frefh bark for two or three months. They are then removed into another pit, called a *layer*, in which they are laid fmooth, with bark ground very fine ftrewed between each hide. After remaining here two or three months, they are generally taken up, when the ooze is drawn out, and the hides put in again with frefh ooze and frefh bark; where, after lying two or three months more, they are completely tanned, except a few very ftout hides, which may require an extra layer: they are then taken out, hung on poles, and being hammered and fmoothed by a fteel pin, are, when dry, fit for fale. Thefe hides are called *crop hides*; they are from ten to eighteen months in tanning, and are ufed for the foles of fhoes.

3. *Skins* is the general term for the fkins of calves, feals, hogs, dogs, &c. Thefe, after being wafhed in water, are put into lime-pits, as before mentioned, where they are taken up and put down every third or fourth day, for a fortnight or three weeks, in order to dilate the pores and diffolve the gelatinous parts of the fkin. The hair is then fcraped off, and the flefh and excrefcences being removed, they are put into a pit of water impregnated with pigeon-dung (called a *grainer* or *maftring*), forming a ftrong alkaline ley, which in a week or ten days foaking out the lime, greafe, and faponaceous matter (during which period they are feveral times fcraped over with a crooked knife to work out the dirt and filth), foftens the fkins, and prepares them for the reception of the ooze. They are then put into a pit of weak ooze, in the fame manner as the hides, and being frequently handled, are by degrees removed into a ftronger and ftill ftronger liquor, for a month or fix weeks, when they are put into a very ftrong ooze, with frefh bark ground very fine, and at the end of two or three months, according to their fubftance, are fufficiently tanned; when they are taken out, hung on poles, dried, and fit for fale.

Thefe fkins are afterwards dreffed and blacked by the currier; and are ufed for the upper-leather of fhoes, boots, &c.

The lighter fort of hides, called *dreffing hides*, as well as horfe-hides, are managed nearly in the fame manner as fkins; and are ufed for coach-work, harnefs-work, &c. &c.

As the method of tanning above defcribed, and all others in general ufe, are extremely tedious and expenfive in their operation, various fchemes have at different times been fuggefted to fhorten the procefs and leffen the expence.—Though moft of

theſe ſchemes have ultimately proved unſucceſsful, yet in a work of this kind it may be expected that we ſhould not paſs them over wholly unnoticed.

Some have imagined, and perhaps juſtly, that cold water alone is not an adequate menſtruum for extracting the reſinous qualities of bark, however aſſiſted by the mucilage of the bark and of the ſkin; a decoction, inſtead of ſimple infuſion, has therefore been recommended as a more effectual mode of obtaining thoſe properties.

The late Dr. Macbride of Dublin having been concerned in a leather manufactory, publiſhed in 1778 a new method of tanning. His projected improvements may be briefly claſſed under two heads: the one recommending the uſe of *vitriolic* inſtead of *vegetable* acid, brewed from rye or barley: the other ſubſtituting *lime-water*, for the purpoſe of extracting the virtues of the bark, inſtead of the *water* commonly uſed by tanners. With reſpect to the firſt, it is generally acknowledged that the vitriolic acid is very proper for raiſing or diſtending the pores of the hides intended for butts, as its operation is not only more ſimple and certain than the acid formerly uſed, but as it tends more effectually to render the texture of the leather firm and durable: it is therefore ſtill preferred by the moſt ſkilful tanners. As to lime-water inſtead of water, it has been found inefficacious; and if the utmoſt care and attention be not obſerved, the leather is liable to ſuffer much injury. Even the ſhortening of the time and leſſening of the expence (which were its chief recommendations) being very problematical, it is now almoſt generally exploded.

Bartholet has obſerved, that it is neceſſary, on account of a chemical combination between the aſtringent principle and the animal ſubſtance in the proceſs of tanning, that free acceſs ſhould be given to the pure air; and therefore ſuppoſes that the proceſs could not be conducted properly in cloſe veſſels.

The methods of tanning in different provinces of France are ſo various, ſo complicated, and ſo contrary to the acknowledged principles of the manufacture, that it would be an endleſs and uſeleſs taſk to endeavour to detail them: we ſhall therefore content ourſelves with a general reference to M. de la Lande's elaborate Treatiſe on this ſubject.

It has been ſaid, that every part of the oak tree contains a great portion of aſtringent, gummy-reſinous matter, and will therefore tan leather as effectually as the bark itſelf. This opinion, which was firſt publiſhed in 1674 by the Honourable Charles Howard (Phil. Tranſ. vol. ix.), has ſince been countenanced by the celebrated Buffon; who adds, that the bark of birch will anſwer the purpoſe of tanning even ſole leather, which, it is well known, requires the ſtrongeſt and moſt penetrating materials.

A long memoir, written by M. Gleditſch, recommends the leaves, branches, fruit, and flowers, of a vaſt number of plants as ſubſtitutes for oak bark. Heath dried and pulveriſed, gall nuts, and the bark of birch, are ſaid by M. Geſner to be uſed in different provinces of Germany. Abbé Nollet informs us, that the leaves of myrrh are uſed by the tanners in Naples. In Corſica they make uſe of the leaves of wild laurel dried in the ſun and beaten into powder, and in the iſland of St. Kilda they tan with the tormentil root. In ſome parts of Italy leather is tanned with myrtle leaves. In Ruſſia, it is ſaid, that leather is tanned with the bark of willow: and it may here be obſerved, that a late writer has recommended the extract of bark to be made in America, in order to leſſen the expence of freight, &c. in conveying the bark itſelf to Europe.

In the year 1765, the Society of Arts, &c. granted a premium of 100l. for the diſcovery of a method of tanning with oak ſaw-duſt; which method has been adopted in Germany: and the Reverend Mr. Swaine has lately revived the exploded ſubſtitute (mentioned by Gleditſch and others) of oak leaves.

The following propoſal was communicated to the Bath Society for extracting the eſſence of oak bark: "Suppoſe (ſays the author) the operator has at hand a common family brewhouſe, with its neceſſary utenſils; let him procure a ton of good oak bark ground as uſual for the pit; and having placed a ſtrainer to the maſh tub, fill it two-thirds with the bark; heat as much water, nearly boiling, as will ſufficiently moiſten it, and maſh it well together. After it has ſtood about two hours, draw it off clear, and put it into a caſk by itſelf. Make a ſecond extract with a ſmaller quantity of boiling water than before, ſo as to draw off a quantity nearly equal to the firſt, and put that alſo into the ſame caſk with the former." Theſe two extracts will probably contain in them as much of the virtues of the bark as the quantity of liquid will abſorb.

A third extract, rather more in quantity than the other two, may be made from the ſame bark, and as ſoon as drawn off, ſhould be returned into the copper again when empty, and employed for the firſt and ſecond maſh of a quantity of freſh bark, as the three extracts may be ſuppoſed to have carried off the virtues of the firſt. Then proceed as before till all the bark is ſteeped, and a ſtrong liquid extract is drawn from it. The bark, when taken out of the copper, may be ſpread in the ſun to dry, and ſerve as fuel in the ſucceeding operations.

The next proceſs is, to evaporate the watery particles from the extract by a gentle heat, till it comes to the conſiſtence of treacle. This may be done either by the air and heat of the ſun, or by the ſtill or iron pan over the fire.

Anthony Day, eſq. of London, obtained a patent, dated 17th July 1790, for a new a method of tanning, "with half the bark in half the uſual time." This plan chiefly conſiſts in concentrating the bark into a ſtrong extract, and in ſome mechanical improvements in the conſtruction of the tan-yard. But neither the one nor the other have yet been adopted.

The 12th May 1795, a patent was granted to Mr. Tucker of Wickham, Hants. He propoſes that the vat, made of wood, be incloſed in a metallic coating or copper pit, completely ſoldered, to prevent the eſcape of any of the fluid. This is to be ſurrounded with a caſe of brick-work, leaving an interſtice of a few inches; and a fire is to be made in a grate near the bottom of the pit, to keep the ooze moderately warm, and thus to ſhorten the proceſs. But the great expence of theſe triple pits and of the fuel, it is to be feared, will counterbalance any advantages which might otherwiſe be derived from this invention.

Monſieur Seguin of Paris has lately ſubmitted to the French Convention a new method of tanning, which is ſaid to poſſeſs wonderful advantages. He has certainly exploded the ignorant and abſurd ſyſtems of the French tanners, which we have above hinted at, and has ſhewn much ingenuity and chemical knowledge in the proſecution of his diſcoveries; but his leading principles ſeem, in fact, to be nearly ſimilar to thoſe which have been long known and practiſed in England.

An ingenious manufacturer in London has, by the application of warm air, conveyed by means of flues from ſtoves properly conſtructed, and by other contrivances not generally known, conſiderably abridged the uſual proceſs of tanning. Some experiments have likewiſe been lately made with the bark of aſh and of horſe-cheſnut.

A ſubſtitute for oak bark, the price of which has lately been enormous, is the grand *deſideratum* in the manufacture of leather. Moſt of thoſe above enumerated have hitherto been

found ineffectual; but a patent, bearing date 16th January 1794, has been granted to Mr. Afhton of Sheffield, Yorkfhire, for his difcovery of a cheap and expeditious method of tanning leather. This method chiefly confifts in applying a preparation of mineral fubftances inftead of oak bark. Thofe which, on account of their cheapnefs, are moft to be preferred, are the drofs of coal-pits, called *fulphur-ftone* or *pyrites*, and the yellow ferruginous earth or red ochre; and, in general, all aftringent, fulphureous, or vitriolated fubftances. If this difcovery, which is yet in its infancy, fhould prove fuccefsful, it may caufe a material alteration in the procefs of this manufacture; and by reducing the expence, may ultimately be of great advantage to the public. Many other experiments are now making in England for the improvement of tanning; and as there are many perfons of ingenuity and knowledge engaged in the leather manufacture, much may be expected from their induftry and fkill.

As the acts of Parliament refpecting leather, &c. are very numerous, and many of them almoft obfolete, we fhall refer our readers to Burn's Juftice, or to the Statutes at Large. We cannot, however, help remarking, that the act of 1 James I. cap. 22. which prefcribes the mode and manner in which leather fhall be tanned, the materials to be ufed, and the time to be employed, is fo palpably abfurd and oppreffive, that it ought to be immediately repealed. The revenue arifing from the duty on leather tanned in Great Britain (exclufive of oiled leather) is upwards of 200,000*l. per annum.*

TANTALUS, in fabulous hiftory, king of Phrygia and Paphlagonia, was the fon of Jupiter and the nymph Plota. He one day entertained the gods at his table; when, to prove their divinity, he ferved up his fon Pelops cut in pieces. All the deities, except Ceres, perceived his cruelty and impiety, and would not touch his provifions. That goddefs, whofe thoughts were folely employed about her daughter Proferpine, inadvertently eat a part of his left fhoulder. Pelops, however, was reftored to life; and an ivory fhoulder given him in the room of that which had been eaten; while Tantalus was thrown into Tartarus, where he was punifhed with perpetual hunger and thirft. He was chained in a lake; the water of which reached up to his chin, but retired when he attempted to drink. The branch of a tree loaded with fruit hung down even to his lips, but on his attempting to pluck the fruit the branch fprung upwards.

TANTALUS, in ornithology, a genus of birds belonging to the order of grallæ. The bill is long, fubulated, and fomewhat crooked; the face naked; the tongue fhort; and the feet have four toes palmated on the under part. There are, according to Dr. Latham, 23 fpecies; of which the moft remarkable is the *ibis*, the bird fo much valued by the ancient Egyptians.

The ibis was formerly held in great veneration in Egypt, on account of its utility in freeing the country from ferpents. Serpents muft therefore have been numerous, or they could not have been very offenfive; and the ibis muft have been numerous, or they could not have been ufeful. Yet we are affured by Mr. Bruce, that the ibis is at prefent unknown in Egypt, and ferpents are no nuifance; and he thinks it impoffible that a country, covered with water for five months of the year as Egypt is, could ever have abounded with ferpents. He endeavours, however, to reconcile the accounts of ancient hiftorians with the ftate of Egypt.

In former times, when Egypt was in its flourifhing ftate, the inhabited country extended much farther than it does at prefent; reaching even a confiderable way into the fandy defert of Libya, where ferpents have their abode. Thefe parts were fupplied with water by immenfe lakes, dug by the magnificent princes of thofe times, and filled by the annual inundation of the Nile. Thefe frontier diftricts would naturally be infefted with vipers from the Libyan defert, and the vaft lakes would as naturally be fupplied by numbers of waterfowl, of which the ibis is a fpecies. This bird being likewife an enemy to ferpents, the inhabitants would foon become acquainted with his ufe, and their fuperftition would foon reward him. In after ages, however, when the ancient improvements were loft, and thofe vaft lakes dried up which brought the ibis thither, the ferpents ceafed to give any offence, becaufe there were none of the human fpecies there whom they could annoy; and in confequence of the want of water, the birds ceafed to annoy them, retiring to their native place Ethiopia, where they continue to frequent the great ftagnant pools which are common in that country.

Mr. Bruce found a bird in Abyffinia, which, after comparing it with the defcription of the ancient writers, and the embalmed ibis of Egypt, he concludes is the fame with the Egyptian ibis. It is called *abou Hannes*, fignifying "father John," from its appearing annually on St. John's day.

This bird is minutely defcribed by Mr. Bruce. It has a beak fhaped like that of a curlew, two-thirds ftraight, and the remaining third crooked; the upper part of a green horny fubftance, and the lower part black. It meafures four inches and an half from the occiput to the place where it joins the beak. The leg, from the lower joint of the thigh to the foot, is fix inches; the bone round and very ftrong; and from the lower joint of the thigh to where it joins the body, is five inches and a half. The height of the body from the fole to the middle of the back is nineteen inches; the aperture of the eye one inch; the feet and legs black: three toes before armed with fharp and ftraight claws; and a toe behind. The head is brown, and the plumage of the fame colour down to the back, or the place where the neck and back are joined. The throat is white, as well as the back, breaft, and thighs; the largeft feathers of the wing are of a deep black for thirteen inches from the tail; and fix inches up the back from the extremity of the tail is black likewife.

TANTALUS's *Cup*. See HYDROSTATICS.

TANZY, or TANSY, in botany. See TANACETUM.

TAORMINA, a town of Sicily, in the valley of Demona, fituated on the eaft coaft, on a rocky hill, called alfo, formerly, *Taurus*, and much celebrated both for its coftly marble and excellent wine. It was very much damaged by an earthquake in the year 1693. In the environs of this town, the fea-water, which makes at certain times a dreadful roaring amidft the rocks, has given room to an idle conjecture, that the water, abforbed by Charybdis, is here evacuated. It was formerly a magnificent city, at prefent it fcarcely contains 2000 inhabitants; fome ancient ruins afford fome idea of its former fplendour. In the tenth century, Taormina was taken from the Greek emperor, by the Arabians, at that time one of the ftrongeft places in the ifland; it was by them called *Al Moezzia*, which name it retained a confiderable time: twenty-feven miles SSW. Meffina, and 24 NNE. Catania. *Long.* 33. 10. E. Ferro. *Lat.* 38. 51. N.

TAPE-WORM. See TÆNIA.

TAPER, TAPERING, is underftood of a piece of timber, or the like, when thick at one end, and gradually diminifhing to the other; as in the cafe in pyramids, cones, &c.

To meafure TAPER-*Timber*, &c. See SLIDING-*Rule*.

TAPER-*Bored*, is applied to a piece of ordnance when it is wider at the mouth than towards the breech.

TAPER, alfo denotes a kind of tall wax candle, placed in a candleftick, and burnt at funeral proceffions, and in other church folemnities. Tapers are made of different fizes; in fome places, as Italy, &c. they are cylindrical; but in moft other countries, as England, France, &c. they are conical or

taper; whence poſſibly the name; unleſs we rather chooſe to derive taper, in the adjective ſenſe, from the ſubſtantive taper; in the Saxon *tapen* or *tapon*, *cereus*, " wax-candle. Both kinds are pierced at bottom for a pin in the candleſtick to enter.—There are two ways of making tapers, the firſt with the ladle, the ſecond by hand; for which, ſee CANDLE.

Paſchal TAPER, among the Romaniſts, is a large taper, whereon the deacon applies five bits of frankincenſe, in holes made for the purpoſe, in form of a croſs; and which he lights with new fire in the ceremony of Eaſter-Saturday. The Pontifical makes Pope Zoſimus the author of this uſage; but Baronius will have it more ancient, and quotes a hymn of Prudentius to prove it. That pope he ſuppoſes to have only eſtabliſhed the uſe thereof in pariſh-churches, which, till then, had been reſtrained to greater churches. F. Papebroch explains the original of the paſchal taper more diſtinctly, in his *Conatus Chronico-Hiſtoricus*, &c. It ſeems, though the council of Nice regulated the day whereon Eaſter was to be celebrated, it laid it on the patriarch of Alexandria to make a yearly canon thereof, and to ſend it to the pope. As all the other moveable feaſts were to be regulated by that of Eaſter, a catalogue of them was made every year; and this was written on a taper, *cereus*, which was bleſſed in the church with much ſolemnity. This taper, according to the abbot Chaſtelain, was not a wax-candle made to be burnt; it had no wick, nor was it any thing more than a kind of column of wax, made on purpoſe to write the liſt of moveable feaſts on; and which would ſuffice to hold that liſt for the ſpace of a year. For among the ancients, when any thing was to be written to laſt for ever, they engraved it on marble or ſteel; when it was to laſt a long while, they wrote it on Egyptian paper; and when it was only to laſt a ſhort time, they contented themſelves to write it on wax. In proceſs of time they came to write the moveable feaſts on paper, but they ſtill faſtened it to the paſchal taper. Such is the original of the benediction of the paſchal taper.

TAPESTRY, a kind of cloth made of wool and ſilk, adorned with figures of different animals, &c. and formerly uſed for lining the walls of rooms, churches, &c. The art of weaving tapeſtry is ſuppoſed to have been borrowed from the Saracens; accordingly the workmen employed in this manufacture in France were formerly called *Sarazins* or *Sarazinois*. Guicciardini aſcribes the invention of tapeſtry hangings to the inhabitants of the Netherlands; but he has not mentioned at what time the diſcovery was made. This art was brought into England by William Sheldon, near the end of Henry VIII.'s reign. In 1619 a manufacture was eſtabliſhed at Mortlake in Surrey by Sir Francis Crane, who received 2000l. from King James to encourage the deſign. The firſt manufacture of tapeſtry at Paris was ſet up under Henry IV. in 1606 or 1607, by ſeveral artiſts whom that monarch invited from Flanders. Under Louis XIV. the manufacture of the Gobelins was inſtituted, which has introduced very beautiful cloths, remarkable for ſtrength, for elegance of deſign, and a happy choice of colours. The fineſt paintings are copied, and eminent painters have been employed in making deſigns for the work.

Tapeſtry-work is diſtinguiſhed by the workmen into two kinds, viz. that of high and that of low warp; though the difference is rather in the manner of working than in the work itſelf; which is in effect the ſame in both: only the looms, and conſequently the warps, are differently ſituated; thoſe of the low warp being placed flat and parallel to the horizon, and thoſe of the high warp erected perpendicularly. The Engliſh anciently excelled all the world in the tapeſtry of the high warp; and they ſtill retain their former reputation, though with ſome little change: their low warps are ſtill admired; but as for the high ones, they are quite laid aſide by the French. The French, before the Revolution, had three conſiderable tapeſtry manufactures beſides that of the Gobelins; the firſt at Aubuſſon in Auvergne, the ſecond at Felletin in the Upper Marche, and the third at Beauvais. They were all equally eſtabliſhed for the high and the low warp; but they had all laid aſide the high warp excepting the Gobelins. There were admirable low warps likewiſe in Flanders, generally exceeding thoſe of France; the chief and almoſt only Flemiſh manufactures were at Bruſſels, Antwerp, Oudenard, Liſle, Tournay, Bruges, and Valenciennes; but of the ſtate of theſe manufactures now we are ignorant. The uſual widths of tapeſtry are from two ells to three ells Paris meaſure.

TAPIOCA, a ſpecies of ſtarch, which the Brazileans make from the roots of the caſſada plant, which is already deſcribed under its botanic name JATROPHA.

TAPIR, in zoology, a quadruped of the order of *belluæ*, reſembling the hippopotamus, has the fore-hoofs divided into four, and the hind-hoofs into three parts. The noſe of the male extends far beyond the lower jaw, is ſlender, and forms a ſort of proboſcis; it is capable of being contracted or extended at pleaſure, and its ſides are ſulcated. The extremities of both jaws end in a point, and there are ten cutting-teeth in each. Between them and the grinders there is a vacant ſpace; and there are ten grinders in each jaw. The ears are erect, the eyes ſmall, and the body is ſhaped like that of a hog. The back is arched; the legs are ſhort; and the hoofs ſmall, black, and hollow. The tail is very ſmall. The animal grows to the ſize of a heifer half a year old. The hair is ſhort: when young, it is ſpotted with white; when old, of a duſky colour. It inhabits the woods and rivers of the eaſtern ſide of South America, from the iſthmus of Darien to the river of Amazons. It ſleeps during day in the darkeſt and thickeſt foreſt adjacent to the banks, and goes out in the night-time in ſearch of food. It lives on graſs, ſugar-canes, and on fruits. If diſturbed, it takes to the water; ſwims very well; or ſinks below, and, like the hippopotamus, walks on the bottom as on dry ground. It makes a ſort of hiſſing noiſe.—This is the largeſt of the American animals.

TAPPING, in general, the act of piercing a hole in a veſſel, and applying a tube or canula in the aperture, for the commodious drawing off the liquor contained therein.

TAPPING, in ſurgery. See SURGERY.

TAPROBANE, the ancient name of the iſland of Ceylon. See CEYLON.

TAR, a thick, black, unctuous ſubſtance obtained chiefly from old pines and fir-trees by burning them with a cloſe ſmothering heat. It is prepared in great quantities in Norway, Sweden, Germany, Ruſſia, and North America, and in other countries where the pine and fir abound. For the method of obtaining it, ſee the article PINUS. Becher, the celebrated chemiſt, firſt propoſed to make tar from pit-coal. Manufactures for this purpoſe have been eſtabliſhed many years ago in the biſhopric of Liege, and in ſeveral parts of England. In the year 1781 the Earl of Dundonald obtained a patent for extracting tar from pit-coal by a new proceſs of diſtillation; (ſee COAL). Tar, which is well known for its economical uſes, is properly an empyreumatic oil of turpentine, and has been much uſed as a medicine both internally and externally. Tar-water, or water impregnated with the more ſoluble parts of tar, was formerly a popular remedy.

TARANTO, the ancient TARENTUM, a ſea-port town of Italy, in the kingdom of Naples, and in the Terra de Otranto. It is a ſtrong and populous place, with an archbiſhop's ſee,

and the title of a principality. It is feated on a peninfula, and is defended by a ftrong caftle; but the harbour is choaked up. E. Long. 17. 29. N. Lat. 40. 35.

TARANTULA, a fpecies of Aranea, fo called from Taranto, the place where they are faid to abound. See ARANEA, fpecies thirteen.

TARASCON, an ancient, populous, and handfome town of France, in the department of the Mouths of the Rhone, and late province of Provence, with a well-built caftle, feated on the river Rhone, oppofite Beaucaire, with which it communicates by a bridge of boats. Its commerce confifts in oil, brandy, ftarch, and ftuffs that are much worn, one fort being of coarfe filk, and the other of the fame material and wool. It is ten miles north of Arles, and 375 fouth by eaft of Paris. E. Long. 4. 45. N. Lat. 43. 46.

TARAZONA, a ftrong town of Spain, in the kingdom of Arragon, and on the frontiers of Old Caftile, with a bifhop's fee. It is feated partly on a rock, and partly in a fertile plain, on the river Chiles. It was taken from the Moors in 1110. W. Long. 1. 26. N. Lat. 42. 10.

TARCHONANTHUS, FLEA-BANE, in botany: a genus of plants belonging to the clafs of *fyngenefia*, and to the order of *polygamia æqualis*; and in the natural fyftem ranging under the 49th order, *Compofitæ*. The receptacle is villous, and the pappus plumy: the calyx is monophyllous, turbinated, and half divided into feven fegments. There are only three fpecies known; the *camphoratus, glaber*, and *ericoides*.

TARE, is an allowance for the outfide package that contains fuch goods as cannot be unpacked without detriment; or for the papers, threads, bands, &c. that inclofe or bind any goods imported loofe; or though imported in cafks, chefts, &c. yet cannot be unpacked and weighed neat.

TARE, or VETCH. See VICIA.

TARGET, a kind of fhield or weapon of defence made ufe of by the ancients.

TARGIONIA, in botany: a genus of plants belonging to the clafs of *cryptogamia*, and natural order of *algæ*. The calyx is bivalved, including a globular body. There is only one fpecies; the *hypophylla*, which is a native of Great Britain. The hypophylla, or vetch targionia, has leaves about a quarter of an inch long, of a heart-fhape, inverted, and growing proftrate in a clump together: their upper furface is green, covered with whitifh papillæ, and their lower furface is black. The fructification grows at the great end of the leaf on the lower fide, and confifts of two concave valves or hemifpheres, of a reddifh black colour, inclofing a chocolate-coloured globule, refembling the feed of a tare or vetch, full of a yellow powder. The leaves increafe by fhooting out young offsets from their fides like the polypus. This plant is found in the north of England, and near the Tarbet of Cantire in Scotland.

TARGUM, a name given to the Chaldee paraphrafes of the books of the Old Teftament. They are called *paraphrafes* or *expofitions*, becaufe they are rather comments and explications than literal tranflations of the text. They are written in the Chaldee tongue, which became familiar to the Jews after the time of their captivity in Babylon, and was more known to them than the Hebrew itfelf. So that when the Hebrew text was read in the fynagogue, or in the temple, they generally added to it an explication in the Chaldee tongue for the fervice of the people, who had but a very imperfect knowledge of the Hebrew tongue. It is probable, that even from the time of Ezra this cuftom began, fince this learned fcribe, reading the law to the people in the temple, explained it, with the other priefts that were with him, to make it underftood by the people (Nehem. viii. 7—9.).

But though the cuftom of making thefe forts of expofitions in the Chaldee language be very ancient among the Hebrews, yet have they no written paraphrafes or targums before the era of Onkelos and Jonathan, who lived about the time of our Saviour. Jonathan is placed about thirty years before Chrift, under the reign of Herod the Great. Onkelos is fomething more modern. The targum of Onkelos is the moft of all efteemed, and copies are to be found in which it is inferted verfe for verfe with the Hebrew. It is fo fhort and fo fimple, that it cannot be fufpected of being corrupted. This paraphraft wrote only upon the books of Mofes; and his ftyle approaches nearly to the purity of the Chaldee, as it is found in Daniel and Ezra. This targum is quoted in the Mifna, but was not known either to Eufebius, St. Jerome, or Origen.

The targum of Jonathan fon of Uziel is upon the greater and leffer prophets. He is much more diffufe than Onkelos, and efpecially upon the leffer prophets, where he takes great liberties, and runs on in allegories. His ftyle is pure enough, and approaches pretty near to the Chaldee of Onkelos. It is thought that the Jewifh doctors who lived above 700 years after him made fome additions to him.

The targum of Jofeph the Blind is upon the Hagiographa. This author is much more modern, and lefs efteemed than thofe we have now mentioned. He has written upon the Pfalms, Job, the Proverbs, the Canticles, Ecclefiaftes, Ruth, and Efther. His ftyle is a very corrupt Chaldee, with a great mixture of words from foreign languages.

The targum of Jerufalem is only upon the Pentateuch; nor is that entire or perfect. There are whole verfes wanting, others tranfpofed, others mutilated; which has made many of opinion that this is only a fragment of fome ancient paraphrafe that is now loft. There is no targum upon Daniel, or upon the books of Ezra and Nehemiah.

Thefe targums are of great ufe for the better underftanding not only of the Old Teftament, on which they are written, but alfo of the New. As to the Old Teftament, they ferve to vindicate the genuinenefs of the prefent Hebrew text, by proving it to be the fame that was in ufe when thefe targums were made, contrary to the opinion of thofe who think the Jews corrupted it after our Saviour's time. They help to explain many words and phrafes in the Hebrew original, and they hand down to us many of the ancient cuftoms of the Jews. And fome of them, with the phrafeologies, idioms, and peculiar forms of fpeech, which we find in them, do in many inftances help us much for the better illuftration and better underftanding of the New Teftament as of the Old; the Jerufalem Chaldee dialect, in which they are written, being the vulgar language of the Jews in our Saviour's time. They alfo very much ferve the chriftian caufe againft the Jews, by interpreting many of the prophecies of the Meffiah in the Old Teftament in the fame manner as the Chriftians do. Many inftances are produced to this purpofe by Dr. Prideaux in his *Connect. of the Hift. of the Old and New Teft.* vol. iv. p. 777, &c.

Thefe targums are publifhed to the beft advantage in the fecond edition of the great Hebrew Bible fet forth at Bafil by Buxtorf the father, *anno* 1610; for he has rectified the Chaldee text, and reformed the vowel pointings in it: the targums having at firft been written without vowel points, which were afterwards added very erroneoufly by fome Jews.

TARIF, a table or catalogue containing the names of different forts of merchandize, with the duties to be paid as fettled by authority amongft trading nations.

TARPA (Spurius Mecius), a Latin critic in the time of Julius Cæfar and Auguftus. He had his tribunal in the temple of Apollo, where, with four affiftants, he paffed fentence on the works of the poets. Cicero and Horace make honourable mention of this critic.

TARPAULIN, a piece of canvafs, well tarred over, to keep off the rain from any place. The term is alfo often applied in a burlefque fenfe to a perfon that has been all his life bred to the fea.

TARPEIAN, in Roman antiquity, an appellation given to a fteep rock in Rome; whence, by the law of the twelve tables, thofe guilty of certain crimes were precipitated. It took its name from Tarpeia, a veftal virgin, who was killed by the Sabines, as related in hiftory.

TARRAGON, or DRAGON-WORT. See ARTEMISIA.

TARROCK, in ornithology, a fpecies of LARUS.

TARSHISH, or TARTESSUS, a town frequently mentioned by ancient authors, the fituation of which it is difficult to afcertain. See the opinions of Mr. Bruce and Dr. Doig on this fubject under the article OPHIR.

TARTAN, in fea language, a fmall coafting veffel navigated in the Mediterranean fea, and having only one maft and a bowfprit, the principal fail, which is extremely large, being extended by a lateen-yard. When tartans put up a fquare fail, it is called a *fail of fortune*.

TARTAR, a hard folid fubftance which feparates from wine after complete fermentation, and adheres to the top and fides of the cafks. See CHEMISTRY and PHARMACY.

TARTARY. This word in its moft extenfive fenfe, contains all that vaft country of Afia, which lies between the Frozen Sea, to the north, and Perfia, Hindooftan, and China to the fouth, and includes a great variety of nations, to which is applied the general name of *Tartars* or *Tatars*, with a particular one often applied from their local fituation. Mr. Strahlenburg, a Swedifh officer, who refided fome years in Siberia, places them in fix claffes: the firft, containing feven different nations, all in the dominions of Ruffia, viz. the Mordvines, who dwell in the government of Nizegorod; the Tfcheremiffes, or Czeremiffes, in the government of Kafan; the Permians, in the government of Perm; the Votiaks, in the government of Viatka; the Vogouls, who dwell on both fides of the mountains, which formed a feparation between Ruffia and Siberia; the Oftiacks, who dwell on the coafts of the river Oby; and the Barabintzi, who inhabit the country between Tara and Tomfk. The fecond clafs of people, called Tartars, includes the Budziacks, which dwell on the coafts of the Black Sea; the Crim Tartars, who inhabit the province of Taurida; the Kuban Tartars, on the borders of the Kuban River; and the Tartars of Daghestan. The Nogois, or Tartars of Aftrachan, of Kazan, and Upha. The Bafkirs and the Tartars about the towns of Tiumen, Tara, Tobolfk, and Tomfk. The Ufbek Tartars, the Turcomans, the Kurquis, the Karakalpas, the Sayantzi, who dwell near the head of the Enifei; the Kirgis, who occupy the mountains fouth of Lake Biakal; the Burats; the Arintzi, who alfo inhabit near the fame mountain, and the Yaktzi, more to the north, on the fides of the Lena. The third clafs includes the Samoiedes, on the coaft of the Frozen Sea, from Archangel to the Lena. The fourth clafs includes the Calmucks and Monguls, who were formerly but one people. The fifth clafs includes the Mantcheux and the Tungufes. The fixth clafs contains the favage nations on the north-eaft coaft of Afia, as the Tfchutki, &c. with the inhabitants of Kamtchatka, and the Kurile Iflands. Of thefe, the firft, third, and fixth clafs are fubject to Ruffia, except that a fmall part of the fecond is independent. The fourth is partly independent and partly fubject to China. The fifth clafs is wholly fubject to China. All the Tartars pretend to be defcended from Turk, the eldeft fon of Japheth. Although from the time that Jenghis Khan fubduced all Tartary, and a great part of Afia, and made irruptions into Europe, they have been known by the name of Tartars, to which that of Monguls or Moguls, of whom he was properly the prince, appeared inferior; neverthelefs, the Tartars preferve among themfelves the name of Turks. Thofe who are Mahometans bordering on Ruffia, but independent of that crown, take every opportunity of robbing their neighbours: the Calmucks and Monguls are very different in their behaviour, living quietly on the produce of their foil, without doing injury to others. The Tartars of Afiatic Ruffia are likewife reprefented as a quiet, inoffenfive people, living chiefly by the chafe and fifhing. Tartary may be divided into three parts, viz. Chinefe Tartary, Independent Tartary, and Ruffian Tartary. Chinefe Tartary is bounded on the north by Siberia, on the eaft by the Gulf of Kamtchatka and the Eaftern Sea, on the fouth by China, and on the weft by the country of the Kalmucks, who are eftablifhed between the Cafpian Sea and Kafhgar. The different tribes which at prefent inhabit it, were formerly comprehended under the general name of Mongul or Mogul Tartars, a warlike and formidable nation, who, on the one hand, conquered Hindooftan, under the famous Jenghis Khan, and on the other, fubdued China. It was in the thirteenth century that the Monguls took poffeffion of the latter empire; but after having reigned there for a hundred years, they were expelled by the Chinefe, in the year 1368. The fugitives took different routs; fome went towards the Eaftern Sea, and eftablifhed themfelves between China and the river Saghalien; the reft returned weftward to their former country, where, intermixing with the Moguls that remained, they foon refumed their ancient manner of living; thofe who fettled towards the eaft, having found the country almoft a defert, and without inhabitants, retained the fame cuftoms which they had brought from China: hence thefe two Mogul nations differ at prefent in language, government, religion, and cuftoms. Thofe of the eaft retain their ancient name of Mongul, or Mogul Tartars; the reft are known by the name of Mantchew or Eaftern Tartars. Chinefe Tartary is therefore divided into two parts, the Eaftern and Weftern. Eaftern Chinefe Tartary extends, north and fouth, from the 41ft to the 55th degree of north latitude; and eaft and weft, from about the 137th degree of longitude, as far as the Eaftern Sea. It is bounded on the north by Siberia, on the fouth by the Gulf of Leao-tong and Corea, on the eaft by the Eaftern Sea, and on the weft by the country of the Monguls. The Tartars who retired hither, after their expulfion from China, in the year 1368, immediately began to build cities, towns, and villages, and to cultivate the earth, after the manner of the Chinefe, among whom they had lived: hence the greater part of them have remained fixed, and are much more civilifed than the reft of the Mongul nation. They were at firft governed by particular khans, each independent of the other; but fince that of Ningouta (who was the moft powerful among them) took poffeffion of China, about the middle of the laft century: the emperor, who is ftill one of his defcendants, has reduced under his dominion all the other khans of this part of Tartary: this prince governs it immediately by himfelf, and fends thither governors and officers, as into all the other provinces of the empire. The country of the Mantchew Tartars is divided into three grand departments: Chenyang, Kirin, and Tcitcicar. Weftern Chinefe Tartary, or Mongul Tartary, is bounded on the north by Siberia, on the eaft by Eaftern Chinefe Tartary, on the fouth by the great wall and Leao-tong, and on the weft by Independent Tartary. It was partly from the bofom of thefe dry deferts, that thofe celebrated conquerors iffued, who made all Afia tremble. The Mongul nation is fubdivided into a multitude of others, who all fpeak the fame language, generally called the Mongul language: they have, it is true, feveral different dialects, which however does not prevent them from underftanding one another. Thefe Tartars have neither towns, villages, nor

houſes; they form themſelves only into wandering hords, and live under plain tents, which they tranſport from one place to another, according as the temperature of the different ſeaſons, or the wants of their flocks require: they paſs the ſummer on the banks of their rivers, and the winter at the bottom of ſome mountain or little hill, which ſhelters them from the ſharp and cutting north-wind. Each of theſe tribes has its reſpective limits, and it would be an act of hoſtility towards their neighbours to go beyond them; but they are at full liberty to encamp wherever they chooſe within the circumference aſſigned them. They are naturally clowniſh, and dirty in their dreſs, as well as in their tents, where they live amidſt the dung of their flocks, which when dried, they burn on their hearths inſtead of wood; enemies to labour, they chooſe rather to be ſatisfied with the food which their flocks ſupply them, than take the trouble of cultivating the earth: it even appears that they neglect agriculture from pride. When the miſſionaries aſked them why they did not at leaſt cultivate ſome gardens, they replied, that the graſs was for beaſts, and beaſts for man. During the ſummer they live only on milk, which they get from their flocks, uſing without diſtinction that of the cow, mare, ewe, goat, and camel. Their ordinary drink is warm water, in which a little coarſe tea has been infuſed; with this drink they mix cream, milk, or butter, according to their circumſtances. They have alſo a method of making a kind of ſpirituous liquor of ſour milk, eſpecially of that of the mare, which they diſtil after having allowed it to ferment. Tartars of better condition, before they diſtil this ſour milk, mix it with ſome of the fleſh of their ſheep, which has been alſo left to ferment. This liquor is ſtrong and nouriſhing: their moſt voluptuous orgies conſiſt in getting drunk with it. The Moguls are free, open, and ſincere. They pride themſelves chiefly on their dexterity in handling the bow and arrow, mounting on horſeback, and hunting wild beaſts. Polygamy is permitted among them; but they generally have only one wife. They burn the bodies of their dead, and tranſport the aſhes to eminences, where they inter them, and cover the grave with a heap of ſtones, over which they plant a great number of ſmall ſtandards. They are unacquainted with the uſe of money, and trade only by barter. Although the Moguls might appropriate to themſelves the ſpoils of a great number of animals, the ſkins which they uſe for clothing are generally thoſe of their ſheep. They wear the wool inmoſt, and the ſkin on the out-ſide. They are very well acquainted with the art of preparing and whitening theſe ſkins. Some of the better ſort among them ſometimes uſe the ſkins of ſtags, dogs, or wild goats, of which they make dreſſes for ſpring; but whatever care theſe people take to prepare theſe ſkins, they always exhale a ſtrong and diſagreeable ſmell, on which account they are called by the Chineſe, Tſaoſatſe—*Stinking Tartars.* Their tents almoſt always ſmell of their ſheep, and can ſcarcely be endured even by thoſe who have been long accuſtomed to them. The religion of the Mogul Tartars is confined to the worſhip of Fo. They have the moſt ſuperſtitious veneration for their lamas. All the Moguls are governed by khans, or particular princes, independent one of the other, but all ſubjected to the authority of the emperor of China, whom they conſider as the grand khan of the Tartars. When the Mantchews ſubdued China, they conferred on the moſt powerful of the Mogul princes the title of *vang, peilé, peiré,* and *cong,* which anſwer to our titles of *king, duke, count,* and *marquis;* each of them had a revenue aſſigned him, but far inferior to the appointments of the Mantchew lords at Peking: the emperor ſettled the limits of their reſpective territories, and appointed them laws, according to which they are at preſent governed: theſe tributary khans have not the power of condemning their ſubjects to death, nor of depriving them of their poſſeſſions; theſe two caſes of death and confiſcation are reſerved for the ſupreme tribunal eſtabliſhed at Peking for the affairs of the Moguls, to which every individual may appeal from the ſentence of his prince, who is obliged to appear in perſon whenever he is cited. All the Mogul nation under the Chineſe government may be divided into four principal tribes, which are the Moguls, properly ſo called, the Kalkas, Ortous, and the Tartars of Kokonor. According to the map of Chineſe Tartary, the country of the Moguls extends more than 300 leagues from eaſt to weſt, and 200 from north to ſouth: it is incloſed between the country of the Ortous, the great wall, Eaſtern Tartary, and the country of the Kalkas; theſe people compoſe forty-nine *ki,* or ſtandards; every ſtandard comprehends an indeterminate number of companies, each of which conſiſts of 150 heads of families; and, as theſe Tartar families are generally numerous, each company may be reckoned to contain 1000 individuals: beſides theſe forty-nine ſtandards, there are five others, under the immediate government of the emperor of China, and commanded by officers whom he ſends thither. The Kalkas (who formerly compoſed a numerous tribe, conſiſting of more than 600,000 families) inhabit to the north of the Mogul Tartars, whom we have juſt mentioned. Their country, which ſtretches as far as the kingdom of the Eluths, is near 300 leagues in extent, from eaſt to weſt. In this region was formerly ſituated, towards the forty-fifth degree of north latitude, the city of Karakun, the ſeat of the empire of Jenghiz-khan, and that of his ſucceſſors. The Kalkas live under tents, on the banks of the rivers which water their country; that of Kalka pira (though one of the ſmalleſt, and at preſent one of the leaſt frequented) has given its name to the whole nation. The moſt conſiderable of theſe rivers are the Kenlon, Toula, Touy, and the Selengué. The vaſt deſert, which the Chineſe call *Chamo,* and the Tartars *Cobi,* occupies almoſt all the ſouthern part of the country of the Kalkas. A war which the king of the Eluths carried on in the year 1688, againſt the Kalkas, almoſt deſtroyed the whole nation. To avoid the purſuit of a ſuperior enemy, they begged the aſſiſtance of the Chineſe arms, and offered to ſubmit to the empire. Kang-hi undertook their defence, conquered the king of the Eluths, and kept the Kalka Tartars under his dominion, after having conferred upon their princes different titles of honour. Theſe people have among them one of thoſe grand lamas, called *hou touctou,* whom they conſider as ſo many living Fos: he is lodged under a large tent, and ſhows himſelf to the public, lying on a kind of altar, where he receives the adoration of all the Tartars. The hou-touctou is however but a lama of the ſecond order; for the lama who reſides in Thibet is acknowledged his ſuperior; the latter is generally conſidered as the high-prieſt, and ſupreme chief of the Tartar religion. The country of the Ortous (who inhabit to the north of the great wall, and to the Moguls, properly ſo called) is 110 leagues in extent, from eaſt to weſt, and ſeventy from ſouth to north. Theſe people are divided into ſix ſtandards, which comprehend 166 companies, each compoſed of 150 heads of families. The Ortous are of a free diſpoſition, extremely lively, and never ſubject to melancholy; they may be juſtly called the *French of Tartary.* The Tartars of Kokonor (who are Eluths or Kalmucks by nation, and who are at preſent ſubjects of the emperor) occupy an extenſive country to the weſt of China and the province of Chen-ſi, from whence they are ſeparated by lofty mountains. They take their name from a lake in this country, called in their language *kokonol* or *kokonor,* and which is one of the largeſt of Tartary. They are ſubject to eight princes, who are each independent of the other, and who are all of the race of the khan of the Eluth Tartars. Theſe people

derive their principal riches from the gold which is found mixed with the fand of their rivers, and above all, with that of Altangkol, or the Golden River. The gold-duft which it furnifhes, is the principal revenue of the princes of Kokonor, who employ their vaffals during fummer in collecting it. One of the principal articles of the trade of Kokonor, is a kind of napped woollen ftuff, called *pou-lou:* it is manufactured by thefe Tartars, who have the art of dyeing it different colours. The Chinefe empire has been lately extended in Tartary, by the celebrated conqueft of the kingdom of the Eluths, made in the year 1759, by the arms of the Emperor Kien-long. The whole nation of the Eluths, who are known in Europe and Ruffia by the name of *Kalmucks*, may be divided into three branches, which have all proceeded from the fame ftem. The moft wefterly (who at prefent are the moft powerful and numerous) occupy the country contained between the Cafpian Sea, Ruffia, Samarcand, and Kafhgar. The fecond divifion of the Eluths inhabit to the eaft. The country is bounded on the north by Ruffia, and on the fouth by the territories of the Ufbeck Tartars. Thefe are the people whom Kien-long has lately obliged to fubmit to the Chinefe government. The third branch of the Eluths inhabit to the weft of China, fpoken of under the name of the *Tartars of Kokonor*, who, for a long time, have been fubjects of the empire. *Independent Tartary* includes all the country between Chinefe Tartary and the Cafpian Sea, and contains Turkeftan, Great and Little Bukharia, Turcomania, Charafm, Thibet, and fome other countries and provinces, inhabited by the Ufbecks and Calmucks. *Ruffian Tartary* includes the remainder.

Krim TARTARY. See CRIMEA.

TASSEL, a fort of pendant ornament at the corners of a cufhion or the like. In building, taffels denote thofe pieces of board that lie under the ends of the mantlet trees.

TASSO (Torquato), an illuftrious poet of Italy, was defcended from the ancient and noble houfe of the Torreggiani, and born at Sorrento, in the kingdom of Naples, in 1544. This extraordinary man at four years of age was fent to the college of the Jefuits at Naples. He applied with fuch amazing ardour to books, that he is faid at feven to have had a very perfect knowledge of the Latin tongue, and a competent fkill in the Greek. He compofed even at that time orations, which he recited in public, and poems infinitely beyond the tendernefs of his years. He muft indeed have been ftrangely mature; for we are confidently affured, that he was involved in a fentence of death with his father, when he was not nine years old. His father, however, ventured to leave him at Rome, while he attended his mafter to France; with whom he continued there three or four years, and then at his death returned to Italy to the Duke of Mantua, who had earneftly invited him to his court, and chofe him for his firft fecretary. Hither he fent for Torquato, then about twelve years old, who was fcarcely arrived at Mantua, when he was made to accompany Scipio de Gonzaga the young prince of Mantua, who was about his own age, to the univerfity of Padua. Here he was for five years; at the end of which he maintained publicly thefes in philofophy, divinity, civil and canon law. Thefe ftudies, however, had not fo far engroffed him, but that he found time to gratify that inclination which he had naturally for poetry: and the year after, when he was only eighteen, he furprifed the public in a moft agreeable manner with his Il Rinaldo, printed at Venice in 1562, 4to. Elate with his fuccefs, he abandoned the law entirely, which his father had trained him to, and gave himfelf up entirely to poetry. He was foon after admitted a member of the academy of the Eterei at Padua; he took the name of Pentito, or the Penitent, to denote his repentance for having wafted fo much time in the purfuit of the law, which he ought to have devoted to the Mufes.

At Padua he began his celebrated poem entitled, "Gerufalemme liberata;" and happy had it been for him, if he had continued in this convenient fituation till he had finifhed it; but in 1565 he removed to Ferrara, at the folicitation of Duke Alphonfus, and the Cardinal Lewis his brother, who greatly efteemed and loved him. The duke gave him lodgings in his palace, and by his generofity put him into a condition of living happily and at eafe: and, to make his refidence at Ferrara the more fecure, preffed him, by his fecretary, to an advantageous match; but Taffo would not liften to this. In 1572 Pope Gregory fending Cardinal Lewis to France, in the quality of legate, Taffo accompanied him, and received great marks of efteem from Charles IX. Upon his return to Ferrara he compofed his "Aminta," a paftoral comedy, which was acted with vaft applaufe: it was printed at Venice in 1581, with fome other fmall pieces of poetry. His joy upon the fuccefs of this piece was foon damped by the lofs of his father, who died in 1585, at Oftiglia upon the Po, of which place the duke of Mantua had given him the government.

During his refidence at Ferrara, he was upon the moft intimate terms with a gentleman of the town; to whom, though he was unreferved upon all other fubjects, yet he never communicated any thing relating to his amours, having, as fuppofed, afpired to the love of Princefs Eleanor, fifter of Duke Alphonfus. This raifed fufpicions in Taffo's friend; who thereupon fearching into the myftery, at laft made difcoveries to others, which might be injurious to Taffo. Taffo expoftulated the affair with him; and, upon his complaints being difrefpectfully received, proceeded fo far as to give him a box. A challenge enfued, and Taffo met the gentleman; when, as they were engaged, three brothers of the gentleman came up, and very bafely fell upon Taffo. Taffo made his part good againft the four, and had wounded his antagogonift, and one of his brothers, when people came up and parted them. He gained upon this occafion as great fame by his fword, as he had gained upon others by his pen; but neither the one nor the other was fufficient to preferve him from numerous evils that followed. The four brothers were obliged to fly, for the little regard they had fhewn to a perfon under the duke's protection, and in his palace: and for Taffo, he was put under guard, not as a punifhment, but to fecure him againft the enterprifes of his enemies. He was confined in prifon, where he fell into the deepeft melancholy: however, at the end of a year, he recovered his fpirits a little, and made his efcape. He withdrew to Turin, where he concealed himfelf for fome time under a fictitious name; but at laft was difcovered, and made known to the Duke of Savoy. The duke had him to court, affigned him apartments there, and fhewed him all the marks of efteem and affection; but all was not fufficient to cure him of his melancholy. Apprehenfive of the Duke of Ferraro's indignation againft him, and full of fufpicions and terrors, he fet out one morning, without any fort of preparation, or even intimating his intentions, towards Rome; where, when he arrived, he went ftraight to the palace of Cardinal Albano, and was received with great kindnefs and affection. After fome ftay in this city, where every body vifited him, he felt a defire of revifiting his native country, and his fifter Cornelia, who was married and fettled there; but the fear of what might happen to him, in a kingdom where he had formerly been condemned as a rebel, plunged him again into his former melancholy. He refolved therefore to leave Rome, as he had left Turin, without taking the leaft notice, and under the pretext of going to divert himfelf at

Frefcati. Having effected this, he wrote to Duke Alphonfus in the moft fubmiffive manner; he implored the affiftance of the Duchefs of Ferrara, and of the princefs Eleanor: but was given to underftand by the latter, that his flight had irritated the duke fo much, as to put it out of their power to do him any fervice. Upon this he refolved to fling himfelf at the Duke of Ferrara's feet, and did fo, when he was received with fuch tokens of affection, as cured him entirely of all his fears: yet when he humbly defired to have the manufcripts he had left behind him at Ferrara, they were refufed him; for Duke Alphonfus being ill-advifed, was perfuaded he was melancholy mad, and thought that ftudy would add thereto. Taffo in vain endeavoured to undeceive him, upon which he left Ferrara, a fecond time, and went to Mantua; afterwards he vifited Padua and Venice. He returned to the Duke of Ferrara who firmly believing, according to the fuggeftions of his minifters, that the melancholic temperament of Taffo, and his conftant application to poetry, had really difordered his underftanding, ordered him to be put into an hofpital, and a guard to be fet over him. The imaginary madnefs, however, that was imputed to him, brought on real melancholy; and he was fometimes fo bad, as to be deprived of his underftanding, although he is faid to have borne his misfortunes with uncommon firmnefs.

He applied to many princes to intercede for his liberty; but their interceffions availed nothing. At length Vincent de Gonzaga, fon of the Duke of Mantua, going to Ferrara, and vifiting him in his hofpital, conceived the higheft efteem for him; and afked him of Duke Alphonfus in fo preffing a manner, that the duke could not hold out any longer: and fo the prince de Gonza refcued him from his prifon, and carried him to Mantua. This was in the beginning of 1586. The Prince of Mantua had promifed the Duke of Ferrara that he would have a very watchful eye over him; and, to make good his promife, he affigned Taffo the town of Mantua for his prifon. But the poet could not relifh this fort of captivity, fo that it was foon enlarged, yet with fome reftrictions. While Taffo was enjoing his repofe at Mantua, better than he had done any-where for fome time, Duke William died in Auguft 1587, and Prince Vincent fucceeded to the government. Vincent had now fomething elfe to do, than to devote himfelf to the Mufes, and to trifle with Taffo; fo that the poet, growing into neglect as it were, began to think of new quarters, where he might fpend the fmall remainder of his miferable life in eafe and freedom. He caft his eyes upon Naples, and thither he went at the end of 1587. In the beginning of 1589 he made a journey to Rome; and there the Duke of Tufcany, Ferdinand, entreated him to go to Florence, and for this purpofe employed the authority of the pope. Taffo, unable to withftand the folicitations of fuch perfonages, went to Florence in the fpring of 1590, but with a defign to return from thence as foon as he fhould be able; and he did return by Rome to Naples, in the autumn of 1591. He had apartments in the palace of the Prince of Conca, who was now his patron; and it was here that he wrote "Gierufalemme conquiftata," which was only a new edition of his "Gierufalemme liberata." The Prince of Conca, who was infinitely charmed with this work, took it into his head to be afraid left fomebody fhould carry off Taffo and his poem; and, in order to prevent it, wifely fet a guard over the one and the other. Taffo complained of this to his friend Manfo, who, furprifed with the uncommonnefs of the proceeding, took Taffo from the palace, and gave him lodgings at his own houfe. Here he was enjoying good health, good air, and quietnefs; when Cardinal Cinthio, nephew of Pope Clement VIII. invited him to Rome, whither he was forced to go, much againft his will, in the fpring of 1592. He foon found himfelf in that unfettled and hurrying ftate, which had long made him fick of his connections with princes; and he wanted very much to be at Naples again, whither after having contrived fome excufe or other, he arrived in the beginning of the fummer 1594. Cardinal Cinthio, who had feen him leave Rome with regret, foon found the means of bringing him back again; for he applied to the pope and Roman fenate, to have him crowned with laurel in the capitol; which honour being obtained for him he was obliged to repair to Rome again immediately. Taffo was at Rome, and all things were prepared for the ceremony of his coronation, when Cardinal Cinthio fell fick; and the cardinal was no fooner upon the recovery, than Taffo fell fick. He was only in his fifty-firft year; but ftudy, which all his changes and chances had never interrupted, travels, confinement, and uneafinefs, had made him old before his time. His illnefs increafing, he ordered himfelf to be carried to the convent of St. Onuphrius. Here he fpent fome days in preparing for futurity, and died the 25th of April 1595.

The works of Taffo have been often printed feparately, at various times and places; but the whole, together with his life, and alfo feveral pieces for and againft his "Gierufalemme liberata," were publifhed at Florence in 1724, in fix volumes folio.

TASTE, a certain fenfation, or clafs of fenfations, excited in the mind by certain bodies, which are called *fapid*, applied to the tongue and palate, and moiftened with the faliva. This is the original and proper meaning of the word *tafte* (fee METAPHYSICS); but as the qualities of bodies which produce thefe fenfations are unknown, they have in all languages got the names of the fenfations themfelves, by that figure of fpeech which fubftitutes the caufe for the effect. Hence we talk of the tafte of fugar, wormwood, honey, vinegar, &c.; and fay, that the tafte of fugar is fweet, and of vinegar, four. Taftes have been divided into fimple and compound; and philofophers have to very little purpofe endeavoured to afcertain the number of each fpecies. Attempts have likewife been made to determine from their taftes the effects of different fubftances on the human body, taken into the ftomach as food or phyfic; but by ftating the refults of the various inquiries, we fhould be more likely to miflead the unlearned reader, than to communicate ufeful information to readers of any defcription. Whoever is defirous of information on the fubject may confult *Phil. Tranf.* N° 280, 299; and *Abercromb. Nov. Med. Clavis.*

TASTE is likewife ufed in a figurative fenfe, to denote that faculty of the mind by which we perceive and enjoy whatever is beautiful or fublime in the works of nature or of art. Like the tafte of the palate, this faculty relifhes fome things, is difgufted with others, and to many is indifferent; and from thefe obvious analogies between it and the external fenfe it has obtained its name. It has likewife been called an internal *fenfe*, and by Dr. Hutchefon, a *reflex fenfe;* whilft others have confidered it, not as a diftinct faculty or fenfe, but as the joint exertion of perception and judgment in fome cafes, and as a play of the imagination in others.

The reader who wifhes for inftruction in the philofophy of tafte, may confult Gerard's Effay on Tafte, with the differtations of Voltaire, d'Alembert, and Montefquieu; Dr. Blair's Lectures on the Belles Lettres; Dr. Reid's Effays on the Intellectual powers of Man; Alifon's Effays on the Nature and Principles of Tafte; and Sir Jofhua Reynold's Difcourfes delivered in the Royal Academy.

TATE (Nahum), an Englifh poet, born about the middle of the reign of Charles II. in Ireland, where he received his education. He was made poet-laureat to King William upon the death of Shadwell, and held that place until the reign of George I. whofe firft birth-day ode he lived to write, and executed it with unufual fpirit. He died in the Mint in 1716, and was fucceeded in the laurel by Mr. Eufden. He was the

author of nine dramatic performances, a great number of poems, and a verſion of the Pſalms in conjunction with Dr. Nicholas Brady.

TATIAN, a writer of the primitive church in the ſecond century. He was born in Aſſyria, and trained up in the heathen religion and learning. Coming over to Chriſtianity, he became the diſciple of Juſtin Martyr, whom he attended to Rome. While Juſtin lived, he continued ſteadily orthodox: but after Juſtin's death he made a ſchiſm, and became the author of a new ſect, condemning marriage, enjoining abſtinence from wine and animal food, and ſuffering only water to be uſed in the holy myſteries; whence his followers were called *Encratitæ* and *Hydroparaſtatæ*. None of his works are now extant but his piece againſt the Gentiles; or, as it is uſually entitled, his *Oration to the Greeks*.

TATIUS (Achilles), a native of Alexandria, was the author of a book on the ſphere, which father Petau tranſlated into Latin. There is alſo attributed to him a Greek romance on the loves of Leucippe and Clitophon, of which Salmaſius has given a beautiful edition in Greek and Latin, with notes. Suidas ſays, that this Achilles Tatius was a Pagan, but that he afterwards embraced the chriſtian religion, and became a biſhop. Photius mentions him in his Bibliotheca.

TATONNEUR, in zoology. See Lemur.

TATTOOING, or Tattowing, an operation in uſe among the iſlanders in the South Sea, for marking their bodies with figures of various kinds, which they conſider as ornamental. It is performed by puncturing the ſkin, and rubbing a black colour into the wounds. The inſtrument uſed ſomewhat reſembles a comb, the teeth of which are repeatedly ſtruck into the ſkin by means of a ſmall mallet. It is very painful; but the children are forced by their relations to ſubmit to it.

TATTOU, a beat of a drum at night to advertiſe the ſoldiers to retreat, or repair to their quarters in the garriſon, or to their tents in a camp.

TAVERNIER (John Baptiſt), a famous French traveller, was born in 1605. In the courſe of forty years he travelled ſix times to Turkey, Perſia, and the Eaſt Indies, and viſited all the countries in Europe, travelling moſtly on foot. His travels have been frequently reprinted in ſix vols. 12mo. He died on his ſeventh journey to the eaſt, at Moſcow, in 1609.

TAVIRA, or Tavila, a conſiderable town of Portugal, and capital of the province of Algarve, with a handſome caſtle, and one of the beſt harbours in the kingdom, defended by a fort. It is ſeated in a pleaſant fertile country, at the mouth of the river Gilaon, between Cape Vincent and the Strait of Gibraltar, 100 miles weſt by north of Cadiz. W. Long. 7. 46. N. Lat. 37. 18.

TAVISTOCK, a town of Devonſhire in England, ſituated on the river Tavey or Tave, W. Long. 4. 12. N. Lat. 50. 37. It ſends two members to parliament, and gives the title of *marquis* to the noble family of Ruſſel duke of Bedford.

TAUNTON, a town of England, in the county of Somerſet. This town in point of ſize, buildings, and reſpectability of inhabitants, may vie with many cities. Its extent from eaſt to weſt is nearly a mile, and it conſiſts of four principal ſtreets, which are wide, and very well built, and contains two pariſh churches. There is a noble ſpacious market-place, in which is a handſome commodious market-houſe, with a town-hall over it, the building whereof was completed in the year 1773. The markets are large, and kept on Wedneſday and Saturday. The woollen manufacture has flouriſhed in this town almoſt ever ſince its firſt introduction into England by the emigrants from Flanders; the firſt manufacture being eſtabliſhed here about the year 1336. Of late years it has decayed, and its ſucceſs has been, in a great meaſure, tranſlated to the neighbouring town of Wellington. A ſilk manufacture was introduced here in 1780. Taunton is an ancient borough by preſcription, and has returned members to parliament from the year 1294. It was incorporated by King Charles I. and again by King Charles II. and put under the government of a mayor. The corporation conſiſts of a mayor, recorder, aldermen, &c. The corporation have neither lands, houſes, nor joint-ſtock, the laſt charter precluding them from any ſuch poſſeſſions. The caſtle ſtands on the weſt ſide of the town, and is part of a ſtately edifice, erected by William Gifford, biſhop of Wincheſter, and lord of the town, in the time of Henry I. In the year 1642, this caſtle fell into the hands of the parliament army, who placed a garriſon therein, and intended to have made it their chief hold in all this country; it was, however, quickly reſcued from them by the royaliſts, under the marquis of Hertford, and as quickly retaken by Colonel Blake, for the parliament, who, in 1645, defended it againſt an army of 10,000 men that was brought againſt it by Lord Goring. After the reſtoration, King Charles II. ordered it to be diſmantled, in which ruinous ſtate it has continued to this day. It ſtood nearly upon the ſite of a fortreſs, erected about the year 700, by Ina, king of the Weſt Saxons, for the purpoſe of better ſecuring the conqueſts which he had made in this part of Britain, and awing thoſe diſaffected nobles who fixed a jealous eye on his dominions. On the 18th of June, 1685, the Duke of Monmouth arrived at Taunton, which he made his head quarters; and having won many perſons of conſiderable eſteem to his cauſe, he procured himſelf to be proclaimed king, on the Cornhill, the 21ſt following, by the title of James II. and then publiſhed three ſeveral proclamations, againſt the king, the parliament, and the Duke of Albemarle. After his defeat, the aſſizes were held here by judge Jefferies, for the trial of the rebels, which have been emphatically called the bloody aſſize: thirty-one miles NE. Exeter, and 140 W. London.

TAURIS, or Tebris, a town of Perſia, and capital of Aderbeitzan. It was formerly the capital of Perſia, and is now the moſt conſiderable next to Iſpahan; for it contains 15,000 houſes, beſides many ſeparate ſhops, and about 200,000 inhabitants. It is about five miles in circumference, and carries on a prodigious trade in cotton, cloth, ſilks, gold and ſilver brocades, fine turbans, and ſhagreen leather. There are 300 caravanſeras, and 250 moſques. Some travellers ſuppoſe it to be the ancient Ecbatana; but of this there is no certainty. It is ſeated in a delightful plain, ſurrounded with mountains, from whence a ſtream iſſues, which runs through the city. E. Long. 47. 50. N. Lat. 38. 18.

TAURUS, a great chain of mountains in Aſia, which begin at the eaſtern part of Little Carimania, and extend very far into the India. In different places they have different names.

Taurus, in aſtronomy, one of the twelve ſigns of the zodiac.

TAWING, the art of dreſſing ſkins in white, ſo as to be fit for divers manufactures, particularly gloves, &c. All ſkins may be tawed; but thoſe chiefly uſed for this purpoſe are lamb, ſheep, kid, and goat ſkins. The method of tawing is this: Having cleared the ſkins of wool or hair by means of lime, they are laid in a large vatt of wood or ſtone, ſet on the ground full of water, in which quicklime has been ſlacked; wherein they are allowed to lie a month or ſix weeks, according as the weather is more or leſs hot, or as the ſkins are required to be more or leſs ſoft and pliant. While they are in the vatt, the water and lime are changed twice, and the ſkins are taken out and put in again every day: and when they are taken out for the laſt time, they are laid all night to ſoak in a

running water, to get out the greatest part of the lime; and in the morning are laid together by sixes one upon another, upon a wooden leg, and are scraped stoutly one after another, to get the flesh off from the fleshy side, with a cutting two-handled instrument called a *knife*; and then they cut off the legs and other superfluous parts about the extremes. Then they are laid in a vatt or pit with a little water, where they are fulled with wooden pestles for the space of a quarter of an hour; and then the vatt is filled up with water, and they are rinsed in it.

In the next place, they are thrown on a clean pavement to drain, and afterwards cast into a fresh pit of water, out of which they rinse them well, and are laid again on the wooden leg, six at a time, with the hair side outermost: over which they rub a kind of whetstone very briskly, to soften and fit them to receive four or five more preparations, given them on the leg both on the flesh-side and the hair-side, with the knife, after the manner above mentioned. After this they are put into a pit of water and wheaten-bran, and stirred about in it with wooden poles, till the bran is perceived to stick to them, and then they are left: as they rise of themselves to the top of the water by a kind of fermentation, they are plunged down again to the bottom; and at the same time fire is set to the liquor, which burns as easily as if it were brandy, but goes out the moment the skins are all covered. They repeat this operation as often as the skins rise above the water; and when they have done rising they take them out, lay them on the wooden leg, the fleshy side outwards, and pass the knife over them to scrape off the bran.

Having thus cleared them of the bran, they lay the skins in a large basket, and load them with huge stones to promote their draining: and when they have drained sufficiently, they give them their feeding; which is performed after the manner following: For 100 of large sheep skins, and for smaller in proportion, they take eight pounds of alum and three of sea-salt, and melt the whole with water in a vessel over the fire, pouring the solution out, while yet lukewarm, into a kind of trough, in which is twenty pounds of the finest wheat-flower, with the yolks of eight dozen of eggs; of all which is formed a kind of paste, a little thicker than children's pap; which, when done, is put into another vessel, to be used in the following manner.

They pour a quantity of hot water into the trough in which the paste was prepared, mixing two spoonfuls of the paste with it; to do which they use a wooden spoon, which contain just as much as is required for a dozen of skins: and when the whole is well diluted, two dozen of the skins are plunged into it; but they take care that the water be not too hot, which would spoil the paste and burn the skins. After they have lain some time in the trough they take them out, one after another, with the hand, and stretch them out; this they do twice: and after they have given them all their paste, they put them into tubs, and there full them afresh with wooden pestles. Then they put them into a vatt, where they are suffered to lie for five or six days, or more; then they take them out in fair weather, and hang them to dry on cords or racks: and the quicker they are dried the better; for if they be too long a-drying, the salt and alum within them are apt to make them rise in a grain, which is an essential fault in this kind of dressing.

When the skins are dry, they are made up into bundles, and just dipt in fair water, and taken out and drained: they are then thrown into an empty tub; and after having lain some time they are taken out and trampled under foot. Then they draw them over a flat iron instrument, the top of which is round like a battledore, and the bottom fixed into a wooden block, to stretch and open them; and having been opened, they are hung in the air upon cords to dry; and being dry, they are opened a second time, by passing them again over the same instrument. In the last place, they are laid on a table, pulled out, and laid smooth, and are then fit for sale.

TAX (*Taxa*, from the Greek ταξις, i. e. *ordo, tributum*), a tribute or imposition laid upon the subject for the support of government. See Revenue. It is the ancient indisputable privilege and right of the House of Commons, that all grants of subsidies or parliamentary aids do begin in their house, and are first bestowed by them; although their grants are not effectual to all intents and purposes until they have the assent of the other two branches of the legislature. See Commons. The general reason given for this exclusive privilege of the House of Commons is, that the supplies are raised upon the body of the people, and therefore it is proper that they alone should have the right of taxing themselves. This reason would be unanswerable, if the Commons taxed none but themselves: but it is notorious, that a very large share of property is in the possession of the House of Lords; that this property is equally taxable, and taxed, as the property of the Commons; and therefore the Commons, not being the sole persons taxed, this cannot be the reason of their having the sole right of raising and modelling the supply. The true reason, arising from the spirit of our constitution, seems to be this. The lords being a permanent hereditary body, created at pleasure by the king, are supposed more liable to be influenced by the crown, and when once influenced to continue so, than the Commons, who are a temporary elective body, freely nominated by the people. It would therefore be extremely dangerous to give the Lords any power of framing new taxes for the subject; it is sufficient that they have a power of rejecting, if they think the Commons too lavish or improvident in their grants. But so reasonably jealous are the Commons of this valuable privilege, that herein they will not suffer the other house to exert any power but that of rejecting. They will not permit the least alteration or amendment to be made by the Lords to the mode of taxing the people by a money-bill: under which appellation are included all bills by which money is directed to be raised upon the subject, for any purpose or in any shape whatsoever; either for the exigencies of government, and collected from the kingdom in general, as the land-tax; or for private benefit, and collected in any particular district, as by turnpikes, parish-rates, and the like. Yet Sir Matthew Hale mentions one case, founded on the practice of parliament in the reign of Henry VI. wherein he thinks the lords may alter a money-bill: and that is, if the Commons grant a tax, as that of tonnage and poundage, for four years; and the Lords alter it to a less time, as for two years: here, he says, the bill need not be sent back to the Commons for their concurrence, but may receive the royal assent without farther ceremony; for the alteration of the Lords is consistent with the grant of the Commons. But such an experiment will hardly be repeated by the Lords, under the present improved idea of the privilege of the House of Commons; and, in any case where a money-bill is remanded to the Commons, all amendments in the mode of taxation are sure to be rejected.

The Commons, when they have voted a supply to his majesty, and settled the *quantum* of that supply, usually resolve themselves into what is called *a committee of ways and means*, to consider the ways and means of raising the supply so voted. And in this committee every member (though it is looked upon as the peculiar province of the chancellor of the exchequer) may propose such schemes of taxation as he thinks will be least detrimental to the public. The resolutions of this committee (when approved by a vote of the house) are in general esteemed to be (as it were) final and conclusive. For though the supply cannot be actually raised upon the subject

till directed by an act of the whole parliament, yet no monied man will scruple to advance to the government any quantity of ready cash, on the credit of a bare vote of the House of Commons, though no law be yet passed to establish it. The taxes which are raised upon the subject are either annual or perpetual.

I. The usual annual taxes are those upon land and malt. See LAND and MALT.

II. The perpetual are, 1 The customs. 2. The excise-duty. 3. The salt-duty. 4. The post-office. 5 The stamp-duty. 6. House and window-duty. 7. The duty on hackney-coaches and chairs. 8 That on offices and pensions.—See the articles CUSTOMS, EXCISE, POST, STAMP, HOUSE, HACKNEY, and OFFICES *and Pensions*. As to the application of all these, see the articles REVENUE, NATIONAL *Debt*, FUNDS, and *Civil* LIST.

TAXATION. See REVENUE, TAX, and FEODAL *System*.

TAXUS, the YEW-TREE, in botany: a genus of plants belonging to the class of *diœcia*, and order of *monodelphia*; and in the natural system ranging under the 51st order, *Coniferæ*. The male calyx is triphyllous, gemmaceous, and imbricated: there is no corolla: the stamina are numerous; the antheræ peltated and octofid. The female calyx resembles the male; there is no corolla nor style, and only one seed with a calycle resembling a berry very entire. There are only two species mentioned by Linnæus, the baccata and nucifera. M. Sonnerat has added a third, called *capensis;* and Sir Charles Thunberg has inserted two more, the macrophylla and verticellata, in his *Flora Japonica*.

The *baccata*, or common yew-tree, is a native of Britain, France, Switzerland, &c. and of North America. It is distinguished from the other species by linear leaves which grow very close, and by the receptacles of the male flowers being subglobose. The wood is reddish, full of veins, and flexible, very hard and smooth, and almost incorruptible. Its hardness renders it very proper for turners and cabinet-makers. It produces berries which are red, mucilaginous, and have a sweet mawkish taste. They are often eaten by birds, and are therefore not poisonous: but it is a common opinion that the leaves are poisonous to cattle, and many facts are mentioned of horses and cows having died by eating them. Others, however, deny these facts. It is found in several parts of the Highlands of Scotland in a wild state. At Glenlure, near Glen-Creran, in Upper-Lorn, are the remains of an old wood of it. The place takes its name from the trees which grow in it; for *Glenlure* in the Gaelic language is no other than a corruption of *Gleaniuir, i. e.* "The valley of yew-trees." It is of no great height, but the trunk grows to a large size. Mr. Pennant has taken notice of a very remarkable decayed one in Fortingal church-yard, the remains of which measured fifty-six feet and an half in circumference.

The yew is at present almost peculiar to church-yards; hence some naturalists suspect that it is an exotic. Several reasons have been assigned for its frequency in church-yards. The first is, that, before the invention of gunpowder, the warrior might never be at a loss for a bow. The second, that they were intended to defend the church against storms. But there are many other trees that would have answered this purpose much better; for the yew is of so slow a growth, that it would be long before it could be of any service at all, and is so low that it could never be a sufficient shelter. A third opinion is, that being an evergreen, it is an emblem of immortality. This is a pretty idea; but the misfortune is, that yew is always considered as a tree of baleful influence. This opinion is as old as Statius, who says, *metuenda succo taxus*. A fourth opinion is, that when anciently it was the custom, as it still is, in Catholic countries, to carry palms on Palm-Sunday, the yew was substituted on such occasions for the palm. Two or three trees, the usual number growing in church-yards, were sufficient for such purposes. This is the only opinion which receives any countenance from history.

TAY, a river of Scotland, which rises in the west part of the county of Perth, on the borders of Argyleshire, passes through Loch Tay, and runs into the German sea below Perth, forming a large bay at its mouth, called *The Frith of Tay*.

TAYLOR (Dr. Jeremy), bishop of Down and Connor in Ireland, was the son of a barber at Cambridge, and there had his education. Upon entering into orders, he became divinity lecturer of St. Paul's in London; and was, by the interest of Archbishop Laud, elected fellow of All-soul's College, Cambridge, in 1636. Two years after he became one of the chaplains of the archbishop, who bestowed on him the rectory of Uppingham in Rutlandshire. In 1642 he was chaplain to the king; and a frequent preacher before him and the court at Oxford. He afterwards attended in the king's army in the condition of a chaplain. Upon the declining of his majesty's cause, he retired into Wales, where he was permitted to officiate as minister, and to keep a school, in order to maintain himself and his children. In this retirement he wrote several of his works. Having spent several years there, his family was visited with sickness; and he lost three sons of great hopes within the space of two or three months. This affliction touched him so sensibly, that it made him desirous to leave the country; and going to London, he for a time officiated in a private congregation of loyalists to his great hazard. At length meeting with Edward lord Conway, that nobleman carried him over with him into Ireland, and settled him at Portmore, where he wrote his *Ductor Dubitantium*. Upon the Restoration he returned to England; soon after, he was advanced to the bishopric of Down and Connor in Ireland, and had the administration of the see of Dromore granted to him. He was likewise made privy-counsellor and vice-chancellor of the university of Dublin; which place he held till his death. He died of a fever at Lisnegarvy in 1667, and was interred in a chapel which he himself had built on the ruins of the old cathedral of Dromore.

TAYLOR (Dr. Brook), was born at Edmonton, August 18th, 1685. He was the son of John Taylor, esq. of Bifron's-house in Kent, by Olivia, daughter of Sir Nicholas Tempest, of Durham, baronet. His grandfather, Nathaniel Taylor, was one of those puritans whom "Cromwell thought fit to elect by a letter, dated June 14, 1653, to represent the county of Bedford in Parliament." The character of his father partook in no small degree of the austerity that had been transmitted to him in the line of his ancestors, and by the spirit of the times in which they lived; and to this cause may be ascribed the disaffection which sometimes subsisted between the father and even such a son as is the subject of this article. In music he possessed uncommon accomplishment, and equally excelled in drawing and painting, of which some specimens are still preserved, that require not those allowances for error or imperfection with which we scan the performances of even the superior *dilettanti*:—they will bear the test of scrutiny and criticism from artists themselves, and those of the first genius and professional abilities. His classical education was conducted at home under a private tutor, and his proficiency in the ordinary branches of the languages and the mathematics was so great, that he was deemed qualified for the university at the early age of fifteen.

He was entered a Fellow Commoner of St. John's College, Cambridge, in 1701; a period when mathematics engaged more particularly the attention of the university. In

1708 he wrote his treatiſe On the Centre of Oſcillation, which was not publiſhed in the Philoſophical Tranſactions till ſome years afterwards. In 1709 he took his degree of Bachelor of Laws. In 1712 he was choſen a Fellow of the Royal Society. During the interval between theſe two periods, he correſponded with Profeſſor Keil on ſeveral of the moſt abſtruſe ſubjects of mathematical diſquiſition. Sir William Young informs us, that he has in his poſſeſſion a letter, dated in 1712, addreſſed to Mr. Machin, which contains at length a ſolution of Kepler's problem, and marking the uſe to be derived from that ſolution. In this year he preſented to the Royal Society three different papers: one, On the Aſcent of Water between two Glaſs Planes; a ſecond, On the Centre of Oſcillation; and a third, On the Motion of a ſtretched String. It appears from his correſpondence with Keil, that in 1713 he preſented a paper on his favourite ſubject of Muſic: but this is not preſerved in the Tranſactions.

His diſtinguiſhed proficiency in thoſe branches of ſcience, which engaged the particular attention of the Royal Society at this period, and which embroiled them in conteſts with foreign academies, recommended him to the notice of its moſt illuſtrious members; and in 1714 he was elected to the office of ſecretary. In this year he took at Cambridge his degree of Doctor of Laws; and at this time he tranſmitted, in a letter to Sir Hans Sloane, an Account of ſome curious Experiments relative to Magnetiſm; which, however, was not delivered to the Society till many years afterward, when it was printed in the Tranſactions. His application to thoſe ſtudies to which his genius inclined was indefatigable: for we find that in 1715 he publiſhed in Latin his *Methodus Incrementorum;* alſo a curious eſſay preſerved in the Philoſophical Tranſactions, entitled, An Account of an Experiment for the Diſcovery of the Laws of Magnetic Attraction; likewiſe a treatiſe well known to the mathematicians, and highly valued by the beſt judges, On the Principles of Linear Perſpective. In the ſame year he conducted a controverſial correſpondence with the Count Raymond de Montmort, on the Tenets of Malebranche; which occaſioned his being particularly noticed in the eulogium pronounced by the French Academy on the deceaſe of that eminent metaphyſician.

The new philoſophy of Newton (as it was then called) engaged the attention of mathematicians and philoſophers both at home and abroad. At Paris it was in high eſtimation; and in conſequence of many urgent invitations, he determined to viſit his friends at Paris in the year 1716. Beſides the mathematicians, to whom he had always free acceſs, he was here introduced to Lord Bolingbroke, the Count de Caylus, and Biſhop Boſſuet. Among the ladies who honoured him with a particular regard, we may mention the names of Marcilly de Villette, and of Miſs Brunton, the beautiful and accompliſhed niece of Sir Iſaac Newton.

Early in 1717 he returned to London, and compoſed three treatiſes, which were preſented to the Royal Society, and publiſhed in the 30th volume of the Tranſactions. About this time his intenſe application had impaired his health to a conſiderable degree; and he was under the neceſſity of repairing, for relaxation and relief, to Aix-la-Chapelle. Having likewiſe a deſire of directing his attention to ſubjects of moral and religious ſpeculation, he reſigned his office of ſecretary to the Royal Society in 1718. After this he applied to ſubjects of a very different kind. Among his papers were found detached parts of a Treatiſe on the Jewiſh Sacrifices, and a diſſertation of conſiderable length on the Lawfulneſs of eating Blood. He did not, however, wholly neglect his former ſubjects of ſtudy, but employed his leiſure hours in combining ſcience and art; with this view he reviſed and improved his treatiſe on Linear Perſpective. Drawing continued to be his favourite amuſement to his lateſt hour; and it is not improbable, that his valuable life was ſhortened by the ſedentary habits which this amuſement, ſucceeding his ſeverer ſtudies, occaſioned.

Toward the end of the year 1720, Dr. Brook Taylor accepted the invitation of Lord Bolingbroke to ſpend ſome time at La Source, a country-ſeat near Orleans. In the next year he returned to England, and publiſhed the laſt paper which appears with his name in the Philoſophical Tranſactions, entitled, An Experiment made to aſcertain the Proportion of Expanſion of Liquor in the Thermometer, with regard to the Degree of Heat.

In 1721 the doctor married Miſs Bridges of Wallington in the county of Surrey, a young lady of good family, but of ſmall fortune; and this marriage occaſioned a rupture with his father, whoſe conſent he had never obtained. After the death of this lady in 1725, and that of an infant ſon, he formed a new connection; and with the full approbation of his father and family, married Sabetta, daughter of John Sawbridge, eſq. of Olantigh in Kent. In 1729, on the death of his father, he ſucceeded to the family eſtate of Bifrons. In the following year he loſt his wife in child-bed. The daughter whoſe birth occaſioned this melancholy event ſurvived, and became the mother of Sir William Young, to whom we owe theſe memoirs of his grandfather.

Between 1721 and 1730, no production by Brook Taylor appears in the Philoſophical Tranſactions; nor did he publiſh in the courſe of that time any work. His biographer has found no traces of his learned labour, excepting a Treatiſe of Logarithms, which was committed to his friend Lord Paiſley (afterward Abercorn), in order to be prepared for the preſs; but which probably was never printed. His health was now much impaired; and his remaining days were days of increaſing imbecility and ſorrow. The eſſay entitled *Contemplatio Philoſophica*, publiſhed by Sir William Young, 1793, appears to have been written about this time, and probably with a view to abſtract his mind from painful recollections and regret. It was the effort of a ſtrong mind, and is a moſt remarkable example of the cloſe logic of the mathematician applied to metaphyſics. Having ſurvived his ſecond wife little more than a year, Dr. Brook Taylor died of a decline in the 46th year of his age, December the 29th 1731, and was buried in the church-yard of St. Ann's, Soho. "I am ſpared (ſays his biographer) the neceſſity of cloſing this biographical ſketch with a prolix detail of his character: in the beſt acceptation of duties relative to each ſituation of life in which he was engaged, his own writings, and the writings of thoſe who beſt knew him, prove him to have been the finiſhed Chriſtian, gentleman, and ſcholar."

Taylor (Dr. John), a learned diſſenting miniſter, born in Lancaſhire. He ſettled firſt at Kirkſtead in Lincolnſhire, where he preached to a ſmall congregation, and taught a grammar-ſchool for near twenty years. Afterward he removed to Norwich, where he preached many years in great repute, until he was invited to ſuperintend the academy formed at Warrington in Lancaſhire: but a few idle differences on formal punctilios and uncertain doctrines kindled into ſuch a flame there, as ſubjected him to much ſcurrility and ill treatment, and endangered the very being of the academy. He died in 1761; and among ſeveral other judicious performances, his Hebrew and Engliſh Concordance, 2 vols. folio, will remain a monument of his critical ſkill and indefatigable induſtry.

Taylor-*Bird*. See Motacilla.

TEA, the dried leaves of the tea plant.—A commodity with which we are ſo well acquainted, which affords a beverage ſo generally uſed and ſo generally agreeable, and which

forms ſo conſiderable an article of commerce, muſt excite the curioſity of the public at large to know ſomething of its hiſtory, and of the nature of the plant from which it is obtained. We are ſorry that we can neither gratify their curioſity nor our own completely. We have conſulted all the botanical books to which we had acceſs, and we believe we have had acceſs to the beſt, yet we have not been able to diſcover with certainty whether there be various ſpecies of the tea plant; or whether all the different kinds of tea, ſo unlike to one another in their flavour, and ſtrength, and colour, be derived from one ſingle ſpecies. As an apology for this imperfection in botanical knowledge, it is proper to obſerve, that the country of which the tea plant is a native is hidden from the exploring eye of the philoſopher; that it is jealous of Europeans, and ſeldom gives them an opportunity of ſtudying its productions. While we apologize for the ignorance of Europeans in this point, and ſincerely regret it, we ſhall be careful to ſelect every important fact, that we may preſent our readers with as accurate and complete an account as our materials can ſupply.

The tea plant is a native of Japan, China, and Tonquin, and has not, as far as we can learn, been found growing ſpontaneouſly in any other parts of the world. Linnæus arranged it under the claſs of *polyandria*, and order of *monogynia*. We are told he was led into this miſtake from having no ſpecimens of the flower to examine but ſuch as were dried. If Linnæus has in this arrangement fallen into error, it is ſurpriſing that he has not been corrected by one who had the beſt opportunity of examining the matter. Sir Charles Thunberg, one of the moſt diſtinguiſhed pupils of that illuſtrious botaniſt, who reſided ſixteen months in Batavia and Japan, has given a full botanical deſcription of the tea plant; and having claſſed it in the ſame manner as his maſter, ſays expreſsly that it has only one ſtyle. Several of the Britiſh botaniſts, on the other hand, refer it to the order of *trigynia;* deriving their authority from a plant in the Duke of Northumberland's garden at Sion-houſe, which had three ſtyles.

Linnæus ſays that there are two ſpecies of the tea plant; the *bohea*, the corolla of which has ſix petals; and the *viridis* or green tea, which has nine petals. Thunberg makes only one ſpecies, the bohea conſiſting of two varieties: the one with broad and the other with narrow leaves. This botaniſt's authority is deciſive reſpecting the Japaneſe tea plants; but as China has not yet been explored, we cannot determine what number of ſpecies there are in that country. Of the bohea plant we have been favoured with a drawing, and botanical deſcription, by a learned gentleman, which we ſhall here preſent to our readers.

Calyx. K, fig. 1, 2, 3, 10. Pl. 31. a perianthium quinquepartite, very ſmall, flat, the ſegments round, obtuſe, permanent. Fig. 1. K.

Corolla. C, fig. 1, 3, 4, 5, 7, 8. the petals ſix, roundiſh, concave; two exterior (fig. 4, 7.) CC; leſs, unequal, incloſing the flower before fully blown (fig. 3.) C; four interior (fig. 5, 6.) CCCC; large, equal, before they fall off recurvate (fig. 8.) CC; (A).

Stamens. *f*, fig. 6, 9, 10, 11. the filaments numerous (B), fig. 6, 9. *f a;* about 200; filiform, white, ſhorter than the corolla, and inſerted in the receptacle; *a*, the antheras cordate; and didymous (fig. 10, 11.) *, magnified (C).

Piſtillum. Fig. 1, 10, 12. * magnified; *g*, the germen; three globular bodies joined in a triangular form; *s*, the ſtyles, three, connected at their baſe (fig. 12.); ſubulate, recurvate, of the length of the ſtamens, preſſed together, and as if united in one by the thickſet ſurrounding ſtamens (D), fig. 6, 9, 10; but after the petals and ſtamens have fallen off they part, ſpread open, increaſe in length, and wither on the germen, fig. 1, 12; the ſtigmas ſimple, *t*, fig. 1, 9, 10, 12.

Pericarpium. P, fig. 1, 13, 14. a capſule in the form of three globular bodies united, fig. 13. trilocular, fig. 14. gaping at the top in three directions, fig. 13.

Seeds. S, fig. 14. ſingle, globoſe, angulate on the inward ſide.

Trunk. T, fig. 1. ramoſe, lignous, round; branches alternate, vague, ſtiffiſh, inclining to aſh colour, towards the top reddiſh; the peduncles axillary, *p*, fig. 1. alternate, ſingle, curved, uniflorous, incraſſate, fig. 1, 2, 7. ſtipulate, the ſtipula ſingle; ſubulate, erect, *d*, fig. 1, 2, 7, 9.

Leaves. F, fig. 1, 15, 16, 17. alternate, illiptical, obtuſely ſerrated, with the edges between the teeth recurvate, with the apex emarginate (E) * magnified, fig. 15. *e*, at the baſe very entire, fig. 16, 17. the ſurface ſmooth, gloſſy, bullate, venoſe on the under ſide, of a firm texture, petiolate; the petiols very ſhort, *b*, fig. 1, 16, 17. round on the under ſide, gibbous, fig. 16. *b*, * magnified; on the upper ſide flattiſh and ſlightly channelled, fig. 17. *b*.

The tea plant, which is an evergreen, grows to the height of five or ſix feet; Le Compte ſays ten or twelve. The leaves, which are the only valuable part of it, are about an inch and a half long, narrow, indented, and tapering to a point, like thoſe of the ſweet-briar, and of a dark green colour. The root is like that of the peach-tree, and its flowers reſemble thoſe of the white wild roſe. The ſtem ſpreads into many irregular branches. The wood is hard, of a whitiſh green colour, and the bark is of a greeniſh colour, with a bitter, nauſeous, and aſtringent taſte. The fruit is ſmall, and contains ſeveral round blackiſh ſeeds, about the bigneſs of a bean or large pea.

This plant delights in valleys, is frequent on the ſloping ſides of mountains and the banks of rivers, where it enjoys a ſouthern expoſure. It flouriſhes in the northern latitudes of Pekin as well as round Canton, but attains the greateſt perfection in the mild temperate regions of Nankin. It is ſaid only to be found between the 30th and 45th degree of north latitude. In Japan it is planted round the borders of fields, without regard to the ſoil; but as it is an important article of commerce with the Chineſe, whole fields are covered with it, it is by them cultivated with care. The Abbé Rochen ſays, it grows equally well in a poor as in a rich ſoil; but that there are certain places where it is of a better quality. The tea which grows in rocky ground is ſuperior to that which grows in a light ſoil; and the worſt kind is that which is produced in a clay ſoil. It is propagated by ſeeds; from ſix to twelve are put into a hole about five inches deep, at certain diſtances from each other. The reaſon why ſo many ſeeds are ſown in the ſame hole is ſaid to be, that only a fifth part vegetate. Being thus ſown, they grow without any other care. Some, however, manure the land, and remove the weeds; for the Chineſe are as fond of

(A) Thunberg ſays, that three of the petals are exterior and three inferior. (B) In a flower received from J. Ellis, eſq upwards of 280 filaments were told. (C) Kœmpfer deſcribes the antheras as ſingle. (D) It was this circumſtance that led Linnæus to place it under the order monogynia. (E) No author has hitherto remarked this obvious circumſtance; even Kœmpfer ſays the leaves terminate in a ſharp point.

good tea, and take as much pains to procure it of an excellent quality, as the Europeans do to procure excellent wine.

The leaves are not fit for being plucked till the ſhrub be of three years' growth. In ſeven years it riſes to a man's height; but as it then bears but few leaves, it is cut down to the ſtem, and this produces a new crop of freſh ſhoots the following ſummer, every one of which bears nearly as many leaves as a whole ſhrub. Sometimes the plants are not cut down till they are ten years old. We are informed by Kœmpfer, that there are three ſeaſons in which the leaves are collected in the iſles of Japan, from which the tea derives different degrees of perfection.

The firſt gathering commences at the end of February or beginning of March. The leaves are then ſmall, tender, and unfolded, and not above three or four days old: theſe are called *ficki-tſiaa*, or "tea in powder," becauſe it is pulveriſed; it is alſo called *imperial tea*, being generally reſerved for the court and people of rank; and ſometimes alſo it is named *bloom tea*. It is ſold in China for 20d. or 2s. per pound. The labourers employed in collecting it do not pull the leaves by handfuls, but pick them one by one, and take every precaution that they may not break them. However long and tedious this labour may appear, they gather from four to ten or fifteen pounds a-day.

The ſecond crop is gathered about the end of March or beginning of April. At this ſeaſon part of their leaves have attained their full growth, and the reſt are not above half their ſize. This difference does not, however, prevent them from being all gathered indiſcriminately. They are afterwards picked and aſſorted into different parcels, according to their age and ſize. The youngeſt, which are carefully ſeparated from the reſt, are often ſold for leaves of the firſt crop, or for imperial tea. Tea gathered at this ſeaſon is called *too-tſiaa*, or "Chineſe-tea," becauſe the people of Japan infuſe it, and drink it after the Chineſe manner.

The third crop is gathered in the end of May or in the month of June. The leaves are then very numerous and thick, and have acquired their full growth. This kind of tea, which is called *Ben-tſiaa*, is the coarſeſt of all, and is reſerved for the common people. Some of the Japaneſe collect their tea only at two ſeaſons of the year, which correſpond to the ſecond and third already mentioned: others confine themſelves to one general gathering of their crop, towards the month of June: however, they always form afterwards different aſſortments of their leaves.

The fineſt and moſt celebrated tea of Japan is that which grows near Ud-ſi, a ſmall village ſituated cloſe to the ſea, and not far diſtant from Meaco. In the diſtrict of this village is a delightful mountain, having the ſame name, the climate of which is ſaid to be extremely favourable to the culture of tea; it is therefore incloſed by a hedge, and ſurrounded with wide ditches, which prevent all acceſs to it. The tea ſhrubs that grow on this mountain are planted in regular order, and are divided by different avenues and alleys.

The care of this place is entruſted to people who are ordered to guard the leaves from duſt, and to defend them from the inclemency of the weather. The labourers who are appointed to collect the tea abſtain from every kind of groſs food for ſome weeks before they begin, that their breath and perſpiration may not in the leaſt injure the leaves. They gather them with the moſt ſcrupulous nicety, and never touch them but with very fine gloves. When this choice tea has undergone the proceſs neceſſary for its preparation, it is eſcorted by the ſuperintendant of the mountain and a ſtrong guard to the emperor's court, and reſerved for the uſe of the imperial family.

As the tea ſhrub grows often on the rugged banks of ſteep mountains, acceſs to which is dangerous, and ſometimes impracticable, the Chineſe, in order to come at the leaves, make uſe of a ſingular ſtratagem: Theſe ſteep places are generally frequented by great numbers of monkeys, which being irritated and provoked, to revenge themſelves tear off the branches, and ſhower them down upon thoſe who have inſulted them. The Chineſe immediately collect theſe branches, and ſtrip them of their leaves.

When the tea leaves have been collected, they are expoſed to the ſteam of boiling water: after which they are put upon plates of copper, and held over the fire until they become dry and ſhrivelled, and appear ſuch as we have them in Europe. According to the teſtimony of Kœmpfer, tea is prepared in the ſame manner in the iſles of Japan. "There are to be ſeen there (ſays this traveller) public buildings erected for the purpoſe of preparing the freſh gathered tea. Every private perſon who has not ſuitable conveniences, or who is unacquainted with the operation, may carry his leaves thither as they dry. Theſe buildings contain a great number of ſmall ſtoves raiſed about three feet high, each of which has a broad plate of iron fixed over its mouth. The workmen are ſeated round a large table covered with mats, and are employed in rolling the tea leaves which are ſpread out upon them. When the iron plates are heated to a certain degree by the fire, they cover them with a few pounds of freſh gathered leaves, which being green and full of ſap crackle as ſoon as they touch the plate. It is then the buſineſs of the workman to ſtir them with his naked hands as quickly as poſſible, until they become ſo warm that he cannot eaſily endure the heat. He then takes off the leaves with a kind of ſhovel, and lays them upon mats. The people who are employed in mixing them, take a ſmall quantity at a time, roll them in their hands always in the ſame direction; while others keep continually ſtirring them, in order that they may cool ſooner, and preſerve their ſhrivelled figure the longer. This proceſs is repeated two or three times, and even oftener, before the tea is depoſited in the warehouſes. Theſe precautions are neceſſary to extract all the moiſture from the leaves."

The people of Japan and China generally keep their tea a year before uſing it, becauſe, when quite freſh and newly gathered, it poſſeſſes a narcotic quality which hurts the brain. Imperial tea is generally preſerved in porcelain vaſes, or in leaden or tin caniſters covered with fine mats made of bamboo. Common tea is kept in narrow-mouthed earthen pots; and coarſe tea, the flavour of which is not ſo eaſily injured, is packed up in baſkets of ſtraw.

An infuſion of tea is the common drink of the Chineſe; and indeed when we conſider one circumſtance in their ſituation, we muſt acknowledge that Providence has diſplayed much goodneſs in ſcattering this plant with ſo much profuſion in the empire of China. The water is ſaid to be unwholeſome and nauſeous, and would therefore perhaps, without ſome corrective, be unfit for the purpoſes of life. The Chineſe pour boiling water over their tea, and leave it to infuſe, as we do in Europe; but they drink it without any mixture, and even without ſugar. The people of Japan reduce theirs to a fine powder, which they dilute with warm water until it has acquired the conſiſtence of thin ſoup. Their manner of ſerving tea is as follows: They place before the company the tea equipage, and the box in which this powder is contained; they fill the cups with warm water, and taking from the box as much powder as the point of a knife can contain, throw it into each of the cups, and ſtir it with a tooth-pick until the liquor begins to foam; it is then preſented to the company, who ſip it while it is warm. According to F. du Halde, this method is not peculiar to the Japaneſe; it is alſo uſed in ſome of the provinces of China.

The firſt European writer who mentions tea is Giovanni

Botero, an eminent Italian author, who published a treatise about the year 1590, of the causes of the magnificence and greatness of cities. He does not indeed mention its name, but describes it in such a manner that it is impossible to mistake it. "The Chinese (says he) have an herb out of which they press a delicate juice, which serves them for drink instead of wine; it also preserves their health, and frees them from all those evils which the immoderate use of wine produces among us."

Tea was introduced into Europe in the year 1610 by the Dutch East-India Company. It is generally said, that it was first imported from Holland into England, in 1666, by the lords Arlington and Offory, who brought it into fashion among people of quality. But it was used in coffee-houses before this period, as appears from an act of parliament made in 1660. in which a duty of 8d. was laid on every gallon of the infusion sold in these places. In 1666 it was sold in London for 60s. per pound, though it did not cost more than 2s. 6d. or 3s. 6d. at Batavia. It continued at this price till 1707. In 1715 green tea began to be used; and as great quantities were then imported, the price was lessened, and the practice of drinking tea descended to the lower ranks. In 1720 the French began to send it to us by a clandestine commerce. Since that period the demand has been increasing yearly, and it has become almost a necessary of life in several parts of Europe, and among the lowest as well as the highest ranks.

The following table will give an idea of the quantity of tea imported annually into great Britain and Ireland since 1717:

From 1717 to 1726	-	700,000 lbs.
1732 to 1742	-	1,200,000
1755 near	-	4,000,000
1766 -	-	6,000,000
1785 about	-	12,000,000
1794 from		16 to 20,000,000

Besides these immense quantities imported into Britain and Ireland, much has been brought to Europe by other nations. In 1766 the whole tea imported into Europe from China amounted to 17 millions of pounds; in 1785 it was computed to be about 19 millions of pounds.

Several researches have been made in Europe to determine whether the tea plant grows spontaneously; but these researches have been hitherto in vain. When Captain Cook visited Teneriffe in his last voyage, Mr. Anderson his surgeon was informed by a gentleman of acknowledged veracity, that a shrub is common near Santa Cruz which agrees exactly with the description given of the tea plant by Linnæus. It is considered as a weed, and large quantities are rooted out of the vineyards every year: But the Spaniards who inhabit the island sometimes make use of it, and ascribe to it all the qualities of the tea imported from China.

Many attempts have been made to introduce this valuable plant into Europe; but from want of proper precautions most of these attempts have miscarried. The seeds are apt to grow rancid during a long voyage, unless proper care is taken to preserve them. There are two methods of preserving these seeds: The first is, to inclose them in wax after they had been dried in the sun; the second is, to leave them in their husks, and shut them up closely in a box made of tin: but neither of these methods has been attended with general success, whatever care has been taken to obtain fresh seeds, or to preserve them. The best method would be, to sow fresh seeds in fine light earth immediately on leaving Canton, and to cover them with wire to secure them from rats and other animals that might attack them. The finest tea-plant known in England was raised in Kew Gardens; it was carried thither by Sir J. Ellis, who brought it from seed: but the first that ever flourished in Europe was one belonging to the Duke of Northumberland at Sion, from a drawing of which our engraving is taken. The plants which are cultivated in the gardens near London thrive well in the green-house during winter, and some stand that season in the open air. Linnæus, who obtained this shrub in its growing state, contrived to preserve it in the open air in the northern latitude of Sweden. France has also procured some plants. There can be no doubt but they would succeed in many countries of Europe, if proper care were paid to their cultivation till they became inured to one climate.

Of the effects of tea on the constitution, many various and opposite opinions have been formed. About a century ago, Bontikoe, a Dutch physician, bestowed extravagant encomiums on the benefits of tea. With him it was good for every thing, and any quantity might be drunk, even to the amount of 200 dishes in a day. Whether Bontikoe in this case acted as a physician, or, being a Dutchman, was eager to encourage the sale of an important article of his country's commerce, is not easy to say. On the other hand, the pernicious effects of tea upon the nervous system have been often repeated, and very opposite effects have been ascribed to it. Some affirm that green tea is mildly astringent; others say it is relaxing. Some say it is narcotic, and procures sleep; while others contend, that taken before bed-time it assuredly prevents it. After study or fatigue it is certainly a most refreshing and grateful repast; it quenches thirst, and cheers the spirits, without heating the blood; and the pleasing society, in which we so often partake of it, is no inconsiderable addition to its value. Dr. Cullen reconciles the opposite opinions as to the wholesomeness of tea on the ground of the difference of constitution; tea proving beneficial even to some, whilst, to others, it is a poison.

In this country teas are generally divided into three kinds of green, and five of bohea: The former are, 1. *Imperial* or bloom tea, with a large loose leaf, light green colour, and a faint delicate smell. 2. *Hyson*, so called from the name of the merchant who first imported it; the leaves of which are closely curled and small, of a green colour, verging to a blue: 3. *Singlo* tea, from the name of the place where it is cultivated. The boheas are, 1. *Souchong*, which imparts a yellow green colour by infusion. 2. *Camho*, so called from the place where it is made; a fragrant tea, with a violet smell; its infusion pale. 3. *Congo*, which has a larger leaf than the following, and its infusion somewhat deeper, resembling common bohea in the colour of the leaf. 4. *Pekoe* tea; this is known by the appearance of small white flowers mixed with it. 5. *Common bohea*, whose leaves are of one colour. There are other varieties, particularly a kind of green tea, done up in roundish balls, called *gunpowder tea*.

Tea-Tree of New Zealand, is a species of myrtle, of which an infusion was drunk by Captain Cook's people in their voyages round the world. Its leaves were finely aromatic, astringent, and had a particular pleasant flavour at the first infusion; but this went off at the next filling up of the tea-pot, and a great degree of bitterness was then extracted; for which reason it was never suffered to be twice infused. In a fine soil in thick forests this tree grows to a considerable size; sometimes 30 or 40 feet in height, and one foot in diameter. On a hilly and dry exposure it degenerates into a shrub of five or six inches; but its usual size is about eight or ten feet high, and three inches in diameter. In that case its stem is irregular and unequal, dividing very soon into branches, which rise at acute angles, and only bears leaves and flowers at top. The flowers are white, and very ornamental to the whole plant. Mr. White in his Journal of a Voyage to New South Wales, mentions a shrub which he calls a *tea-tree*, merely from its being used by the con-

victs as a fuccedaneum for tea; for he had not feen the flower, nor did he know to what genus it belonged. It is a creeping kind of a vine, running to a great extent along the ground; the ftalk flender; the leaf not fo large as the common bay leaf; the tafte fweet, exactly like the liquorice root of the fhops.

TEAL, in ornithology. See ANAS.

TEARS, a lymph or aqueous humour, which is limpid, and a little faltifh: it is feparated from the arterial blood by the lachrymal glands and fmall glandulous grains on the infide of the eyelids.

TEASELS, a plant cultivated in the weft of England for the ufe of clothiers. See DIPSACUS.

TEBETH, the tenth month of the Jewifh ecclefiaftical year, and fourth of the civil. It anfwers to our month of December.

TECKLENBURG, a town of Germany, in the circle of Weftphalia, capital of the county of the fame name, with a caftle built on a hill. It was bought by the King of Pruffia in 1707. E. Long. 8. 2. N. Lat. 52. 20.

TECTONA, in botany: a genus of plants belonging to the clafs of *pentandria*, and order of *monogynia*. The ftigma is dentate; the fruit a dry fpongy plum within an inflated calyx; and the nucleus is trilocular. There is only one fpecies, the *grandis*, Indian oak, or teak wood, which is a native of India.

TE DEUM, the name of a celebrated hymn, ufed in the chriftian church, and fo called becaufe it begins with thefe words, *Te Deum laudamus*, We praife thee, O God. It is fung in the Romifh church with great pomp and folemnity upon the gaining of a victory, or other happy event; and is believed to be the compofition of ST. AMBROSE bifhop of *Milan*.

TEES, a river which rifes on the confines of Cumberland, and running eaftward, divides the county of Durham from Yorkfhire, and falls into the German fea below Stockton.

TEETH, the bones placed in the jaws for chewing food, that it may be more eafily digefted in the ftomach. The anatomical ftructure of thefe has already been defcribed under ANATOMY and COMPARATIVE ANATOMY. The difeafes to which they are liable, as well as the moft fuccefsful remedies for removing them, are fully detailed under MEDICINE and SURGERY, to which we refer the reader.

Much attention has been paid to the beauty and prefervation of the teeth among moft nations. The Romans rubbed and wafhed them with great care; and when they loft them, fupplied their place with artificial teeth made of ivory; and fometimes, when loofe, bound them with gold. Ligatures of wire have been found to hurt the natural teeth with which the artificial are connected; whereas filken twift cannot affect them to any confiderable degree for feveral years.

M. de Chemant makes a compofition of a pafte for making artificial teeth, which fhall never grow yellow. When feveral teeth are out in the fame place, it is beft to make a fet, or the number wanted, out of one piece, all adhering together, which may be faftened to the two next of the found or natural teeth. And even a whole fet of artificial teeth may be made for one or both jaws, fo well fitted as to admit of the neceffary motions, and fo conveniently retained in the proper fituation by means of fprings, that they will nearly anfwer the purpofe of natural teeth, and may be taken out, cleaned, and replaced, by the patient himfelf with great eafe.

The common trick of mountebanks and other fuch practitioners, is to ufe various acid wafhes for teeth, the fudden effects of which, in cleaning and whitening the teeth, furprife and pleafe people; but the effects are very pernicious. After all the numerous means which have been propofed, we will venture fimply to recommend the *keeping the teeth clean* as the moft efficacious; avoiding every kind of hot food, efpecially hot liquids, as tea, &c. They who are conftantly ufing powders generally deftroy their teeth altogether, as the valetudinarian does his health.

TEETHING in children. See MEDICINE.

TEFF, a kind of grain, fown all over Abyffinia, from which is made the bread commonly ufed throughout the country. We have no defcription of this plant but from Mr. Bruce, who fays that it is herbaceous; and that from a number of weak leaves furrounding the root proceeds a ftalk of about 28 inches in length, not perfectly ftraight, fmooth, but jointed or knotted at particular diftances. This ftalk is not much thicker than that of a carnation or jellyflower. About eight inches from the top, a head is formed of a number of fmall branches, upon which it carries the fruit and flowers; the latter of which is fmall, of a crimfon colour, and fcarcely perceptible by the naked eye but from the oppofition of that colour. The piftil is divided into two, feemingly attached to the germ of the fruit, and has at each end fmall capillaments forming a brufh. The ftamina are three in number; two on the lower fide of the piftil, and one on the upper. Thefe are each of them crowned with two oval ftigmata, at firft green, but after crimfon. The fruit is formed in a capfula, confifting of two conical hollow leaves, which, when clofed, feems to compofe a fmall conical pod, pointed at the top. The fruit or feed is oblong, and is not fo large as the head of the fmalleft pin; yet it is very prolific, and produces thefe feeds in fuch quantity as to yield a very abundant crop in the quantity of meal. Our author, from the fimiliarity of the names, conjectures it to be the *tipha* mentioned, but not defcribed, by Pliny: but this conjecture, which he acknowledges to be unfupported, it is of very little importance.

Of this *teff* bread the natives make a liquor, by a procefs which our author defcribes in the following words: The bread, when well toafted, is broken into fmall pieces, which are put into a large jar, and have warm water poured upon them. It is then fet by the fire, and frequently ftirred for feveral days, the mouth of the jar being clofe-covered. After being allowed to fettle three or four days, it acquires a fourifh tafte, and is what they call *bouza*, or the common beer of the country. The bouza in Atbara is made in the fame manner, only inftead of teff, cakes of barley-meal are employed. Both are very bad liquors, but the worft is that made of barley.

TEFFLIS, or TIFFLIS, a town of Afia, capital of Georgia, and fee of a bifhop, fituated at the foot of a mountain, on the river Kur. This city is furrounded with ftrong walls, except towards the river, and has a large fortrefs at the declivity of the mountain, which contains a garrifon, and is often made ufe of as a place of refuge for criminals and debtors. All the houfes are of ftone, with flat roofs, which ferve, according to the cuftom of the eaft, as walks for the women. The buildings are neat and clean; but the ftreets are exceedingly dirty and narrow. The town contains one Roman-catholic, thirteen Greek, and feven Armenian churches: 100 leagues SSW. Aftracan. *Long.* 62. 45. E. Ferro. *Lat.* 42. 47. N.

TEGERHY, a town of Africa, in the country of Fezzen: eighty miles SW. Mourzouk.

TEINTS, and SEMITEINTS, in painting, denote the feveral colours ufed in a picture, confidered as more or lefs high, bright, deep, thin, or weakened and diminifhed, &c. to give the proper relievo, foftnefs, or diftance, &c. of the feveral objects.

TELEGRAPH (derived from τηλε and γραφω), is the name very properly given to an inftrument, by means of which information may be almoft inftantaneoufly conveyed to a confiderable diftance.

The telegraph, though it has been generally known and ufed

by the moderns only for a few years, is by no means a modern invention. There is reaſon to believe that amongſt the Greeks there was ſome ſort of telegraph in uſe. The burning of Troy was certainly known in Greece very ſoon after it happened, and before any perſon had returned from thence. Now that was altogether ſo tedious a piece of buſineſs, that conjecture never could have ſupplied the place of information. A Greek play begins with a ſcene, in which a watchman deſcends from the top of a tower in Greece, and gives the information that Troy was taken. "I have been looking out theſe ten years (ſays he) to ſee when that would happen, and this night it is done." Of the antiquity of a mode of conveying intelligence quickly to a great diſtance, this is certainly a proof.

The Chineſe, when they ſend couriers on the great canal, or when any great man travels there, make ſignals by fire from one day's journey to another, to have every thing prepared; and moſt of the barbarous nations uſed formerly to give the alarm of war by fires lighted on the hills or riſing grounds.

Polybius calls the different inſtruments uſed by the ancients for communicating information πυρσαι, *pyrſiæ*, becauſe the ſignals were always made by means of fire. At firſt they communicated information of events merely by torches; but this method was of little uſe, becauſe it was neceſſary before-hand to fix the meaning of every particular ſignal. Now as events are exceedingly various, it was impoſſible to expreſs the greater number of them by any premeditated contrivance. It was eaſy, for inſtance, to expreſs by ſignals that a fleet had arrived at ſuch a place, becauſe this had been foreſeen, and ſignals accordingly had been agreed upon to denote it; but an unexpected revolt, a murder, and ſuch accidents, as happen but too often, and require an immediate remedy, could not be communicated by ſuch ſignals; becauſe to foreſee them was impoſſible.

Æneas, a contemporary of Ariſtotle, who wrote a treatiſe on the duties of a general, endeavoured to correct thoſe imperfections, but by no means ſucceeded.

In fact his method was defective, becauſe it could not convey any other intelligence except what was written, and even that not particularly enough. With regard to all unforeſeen events, it was quite uſeleſs.

A new method was invented by Cleoxenus (others ſay by Democlitus), and very much improved by Polybius, as he himſelf informs us. He deſcribes this method as follows: Take the letters of the (Greek) alphabet, and divide them into five parts, each of which will conſiſt of five letters, except the laſt diviſion, which will have only four. Let theſe be fixed on a board in five columns. The man who is to give the ſignals is then to begin by holding up two torches, which he is to keep aloft till the other party has alſo ſhown two. This is only to ſhow that both ſides are ready. Theſe firſt torches are then withdrawn. Both parties are provided with boards, on which the letters are diſpoſed as formerly deſcribed. The perſon then who gives the ſignal is to hold up torches on the left to point out to the other party from what column he ſhall take the letters as they are pointed out to him. If it is to be from the firſt column, he holds up one torch; if from the ſecond, two; and ſo on for the others. He is then to hold up torches on the right, to denote the particular letter of the column that is to be taken. All this muſt have been agreed on beforehand. The man who gives the ſignals muſt have an inſtrument (διοπτραν), conſiſting of two tubes, and ſo placed as that, by looking through one of them, he can ſee only the right ſide, and through the other only the left, of him who is to anſwer. The board muſt be ſet up near this inſtrument; and the ſtation on the right and left muſt be ſurrounded with a wall (παραπεφραχθαι) ten feet broad, and about the height of a man, that the torches raiſed above it may give a clear and ſtrong light, and that when taken down they may be completely concealed. Let us now ſuppoſe that this information is to be communicated—*A number of the auxiliaries, about a hundred, have gone over to the enemy.* In the firſt place, words muſt be choſen that will convey the information in the feweſt letters poſſible; as, *A hundred Cretans have deſerted*, Κρητες εκατον αφ' ημων ηυτομολησαν. Having written down this ſentence, it is conveyed in this manner. The firſt letter is a K, which is in the ſecond column; two torches are therefore to be raiſed on the left hand to inform the perſon who receives the ſignals to look into that particular column. Then five torches are to be held up on the right, to mark the letter *k*, which is the laſt in the column. Then four torches are to be held up on the left to point out the ρ (*r*), which is in the fourth column, and two on the right to ſhow that it is the ſecond letter of that column. The other letters are pointed out in the ſame manner.—Such was the *pyrſia* or telegraph recommended by Polybius.

But neither this nor any other method mentioned by the ancients ſeems ever to have been brought into general uſe; nor does it appear that the moderns had thought of ſuch a machine as a *telegraph* till the year 1663, when the Marquis of Worceſter, in his Century of Inventions, affirmed that he had diſcovered "a method by which, at a window, as far as eye can diſcover black from white, a man may hold diſcourſe with his correſpondent, without noiſe made or notice taken; being according to occaſion given, or means afforded, *ex re nata*, and no need of proviſion beforehand; though much better if foreſeen, and courſe taken by mutual conſent of parties." This could be done only by means of a telegraph, which in the next ſentence is declared to have been rendered ſo perfect, that by means of it the correſpondence could be carried on "by night as well as by day, though as dark as pitch is black."

About 40 years afterwards M. Amontons propoſed a new telegraph. His method was this: Let there be people placed in ſeveral ſtations, at ſuch a diſtance from one another, that by the help of a teleſcope a man in one ſtation may ſee a ſignal made in the next before him; he muſt immediately make the ſame ſignal, that it may be ſeen by perſons in the ſtation next after him, who are to communicate it to thoſe in the following ſtation, and ſo on. Theſe ſignals may be as letters of the alphabet, or as a cypher, underſtood only by the two perſons who are in the diſtant places, and not by thoſe who make the ſignals. The perſon in the ſecond ſtation making the ſignal to the perſon in the third the very moment he ſees it in the firſt, the news may be carried to the greateſt diſtance in as little time as is neceſſary to make the ſignals in the firſt ſtation. The diſtance of the ſeveral ſtations, which muſt be as few as poſſible, is meaſured by the reach of a teleſcope. Amontons tried this method in a ſmall tract of land before ſeveral perſons of the higheſt rank at the court of France.

It was not, however, till the French revolution that the telegraph was applied to uſeful purpoſes. Whether M. Chappe, who is ſaid to have invented the telegraph firſt uſed by the French about the end of 1793, knew any thing of Amontons's invention or not, it is impoſſible to ſay; but his telegraph was conſtructed on principles nearly ſimilar. The manner of uſing this telegraph was as follows: At the firſt ſtation, which was on the roof of the palace of the Louvre at Paris, M. Chappe, the inventor, received in writing, from the committee of public welfare, the words to be ſent to Liſle, near which the French army at that time was. An upright poſt was erected on the Louvre, at the top of which were two tranſverſe arms, moveable in all directions by a ſingle piece of mechaniſm, and with inconceivable rapidity. He invented a number of poſitions for theſe arms, which

ftood as figns for the letters of the alphabet; and thefe, for the greater celerity and fimplicity, he reduced in number as much as poffible. The grammarian will eafily conceive that fixteen figns may amply fupply all the letters of the alphabet, fince fome letters may be omitted not only without detriment but with advantage. Thefe figns, as they were arbitrary, could be changed every week; fo that the fign of B for one day might be the fign of M the next; and it was only neceffary that the perfons at the extremities fhould know the key. The intermediate operators were only inftructed generally in thefe fixteen fignals; which were fo diftinct, fo marked, fo different the one from the other, that they were eafily remembered. The conftruction of the machine was fuch, that each fignal was uniformly given in precifely the fame manner at all times: It did not depend on the operator's manual fkill; and the pofition of the arm could never, for any one fignal, be a degree higher or a degree lower, its movement being regulated mechanically.

M. Chappe having received at the Louvre the fentence to be conveyed, gave a known fignal to the fecond ftation, which was Mont Martre, to prepare. At each ftation there was a watch tower, where telefcopes were fixed, and the perfon on watch gave the fignal of preparation which he had received, and this communicated fucceffively through all the line, which brought them all into a ftate of readinefs. The perfon at Mont Martre then received, letter by letter, the fentence from the Louvre, which he repeated with his own machine; and this was again repeated from the next height, with inconceivable rapidity, to the final ftation at Lifle.

The firft defcription of the telegraph was brought from Paris to Frankfort on the Maine by a former member of the parliament of Bourdeaux, who had feen that which was erected on the mountain of Belville. As given by Dr. Hutton from fome of the Englifh papers, it is as follows. AA is a beam or maft of wood placed upright on a rifing ground (fig. 1, Plate 32), which is about 15 or 16 feet high. BB is a beam or balance moving upon the centre AA. This balance-beam may be placed vertically or horizontally, or any how inclined, by means of ftrong cords, which are fixed to the wheel D, on the edge of which is a double groove to receive the two cords. This balance is about 11 or 12 feet long, and nine inches broad, having at the ends two pieces of wood CC, which likewife turn upon angles by means of four other cords that pafs through the axis of the main balance, otherwife the balance would derange the cords; the pieces C are each about three feet long, and may be placed either to the right or left, ftraight or fquare, with the balance-beam. By means of thefe three the combination of movement is very extenfive, remarkably fimple, and eafy to perform. Below is a fmall wooden gouge or hut, in which a perfon is employed to obferve the movements of the machine. In the mountain neareft to this another perfon is to repeat thefe movements, and a third to write them down. The time taken up for each movement is twenty feconds; of which the motion alone is four feconds, the other 16 the machine is ftationary. Two working models of this inftrument were executed at Frankfort, and fent by Mr. W. Playfair to the Duke of York: and hence the plan and alphabet of the machine came to England.

Various experiments were in confequence tried upon telegraphs in this country; and one was foon after fet up by government in a chain of ftations from the admiralty-office to the fea coaft. It confifts of fix octagon boards, each of which is poifed upon an axis in a frame, in fuch a manner that it can be either placed vertically, fo as to appear with its full fize to the obferver at the neareft ftation, as in fig. 2. or it becomes invifible to him by being placed horizontally, as in fig. 3. fo that the narrow edge alone is expofed; which narrow edge is from a diftance invifible. Fig. 2. is a reprefentation of this telegraph, with the parts all fhut, and the machine ready to work. T, in the officer's cabin, is the telefcope pointed to the next ftation. Fig. 3. is a reprefentation of the machine not at work, and with the ports all open. The opening of the firft port (fig. 2.) expreffes *a*, the fecond *b*, the third *c*, the fourth *d*, the fifth *e*, and the fixth *f*, &c.

Six boards make 36 changes, by the moft plain and fimple mode of working; and they will make many more if more were neceffary: but as the real fuperiority of the telegraph over all other modes of making fignals confifts in its making letters, we do not think that more changes than the letters of the alphabet, and the ten arithmetical ciphers, are neceffary; but, on the contrary, that thofe who work the telegraphs fhould avoid communicating by words or figns agreed upon to exprefs fentences; for that is the fure method never to become expert at fending unexpected intelligence accurately.

This telegraph is, without doubt, made up of the beft number of combinations poffible; five boards would be infufficient, and feven would be ufelefs. It has been objected to it, however, that its form is too clumfy to admit of its being raifed to any confiderable height above the building on which it ftands; and that it cannot be made to change its direction, and confequently cannot be feen but from one particular point.

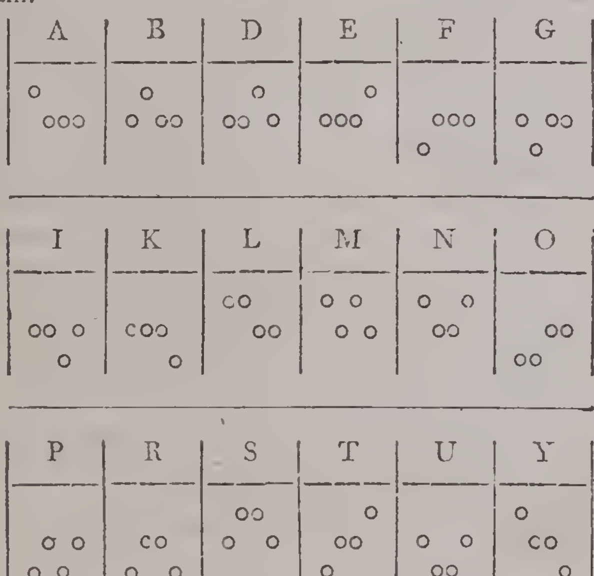
Several other telegraphs have been propofed to remedy thefe defects, and perhaps others to which the inftrument is ftill liable. The dial plate of a clock would make an excellent telegraph, as it might exhibit 144 figns fo as to be vifible at a great diftance. A telegraph on this principle, with only fix divifions inftead of twelve, would be fimple and cheap, and might be raifed 20 or 30 feet high above the building without any difficulty: it might be fupported on one poft, and therefore turn round, and the contraft of colours would always be the fame.

A very ingenious improvement of the telegraph has been propofed in the Gentleman's Magazine. It confifts of a femicircle, to be properly elevated, and fixed perpendicularly on a ftrong ftand. The radius 12 feet; the femicircle confequently fomewhat more than 36. This is to be divided into 24 parts. Each of thefe will therefore comprife a fpace of 18 inches, and an arch of $7^\circ 30'$ on the circumference. Thefe 24 divifions to be occupied by as many circular apertures of fix inches diameter; which will leave a clear fpace of fix inches on each fide between the apertures. Thefe apertures, beginning from the left, to denote the letters of the alphabet, omitting K, J confonant, V, X, and Q, as ufelefs for this purpofe. There are then 21 letters. The four other fpaces are referved for fignals. The inftrument to have an index moveable by a windlafs on the centre of the femicircle, and having two tops, according as it is to be ufed in the day or night; one, a circular top of lacquered iron or copper, of equal diameter with the apertures (and which confequently will eclipfe any of them againft which it refts); the other, a fpear or arrow-fhaped top, black, and highly polifhed, which in ftanding before any of the apertures in the day-time, will be diftinctly vifible. In the night, the apertures to be reduced by a diaphragm fitting clofe to each, fo as to leave an aperture of not more than two inches diameter. The diaphragm to be of well-polifhed tin; the inner rim lacquered black half an inch. All the apertures to be illuminated, when the inftrument is ufed in the night-time, by fmall lamps; to which, if neceffary, according to circumftances, convex lenfes may be added, fitted into each diaphragm, by which the light may be powerfully concentrated and increafed. Over each aperture one of the five prifmatic colours leaft likely to be miftaken (the remaining two being lefs diftinguifhable, and not wanted, are beft omitted) to be painted; and, in their natural order, on a width of eighteen inches and a depth of four, red, orange, yellow, green, blue; or, ftill to heighten the contraft, and render

immediately ſucceſſive apertures more diſtinguiſhable, red, green, orange, blue, yellow. The whole inner circle beneath and between the apertures to be painted black.

When the inſtrument is to be uſed, the index to be ſet to the ſignal apertures on the right. All the apertures to be covered or dark when it begins to be uſed, except that which is to give the ſignal. A ſignal gun to be fired to appriſe the obſerver. If the index is ſet to the firſt aperture, it will denote that words are to be expreſſed; if to the ſecond, that figures; if to the third, that the figures ceaſe; and that the intelligence is carried on in words. When figures are to be expreſſed, the alternate apertures from the left are taken in their order, to denote from 1 to 10 incluſively; the ſecond from the right denotes 100; the fifth 1000. This order, and theſe intervals, are taken to prevent any confuſion in ſo peculiarly important an article of the intelligence to be conveyed.

Perhaps, however, none of the telegraphs hitherto offered to the public exceeds the following, either in ſimplicity, cheapneſs, or facility in working, and it might, perhaps, with a few trifling additions, be made exceedingly diſtinct. It is thus deſcribed in the Repertory of Arts and Manufactures: For a nocturnal telegraph, let there be four large patent reflectors, lying on the ſame plane, parallel to the horizon, placed on the top of an obſervatory. Let each of theſe reflectors be capable, by means of two winches, either of elevation or depreſſion to a certain degree. By elevating or depreſſing one or two of the reflectors, eighteen very diſtinct arrangements may be produced, as the following ſcheme will explain.



For the ſake of example, the above arrangements are made to anſwer to the moſt neceſſary letters of the alphabet; but alterations may be made at will, and a greater number of changes produced, without any addition to the reflectors. In the firſt obſervatory there need only be a ſet of *ſingle* reflectors; but in the others each reflector ſhould be double, ſo as to face both the preceding and ſubſequent obſervatory; and each obſervatory ſhould be furniſhed with two teleſcopes. The proper diameter of the reflectors, and their diſtance from each other, will be aſcertained by experience; and it muſt be obſerved, that each reflector, after every arrangement, muſt be reſtored to its place.

To convert this machine into a diurnal telegraph, nothing more is neceſſary than to inſert, in the place of the reflectors, gilt balls, or any other conſpicuous bodies.

Since theſe inventions were made public, telegraphs have been brought to ſo great a degree of perfection, that they now convey information ſpeedily and diſtinctly, and are ſo much ſimplified, that they can be conſtructed and maintained at little expence. The advantages too which reſult from their uſe are almoſt inconceivable. Not to ſpeak of the ſpeed with which information is communicated and orders given in time of war, by means of them, the whole kingdom could be prepared in an inſtant to oppoſe an invading enemy. A telegraph might be alſo uſed by commercial men to convey a commiſſion cheaper and ſpeedier than an expreſs can travel. An eſtabliſhment of telegraphs might be made like that of the poſt; and inſtead of being an expence, it would produce a revenue.

TELEPHIUM, TRUE ORPINE, in botany: a genus of plants belonging to the claſs of *pentandria*, and order of *trigynia*; and in the natural ſyſtem ranging under the 54th order, *Miſcellaneæ*. The calyx is pentaphyllous; there are five petals, which are inſerted into the receptacle; the capſule is unilocular and trivalvular. There are two ſpecies, the *imperati* and *oppoſitifolia*.

TELESCOPE, an optical inſtrument for viewing diſtant objects; ſo named by compounding the Greek words τηλε *far off*, and σκοπειν *to look at* or *contemplate*. This name is commonly appropriated to the larger ſizes of the inſtrument, while the ſmaller are called PERSPECTIVE-GLASSES, SPY-GLASSES, OPERA-GLASSES. A particular kind, which is thought to be much brighter than the reſt, is called a NIGHT-GLASS.

The deſcription which has been already given of the various conſtructions of teleſcopes in the article OPTICS, is ſufficient for inſtructing the reader in the general principles of their conſtruction, and will ſhow the manner in which the rays of light proceed, in order to enſure the different circumſtances of amplification, brightneſs, and extent of field, and even diſtinctneſs of viſion, in as far as this depends on the proper intervals between the glaſſes. In addition to this, we ſhould notice the improvements aimed at in the different departures from the original conſtructions of Galileo and Scheiner, the advantage of the double eye-glaſs of Huyghens, and the quintuple eye-glaſs of Dollond: ſtill more it ſhould be ſhown, why the higheſt degrees of amplification and moſt extenſive field cannot be obtained by the mere proportion of the focal diſtances of the glaſſes, as Kepler had taught. In ſhort, without the Huyghenian doctrine of aberrations, neither can the curious reader learn the limits of their performance, nor the artiſt learn why one teleſcope is better than another, or in what manner to proceed to make a teleſcope differing in any particular from thoſe which he ſervilely copies. For this, however, the limits of a work like this are inſufficient. For the doctrine of aberrations therefore, ſo abſolutely neceſſary to the conſtruction of ACHROMATIC TELESCOPES, we muſt refer the reader to Euler's *Dioptrics*, and other works of that kind. Dr. Smith has alſo given as much as was neceſſary for the compariſon of the merits of different glaſſes of ſimilar conſtruction, and this in a very plain and elegant manner.

On the ſubject of the *compounded aberrations* of different ſurfaces, we recommend the reader to conſult the writings of Abbé Boſcovich, and the diſſertations of M. Clairaut, which are to be found in the Memoirs of the Academy of Paris, 1756, &c. Thoſe of Boſcovich are printed in the Memoirs of the Academy of Bologna, and in his five volumes of *Opuſcula*, publiſhed at Baſſano in 1785. To theſe may be added D'Alembert and Euler. The only thing in our language is the tranſlation of a very imperfect work by Schœrter.

Dr. Blair, in his ingenious Diſſertation on Achromatic Glaſſes, read to the Royal Society of Edinburgh in 17[illegible]3, rendered a moſt eſſential ſervice to the public, by the diſcovery of fluid mediums of a proper diſperſive power. By compoſing the lenſes of ſuch ſubſtances, we are at once freed from the irregularities in the refraction and diſperſion of flint-glaſs, which the chemiſts have not been able to free it from. In

whatever way this glaſs is made, it conſiſts of parts which differ both in refractive and diſperſive power ; and when taken up from the pot, theſe parts mix in threads, which may be diſſeminated through the maſs in any degree of fineneſs. But they ſtill retain their properties ; and when a piece of flint-glaſs has been formed into a lens, the eye, placed in its focus, ſees the whole ſurface occupied by gliſtening threads or broader veins running acroſs it. Great rewards have been offered for removing this defect, but hitherto to no purpoſe.

By uſing a fluid medium, Dr. Blair was freed from all this embarraſſment ; and he acquired another immenſe advantage, that of adjuſting at pleaſure both the refractive and diſperſive powers of his lenſes. In ſolid lenſes, we do not know whether we have taken the curvatures ſuited to the refractions till our glaſs is finiſhed ; and if we have miſtaken the proportions, all our labour is loſt. But when fluids are uſed, it is enough that we know nearly the refractions. We ſuit our focal diſtances to theſe, and then ſelect our curvatures, ſo as to remove the aberration of figure, preſerving the focal diſtances. Thus, by properly tempering the fluid mediums, we bring the lens to agree preciſely with the theory, perfectly achromatic, and the aberration of figure as much corrected as is poſſible.

Dr. Blair examined the refractive and diſperſive powers of a great variety of ſubſtances, and found great variety in their actions on the different colours. This is, indeed, what every well-informed naturaliſt would expect. There is no doubt now among naturaliſts about the mechanical connection of the phenomena of nature ; and all are agreed that the chemical actions of the particles of matter are perfectly like in kind to the action of gravitating bodies ; that all theſe phenomena are the effects of forces like thoſe which we call attractions and repulſions, and which we obſerve in magnets and electrified bodies ; that light is refracted by forces of the ſame kind, but differing chiefly in the ſmall extent of their ſphere of activity. One who views things in this way will expect, that as the actions of the ſame acid for the different alkalis are different in degree, and as the different acids have alſo different actions on the ſame alkali, in like manner different ſubſtances differ in their general refractive powers, and alſo in the proportion of their action on the different colours. Nothing is more unlikely therefore than the proportional diſperſion of the different colours by different ſubſtances ; and it is ſurpriſing that this inquiry has been ſo long delayed. It is hoped that Dr. Blair will oblige the public with an account of the experiments which he has made, which will enable others to co-operate in the improvement of achromatic glaſſes. Dr. Blair found a mixture of ſolutions of ammonical and mercurial ſalts, and alſo ſome other ſubſtances, which produced diſperſions proportional to that of glaſs, with reſpect to the different colours. And thus the reſult of this intricate and laborious inveſtigation correſponding to his utmoſt wiſhes, he has produced achromatic teleſcopes which ſeem as perfect as the thing will admit of ; for he has been able to give them ſuch apertures, that the *incorrigible* aberration ariſing from the ſpherical ſurfaces becomes a ſenſible quantity, and precludes farther amplification by the eye glaſſes. We have examined one of his teleſcopes : The focal diſtance of the object-glaſs did not exceed 17 inches, and the aperture was fully $3\frac{1}{2}$ inches. We viewed ſome ſingle and double ſtars and ſome common objects with this teleſcope ; and found, that in magnifying power, brightneſs, and diſtinctneſs, it was manifeſtly ſuperior to one of Mr. Dollond's of 42 inches focal length. It alſo gave us an opportunity of admiring the dexterity of the London artiſts, who could work the glaſſes with ſuch accuracy. We had moſt diſtinct viſion of a ſtar when uſing an erecting eye-piece, which made this teleſcope magnify more than a hundred times ; and we found the field of viſion as uniformly diſtinct as with Dollond's 42-inch teleſcope magnifying 46 times. The intelligent reader muſt admire the nice figuring and centuring of the very deep eye-glaſſes which are neceſſary for this amplification.

It is to be hoped that Dr. Blair will extend his views to *glaſſes* of different compoſitions, and thus give us object-glaſſes which are ſolid ; for thoſe compoſed of fluids have inconveniences which will hinder them from coming into general uſe, and will confine them to the muſeums of philoſophers. We imagine that antimonial glaſſes bid fair to anſwer this purpoſe, if they could be made free of colour, ſo as to tranſmit enough of light. We recommend this diſſertation to the careful peruſal of our readers. Thoſe who have not made themſelves much acquainted with the delicate and abſtruſe theory of aberrations, will find it exhibited in ſuch a popular form as will enable them to underſtand its general aim ; and the well-informed reader will find many curious indications of inquiries and diſcoveries yet to be made.

We ſhould now proceed to conſider the eye-glaſſes or glaſſes of teleſcopes. The proper conſtruction of an eye-piece is not leſs eſſential than that of the object-glaſs. But our limits will not allow us to treat this ſubject in the detail, neceſſary to its being well underſtood. Our readers will find abundant information in Dr. Smith's Optics concerning the eye-glaſſes, chiefly deduced from Huyghen's fine theory of aberration. At the ſame time, we muſt pay Mr. Dollond the merited compliment of ſaying, that he was the firſt who made any ſcientific application of this theory to the compound eye-piece for erecting the object. His eye-pieces of five and ſix glaſſes are very ingenious reduplications of Huyghen's eye-piece of two glaſſes, and would probably have ſuperſeded all others, had not his diſcovery of achromatic object-glaſſes cauſed opticians to conſider the chromatic diſperſion with more attention, and pointed out methods of correcting it in the eye-piece without any compound eye-glaſſes. They have found that this may be more conveniently done with four eye-glaſſes, without ſenſibly diminiſhing the advantages which Huyghens ſhowed to reſult from employing many ſmall refractions inſtead of a leſſer number of great ones. As this is a very curious ſubject, we ſhall give enough for making our readers fully acquainted with it, and content ourſelves with merely mentioning the principles of the other rules for conſtructing an eye-piece.

Such readers as are leſs familiarly acquainted with optical diſcuſſions will do well to conſult the article Optics, p. 107, *et ſeq.*

The perfection of a teleſcope is to repreſent an object in its proper ſhape, diſtinctly magnified, with a great field of viſion, and ſufficiently bright.

A great field of viſion is incompatible with the true ſhape of the object ; for a cheſs-board viewed through a reading-glaſs appears drawn out at the corners, and the ſtraight lines are all changed into curves.

The circumſtance which moſt peremptorily limits the extent of field is the neceſſary diſtinctneſs. If the viſion be indiſtinct, it is uſeleſs, and no other quality can compenſate this defect. The diſtortion is very inconſiderable in much larger angles of viſion than we can admit, and is unworthy of the attention paid to it by optical writers. They have been induced to take notice of it, becauſe the means of correcting it in a conſiderable degree are attainable, and afford an opportunity of exhibiting their knowledge ; whereas the indiſtinctneſs which accompanies a large field is a ſubject of moſt difficult diſcuſſion, and has hitherto baffled all their efforts to expreſs by any intelligible or manageable formulæ. The cauſe of this indiſtinctneſs is, the ſhortneſs of the lateral foci of lateral and oblique pencils refracted by the eye-glaſs. We have ſhown (in Optics), how to determine theſe in all the caſes which occur.

We cannot add any thing to what Dr. Smith has delivered on the theory of reflecting teleſcopes. There appears to be

the ſame poſſibility of correcting the aberration of the great ſpeculum by the contrary aberration of a convex ſmall ſpeculum, that we have practiſed in the compound object-glaſs of an achromatic refracting teleſcope. But this cannot be, unleſs we make the radius of the convex ſpeculum exceedingly large, which deſtroys the magnifying power and the brightneſs. This therefore muſt be given up. Indeed their performance, when well executed, does already ſurpaſs all imagination. Dr. Herſchel has found great advantages in what he calls the *front view*, not uſing a plane mirror to throw the pencils to one ſide. But this cannot be practiſed in any but teleſcopes ſo large, that the loſs of light, occaſioned by the interpoſition of the obſerver's head, may be diſregarded.

Nothing remains but to deſcribe the mechaniſm of ſome of the moſt convenient forms.

To deſcribe all the varieties of ſhape and accommodation which may be given to a teleſcope, would be a taſk as trifling as prolix. The artiſts of London and of Paris have racked their inventions to pleaſe every fancy, and to ſuit every purpoſe. We ſhall content ourſelves with a few general maxims, deduced from the ſcientific conſideration of a teleſcope, as an inſtrument by which the viſual angle ſubtended by a diſtinct object is greatly magnified.

The chief conſideration is to have a ſteady view of the diſtant object. This is unattainable, unleſs the axis of the inſtrument be kept conſtantly directed to the ſame point of it: for when the teleſcope is gently ſhifted from its poſition, the object *ſeems to move* in the ſame or in the oppoſite direction, according as the teleſcope inverts the object or ſhows it erect. This is owing to the magnifying power, becauſe the apparent angular-motion is greater than what we naturally connect with the motion of the teleſcope. This does not happen when we look through a tube without glaſſes.

All ſhaking of the inſtrument therefore makes the object dance before the eye; and this is diſagreeable, and hinders us from ſeeing it diſtinctly. But a tremulous motion, however ſmall, is infinitely more prejudicial to the performance of a teleſcope, by making the object quiver before us. A perſon walking in the room prevents us from ſeeing diſtinctly; nay, the very pulſation in the body of the obſerver, agitates the floor enough to produce this effect, when the teleſcope has a great magnifying power: For the viſible motion of the object is then an imperceptible tremor, like that of an harpſichord wire, which produces an effect preciſely ſimilar to optical indiſtinctneſs; and every point of the object is diffuſed over the whole ſpace of the angular tremor, and appears coexiſtent in every part of this ſpace, juſt as a harpſichord wire does while it is ſounding. The more rapid this motion is, the indiſtinctneſs is the more complete. Therefore the more firm and elaſtic and well bound together the frame-work and apertures of our teleſcope is, the more hurtful will this conſequence be. A mounting of lead, were it practicable, would be preferable to wood, iron, or braſs. This is one great cauſe of the indiſtinctneſs of the very fineſt reflecting teleſcopes of the uſual conſtructions, and can never be totally removed. In the Gregorian form, it is hardly poſſible to damp the elaſtic tremor of the ſmall ſpeculum, carried by an arm ſupported at one end only, even though the tube were motionleſs. We were witneſſes of a great improvement made on a four-feet reflecting teleſcope, by ſupporting the ſmall ſpeculum by a ſtrong plate of lead placed acroſs the tube, and led by an adjuſting ſcrew at each end. But even the great mirror may vibrate enough to produce indiſtinctneſs. Refracting teleſcopes are free from this inconveniency, becauſe a ſmall angular motion of the object-glaſs round one of its own diameters has no ſenſible effect on the image in its focus. They are affected only by an angular motion of the axis of the teleſcope or of the eye-glaſſes.

This ſingle conſideration gives us great help towards judging of the merits of any particular apparatus. We ſhould ſtudy it in this particular, and ſee whether its form makes the tube readily ſuſceptible of ſuch tremulous motions. If it does, the firmer it is, and the more elaſtic it is, the worſe. All forms therefore where the tube is ſupported only near the middle, or where the whole immediately or remotely depend on one narrow joint, are defective.

Reaſoning in this way, we ſay with confidence, that of all the forms of a teleſcope apparatus, the old faſhioned ſimple ſtand repreſented in Pl. 33. fig. 1. is by far the beſt, and that others are ſuperior according as the diſpoſition of the points of ſupport of the tube approaches to this. Let the pivots A, B, be fixed in the lintel and ſole of a window. Let the four braces terminate very near to theſe pivots. Let the teleſcope lie on the pin F*f*, reſting on the ſhoulder round the eye-piece, while the far end of it reſts on one of the pins 1, 2, 3, &c.; and let the diſtance of theſe pins from F very little exceed the length of the teleſcope. The trembling of the axis, even when conſiderable, cannot affect the poſition of the tube, becauſe the braces terminate almoſt at the pivots. The tremor of the brace CD does as little harm, becauſe it is nearly perpendicular to the tube. And if the object-glaſs were cloſe at the upper ſupporting pin, and the focus at the lower pin F, even the bending and trembling of the tube will have no effect on its optical axis. The inſtrument is only ſubject to horizontal tremors. Theſe may be almoſt annihilated by having a ſlender rod coming from a hook's joint in the ſide of the window, and paſſing through ſuch another joint cloſe by the pin F. We have ſeen an inſtrument of this form, having AB parallel to the earth's axis. The whole apparatus did not coſt 50 ſhillings, and we find it not in the leaſt ſenſible manner affected by a ſtorm of wind. It was by obſervations with this inſtrument that the tables of the motions of the Georgium Sidus, publiſhed in the Edinburgh Tranſactions, were conſtructed, and they are as accurate as any that have yet appeared. This is an excellent equatorial.

But this apparatus is not portable, and it is ſadly deficient in elegance. The following is the beſt method we have ſeen of combining theſe circumſtances with the indiſpenſable requiſites of a good teleſcope.

The pillar VX (fig. 2.) riſes from a firm ſtand, and has a horizontal motion round a cone which completely fills it. This motion is regulated by a rack-work in the box at V. The ſcrew of this rack-work is turned by means of the handle P, of a convenient length, and the ſcrew may be diſengaged by the click or detent V, when we would turn the inſtrument a great way at once. The teleſcope has a vertical motion round the joint Q placed near the middle of the tube. The lower end of the tube is ſupported by the ſtay OT. This conſiſts of a tube RT, faſtened to the pillar by a joint T, which allows the ſtay to move in a vertical plane. Within this tube ſlides another, with a ſtiff motion. This tube is connected with the teleſcope by another joint O, alſo admitting motion in a vertical plane. The ſide M of this inner tube is formed into a rack, in which works a pinion fixed to the top of the tube RT, and turned by the flat finger-piece R. The reader will readily ſee the advantages and the remaining defects of this apparatus. It is very portable, becauſe the teleſcope is eaſily diſengaged from it, and the legs and ſtay fold up. If the joint Q were immediately under A, it would be much freer from all tremor in the vertical plane. But nothing can hinder other tremors ariſing from the long pillar and the three ſpringy legs. Theſe communicate all external agitations with great vigour. The

inſtrument ſhould be ſet on a ſtone pedeſtal, or, what is better, a caſk filled with wet ſand. This pedeſtal, which neceſſity perhaps ſuggeſted to our ſcientific navigators, is the beſt that can be imagined.

Fig. 3 is the ſtand uſually given to reflecting teleſcopes. The vertical tube FBG is faſtened to the tube by finger ſcrews, which paſs through the ſlits at F and G. This arch turns round a joint in the head of the divided pillar, and has its edge cut into an oblique rack, which is acted on by the horizontal ſcrew, furniſhed with the finger-piece A. This ſcrew turns in a horizontal ſquare frame. This frame turns round a horizontal joint in the off-ſide, which cannot be ſeen in this view. In the ſide of this frame next the eye there is a finger-ſcrew *a*, which paſſes through the frame, and preſſes on the round horizontal plate D. By ſcrewing down this finger-ſcrew, the frame is brought up, and preſſes the horizontal ſcrew to the rack. Thus the elevation of the teleſcope is fixed, and may be nicely changed by the finger applied to A and turning this ſcrew. The horizontal round plate D moves ſtiffly round on another plate of nearly equal diameter. This under plate has a deep conical hollow ſocket, which is nicely fitted by grinding to a ſolid cone formed on the top of the great upright pillar, and they may be firmly fixed in any poſition by the finger-ſcrew E. To the under plate is faſtened a box *c*, containing a horizontal ſcrew C, which always works in a rack cut in the edge of the upper plate, and cannot be diſengaged from it. When a great vertical or horizontal motion is wanted, the ſcrews *a* and E are ſlacked, and by tightening them the teleſcope may be fixed in any poſition, and then any ſmall movements may be given it by the finger-plates A and C.

This ſtand is very ſubject to briſk tremor, either from external agitation of the pedeſtal, or from the immediate action of the wind; and we have ſeldom ſeen diſtinctly through teleſcopes mounted in this manner, till one end of the tube was preſſed againſt ſomething that was very ſteady and unelaſtic. It is quite aſtoniſhing what a change this produces. We took a very fine teleſcope made by James Short, and laid the tube on a great lump of ſoft clay, preſſing it firmly down into it. Several perſons, ignorant of our purpoſe, looked through it, and read a table of logarithms at the diſtance of 310 yards. We then put the teleſcope on its ſtand, and pointed it to the ſame object; none of the company could read at a greater diſtance than 235 yards, although they could perceive no tremor. They thought the viſion as ſharp as before; but the incontrovertible proof of the contrary was, that they could not read at ſuch a diſtance.

If the round plates were of much greater dimenſions; and if the lower one, inſtead of being fixed to the pillar, were ſupported on four ſtout pillars ſtanding on another plate; and if the vertical arch had a horizontal axis turning on two upright frames firmly fixed to the upper plate;—the inſtrument would be much freer from tremor. Such ſtands were made formerly; but being much more bulky and inconvenient for package, they have gone into diſuſe.

The high magnifying powers of Dr. Herſchel's teleſcopes made all the uſual apparatus for their ſupport extremely imperfect. But his judgment, and his ingenuity and fertility in reſource, are as eminent as his philoſophical ardour. He has contrived for his reflecting teleſcopes ſtands which have every property that can be deſired. The tubes are all ſupported at the two ends. The motions, both vertical and horizontal, are contrived with the utmoſt ſimplicity and firmneſs. We cannot more properly conclude this article than with a deſcription of his 40-feet teleſcope, the nobleſt monument of philoſophical zeal and of princely munificence that the world can boaſt of.

In Plate 33, we have given a view of this noble inſtrument in a meridional ſituation, as it appears when ſeen from a convenient diſtance by a perſon placed to the ſouth-weſt of it. The foundation in the ground conſiſts of two concentric circular brick walls, the outermoſt of which is 42 feet in diameter, and the inſide one 21 feet. They are two feet ſix inches deep under ground; two feet three inches broad at the bottom, and one foot two inches at the top; and are capped with paving ſtones about three inches thick, and twelve and three-quarters broad. The bottom frame of the whole apparatus reſts upon theſe two walls by twenty concentric rollers III, and is moveable upon a pivot, which gives a horizontal motion to the whole apparatus, as well as to the teleſcope.

The tube of the teleſcope A, though very ſimple in its form, which is cylindrical, was attended with great difficulties in the conſtruction. This is not to be wondered at, when its ſize, and the materials of which it is made, are conſidered. Its length is 39 feet four inches; it meaſures four feet ten inches in diameter; and every part of it is of iron. Upon a moderate computation, the weight of a wooden tube muſt have exceeded an iron one at leaſt 3000 pounds; and its durability would have been far inferior to that of iron. It is made of rolled or ſheet iron, which has been joined together without rivets, by a kind of ſeaming well known to thoſe who make iron-funnels for ſtoves.

Very great mechanical ſkill is uſed in the contrivance of the apparatus by which the teleſcope is ſupported and directed. In order to command every altitude, the point of ſupport is moveable; and its motion is effected by mechaniſm, ſo that the teleſcope may be moved from its moſt backward point of ſupport to the moſt forward, and, by means of the pulleys GG ſuſpended from the great beam H, be ſet to any altitude, up to the very zenith. The tube is alſo made to reſt with the point of ſupport in a pivot, which permits it to be turned ſide-wiſe.

The concave face of the great mirror is 48 inches of poliſhed ſurface in diameter. The thickneſs, which is equal in every part of it, remains now about three inches and a half; and its weight, when it came from the caſt was 2118 pounds, of which it muſt have loſt a ſmall quantity in poliſhing. To put this ſpeculum into the tube, it is ſuſpended vertically by a crane in the laboratory, and placed on a ſmall narrow carriage, which is drawn out, rolling upon planks, till it comes near the back of the tube; here it is again ſuſpended and placed in the tube by a peculiar apparatus.

The method of obſerving by this teleſcope is by what Dr. Herſchel calls the *front view*; the obſerver being placed in a ſeat C, ſuſpended at the end of it, with his back towards the object he views. There is no ſmall ſpeculum, but the magnifiers are applied immediately to the firſt focal image.

From the opening of the teleſcope, near the place of the eye-glaſs, a ſpeaking pipe runs down to the bottom of the tube, where it goes into a turning joint; and after ſeveral other inflections, it at length divides into two branches, one going into the obſervatory D, and the other into the work-room E. By means of the ſpeaking pipe the communications of the obſerver are conveyed to the aſſiſtant in the obſervatory, and the workman is directed to perform the required motions.

In the obſervatory is placed a valuable ſidereal time-piece, made by Mr. Shelton. Cloſe to it, and of the ſame height, is a polar diſtance-piece, which has a dial-plate of the ſame dimenſions with the time-piece: this piece may be made to ſhow polar diſtance, zenith diſtance, declination, or altitude, by ſetting it differently. The time and polar diſtance pieces are placed ſo that the aſſiſtant ſits before them at a table, with the ſpeaking-pipe riſing between them; and in this manner obſervations may be written down very conveniently.

This noble inſtrument, with proper eye-glaſſes, magnifies above 6000 times, and is the largeſt that has ever been made. Such of our readers as wiſh for a fuller account of the machinery attached to it, viz. the ſtairs, ladders, and platform B, may have recourſe to the ſecond part of the Tranſactions of

the Royal Society for 1795; in which, by means of 18 plates and 63 pages of letter-prefs, an ample detail is given of every circumftance relating to joiner's work, carpenter's work, and fmith's work, which attended the formation and erection of this telefcope. It was completed on Auguft the 28th, 1789, and on the fame day was the fixth fatellite of Saturn difcovered.

TELL (William), an illuftrious Swifs patriot, chief inftrument of the revolution which delivered the Swifs cantons from the German yoke in 1307. Grifler, the governor of thefe provinces for the emperor Albert, having ordered him, under pain of death, to fhoot at an apple placed on the head of one of his children; he had the dexterity, though the diftance was very confiderable, to ftrike it off without hitting the child. The tyrant, perceiving he had another arrow concealed under his cloak, afked him for what purpofe? To which he boldly replied, "To have fhot you through the heart, if I had had the misfortune to kill my fon." The enraged governor now ordered him to be hanged; but his fellow-citizens, animated by his fortitude and patriotifm, flew to arms; attacked and vanquifhed Grifler, who was fhot to death by Tell; and the affociation for the independency took place that inftant.

TELL-*Tale*, a name fometimes given to the *Perpetual*-LOG. See that article.

TELLER, an officer of the exchequer, in ancient records called *tallier*. There are four of thefe officers, whofe duty is to receive all fums due to the king, and to give the clerk of the pells a bill to charge him therewith. They likewife pay all money due from the king, by warrant from the auditor of the receipt; and make weekly and yearly books both of their receipts and payments, which they deliver to the lord-treafurer.

TELLINA, in natural hiftory, a genus of animals belonging to the clafs of *vermes*, and order of *teftaceæ*. The animal is a tethys; the fhell is bivalve, generally floping to one fide, with three teeth at the hinge. Gmelin reckons about 90 fpecies. The tellinæ bury themfelves in the mud or fand at the bottom of the fea, keeping a communication with the water above by means of fhort tubes or pipes.

TEMISSA, a large town in Africa, about 120 miles north-eaft of Mourzouk, the capital of Fezzan. Here the caravan of pilgrims from Bornou and Nigritia, which takes its departure from Mourzouk, and travels by the way of Cairo to Mecca, ufually provides the ftores of corn and dates, and dried meat, that are requifite for its dreary paffage.

TEMPER, in a mechanical fenfe. See TEMPERING.

TEMPERAMENT, among phyficians, the fame with conftitution, or a certain difpofition of the folids and fluids of the human body, by which it may be properly denominated ftrong, weak, lax, &c.

In every perfon there are appearances of a temperament peculiar to himfelf, though the ancients only took notice of four, and fome have imagined thefe were deduced from the theories of the four humours or four cardinal qualities; but it is more probable that they were firft founded on obfervation, and afterwards adapted to thofe theories, fince we find they have a real exiftence, and are capable of receiving an explanation. The two that are moft diftinctly marked are the fanguineous and melancholic, viz. the temperaments of youth and age.

1. *Sanguineous*. Here there is laxity of folids, difcoverable by the foftnefs of hair and fucculency; large fyftem of arteries, redundancy of fluids, florid complexion; fenfibility of the nervous power, efpecially to pleafing objects; irritability from the plethora; mobility and levity from lax folids. Thefe characters are diftinctly marked, and are proved by the difeafes incident to this age, as hæmorrhages, fevers, &c. but thefe, as they proceed from a lax fyftem, are more eafily cured.

2. *Melancholic Habit*. Here greater rigidity of folids occurs, difcoverable by the hardnefs and crifpature of the hair; fmall proportion of the fluids, hence drynefs and leannefs; fmall arteries, hence pale colour; venous plethora, hence turgefcency of thefe, and lividity; fenfibility, frequently exquifite; moderate irritability, with remarkable tenacity of impreffions; fteadinefs in action and flownefs of motion, with great ftrength; for excefs of this conftitution in maniacs gives the moft extraordinary inftance of human ftrength we know. This temperament is moft diftinctly marked in old age, and in males. The fanguineous temperament of youth makes us not diftinguifh the melancholic till the decline of life, when it is very evident, from difeafes of the veins, hemorrhoids, apoplexy, cachexy, obftructions of the vifcera, particularly of the liver, dropfies, affections of the alimentary canal, chiefly from weaker influence of the nervous power. So much for the fanguineous and melancholic temperaments; the other two are not fo eafily explained. The choleric temperament takes place between youth and manhood. In the

3. *Choleric*, the diftribution of the fluids is more exactly balanced; there is lefs fenfibility, and lefs obefity, with more irritability, proceeding from greater tenfion, lefs mobility and levity, and more fteadinefs in the ftrength of the nervous power. As to the

4. *Phlegmatic*. This temperament cannot be diftinguifhed by any characters of age or fex. It agrees with the fanguineous in laxity and fucculency. It differs from that temperament, and the melancholic, by the more exact diftribution of the fluids. Again it differs from the fanguineous, by having lefs fenfibility, irritability, mobility, and perhaps ftrength, though fometimes indeed this laft is found to be great.

Thefe are the ancient temperaments. The temperaments, indeed, are much more various; and very far from being eafily marked and reduced to their genera and fpecies, from the great variety which is obfervable in the conftitutions of different men.

TEMPERAMENT, in mufic, is defined by Rouffeau to be an operation which, by means of a flight alteration in the intervals, caufes the difference between two contiguous founds to difappear, makes each of thefe founds feem identical with the other, which, without offending the ear, may ftill preferve their refpective intervals or diftances one from the other. By this operation the fcale is rendered more fimple, and the number of founds which would otherwife be neceffary retrenched. Had not the fcale been thus modified, inftead of twelve founds alone, which are contained in the octave, more than fixty would be indifpenfably required to form what we properly call *modulation* in every tone. It is proved by computation, that upon the organ, the harpfichord, and every other inftrument with keys, there is not, and there fcarcely can be, any chords properly in tune, fave the octave alone. The caufe is this, that though three thirds major, or four thirds minor, ought to form a juft octave, thofe are found to furpafs, and thefe not to reach it.

TEMPERING, in the mechanic arts, the preparing of fteel and iron, fo as to render them more compact, hard, and firm; or even more foft and pliant, according to their refpective occafions. See IRON and STEEL.

TEMPESTA. See MOLYN.

TEMPLARS, TEMPLERS, or *Knights of the Temple*, a religious order inftituted at Jerufalem in the beginning of the 12th century, for the defence of the holy fepulchre and the protection of Chriftian pilgrims. They were firft called *The poor of the Holy City*, and afterwards affumed the appel-

lation of *Templers*, becaufe their houfe was near the temple. The order was founded by Baldwin II. then king of Jerufalem, with the concurrence of the pope; and the principal articles of their rule were: that they fhould hear the holy office throughout every day; or that, when their military duties fhould prevent this, they fhould fupply it by a certain number of pater-nofters: that they fhould abftain from flefh four days in the week, and on Fridays from eggs and milk-meats: that each knight might have three horfes, and one efquire; and that they fhould neither hunt nor fowl. After the ruin of the kingdom of Jerufalem about 1186, they fpread themfelves through Germany and other countries of Europe, to which they were invited by the liberality of the Chriftians. In the year 1228, this order acquired ftability, by being confirmed in the council of Troyes, and fubjected to a rule of difcipline drawn up by St. Bernard. In every nation they had a particular governor, called *mafter of the Temple*, or of the *militia of the Temple*. Their grand-mafter had his refidence at Paris.

The order of Templars flourifhed for fome time, and acquired, by the valour of its knights, immenfe riches and an eminent degree of military renown: but as their profperity increafed, their vices were multiplied, and their arrogance, luxury, and cruelty, rofe at laft to fuch a monftrous height, that their privileges were revoked, and their order fuppreffed with the moft terrible circumftances of infamy and feverity. Their accufers were two of their own body, and their chief profecutor Philip the Fair of France, who addreffed his complaints to Clement V. The pope, though at firft unwilling to proceed againft them, was under a neceffity of complying with the king's defire; fo that, in the year 1307, upon an appointed day, and for fome time afterwards, all the knights, who were difperfed throughout Europe, were feized and imprifoned, and many of them, after trials for capital crimes, were convicted and put to death. In 1312 the whole order was fuppreffed by the council of Vienne. A part of the rich revenues they poffeffed was beftowed upon other orders, efpecially on the knights of St. John, now of Malta, and the reft confifcated to the refpective treafuries of the fovereign princes in whofe dominions their poffeffions lay.—The knights Templars, in order to juftify the feverity with which they were treated, were charged with apoftafy to the Saracens, and holding correfpondence with them, with infulting the majefty of God, turning into derifion the gofpel of Chrift, and trampling upon the obligation of all laws human and divine. Candidates, it is faid, upon admiffion to this order, were commanded to fpit, in token of contempt, upon an image of Chrift, and after admiffion to worfhip either a cat or a wooden head crowned with gold. It is farther affirmed, that, among them, the odious and unnatural act of fodomy was a matter of obligation; and they are charged with other crimes too horrible to be mentioned, or even imagined. However, though there be reafon to believe, that in this order as well as others of the fame period, there were fhocking examples of impiety and profligacy; yet that the whole order was thus enormoufly corrupt, there is no reafon to believe. The pope, indeed, though he acted with feverity, acted with juftice. He fent two cardinals to Paris, who, publifhing his bull againft the order, condemned thofe Templars who had made the voluntary confeffion to be burnt by a flow fire. The criminals recanted their former confeffions, but acknowleged themfelves worthy of death, becaufe they had unjuftly accufed the order of crimes of which they were innocent. Several authors of thofe times wrote in defence of the order; and Boccace alleges, that its extirpation was owing to the avarice of the king of France, who coveted the rich poffeffions the Templars then enjoyed in France.

The king of Arragon was much preffed to treat the Templars in his kingdom as they had been treated in France; but his conftant anfwer was, "We muft be firft convinced of their guilt, and it will be then time enough to talk of their punifhment." The people, however, were in general fo provoked againft them, that they were compelled to fhut themfelves up in the fortreffes belonging to their order, to prevent their being torn in pieces; which precaution was reprefented to the king of Arragon as an act of rebellion. He marched, therefore, with a corps of troops againft one of thefe fortreffes. The knight who commanded furrendered immediately, and told the king the truth, affuring him that they defired nothing but a fair trial; with which declaration the king was extremely moved, took the whole order into his protection, and forbade any to abufe or infult them under the heavieft penalties. At the fame time he declared, he was ready to receive any informations againft them that were fupported by proofs; but if the informers failed therein, he would punifh them as they deferved.

Thefe facts plead ftrongly for the innocence of the Templars, or at leaft they prove that their guilt muft have been exaggerated; and if we add, that many of the accufations advanced againft them flatly contradict each other, and that many members of this unfortunate order folemnly avowed their innocence while languifhing under the fevereft tortures, and even with their dying breath;—it would feem probable, that king Philip fet on foot this bloody tragedy, with a view to gratify his avarice, and glut his refentment againft the Templars, and efpecially againft their grand-mafter, who had highly offended him. The principal caufe of his invincible hatred againft them was, that in his quarrel with Boniface VIII. the knights efpoufed the caufe of the pope, and furnifhed him with money to carry on the war. They originally wore a white habit, with red croffes fewed upon their cloaks as a mark of diftinction.

TEMPLE (Sir William), an eminent Englifh ftatefman, and very polite writer, was the fon of Sir William Temple, of Sheen in Surrey, mafter of the rolls and privy-counfellor in Ireland, in the reign of Charles II. by a fifter of the learned Dr. Henry Hammond. His grandfather, Sir William Temple, was the younger fon of the Temples, of Temple-Hall, in Leicefterfhire, and, as it feems, the raifer of his family. He was, at firft, fellow of King's College in Cambridge, afterwards mafter of the free-fchool at Lincoln, then fecretary fucceffively to Sir Philip Sidney, William Davifon, efq. one of Queen Elizabeth's fecretaries, and to the famous earl of Effex; which laft he ferved while he was lord-deputy of Ireland. In 1609, upon the importunate folicitation of Dr. James Ufher, he accepted the provoftfhip of Trinity College in Dublin; after which he was knighted, and made one of the mafters of the chancery in Ireland. He died about 1626, aged 72, after having giving proof of his abilities and learning, by feveral publications in Latin.

Our Sir William Temple was born at London, about 1629; and from his childhood difcovered a folid penetrating genius, and a wonderful defire of knowledge, which his father took care to cultivate by all the advantages of a liberal education. He made his firft application to letters at Penfhurft in Kent, under the infpection of his uncle, Dr. Hammond, who was then minifter of that parifh; and from thence was removed to a fchool at Bifhop's-Stortford, to be further inftructed in the Greek and Latin tongues. At feventeen years of age he was fent to Emanuel College in Cambridge, and about a year after left the univerfity, in

order to travel into foreign countries. He went into France in 1648; and, after ſpending two years there, proceeded to Holland, Flanders, and Germany. In theſe travels, he made himſelf a very complete maſter of the French and Spaniſh tongues. He returned to England in 1654, and ſoon after married a daughter of Sir Thomas Oſborne; he had met with her in the Iſle of Wight, in 1648, when King Charles was a priſoner in Cariſbrook Caſtle; and accompanying her to Guernſey, where her father was then governor, conceived a paſſion for her, which ended in marriage. While England was governed by the uſurpers, he lived privately with his father in Ireland, and devoted his whole time to the ſtudy of hiſtory and philoſophy. Upon the reſtoration of Charles II. he began to put himſelf forward, and became a member of parliament in Ireland; but, upon being ſent over hither as a commiſſioner, in 1662, to the king, freſh views opened themſelves to him; and he only returned to Ireland, in order to tranſport his family to England. Having ſpent twenty years in the buſineſs of the ſtate, with particular honour and ſucceſs, namely, from the 32d to the 52d year of his age, he went into retirement, and divided his time between his books and garden, notwithſtanding which, he occaſionally gave his advice. He was not only a very able ſtateſman and negotiator, but alſo a very polite and elegant writer. His "Obſervations upon the United Provinces of the Netherlands," were publiſhed in one vol. 8vo. in 1672. His "Miſcellanea," conſiſting of ten tracts upon different ſubjects, are in two vols. 8vo. His "Memoirs," alſo, of what had paſſed in his public employments, eſpecially thoſe abroad, make a very entertaining part of his works, being in three parts. In 1693 Sir William publiſhed an anſwer to a ſcurrilous pamphlet, entituled, "A Letter from Mr. du Cros to the Lord ———." In 1694, he had the misfortune to loſe his lady, who was a very extraordinary woman, as well as a good wife. In 1695 he publiſhed "An Introduction to the Hiſtory of England:" ſome few miſtakes were noted in this work. He died in 1700, aged 72, at Moor-Park, near Farnham in Surrey; where, accord-to his will, his heart was buried in a ſilver-box, under the ſun-dial in his garden. Not long after his death, Dr. Swift, then domeſtic chaplain to the earl of Berkley, who had lived many years as an amanuenſis in Sir William Temple's family, publiſhed two volumes of his "Letters," containing an account of the moſt important tranſactions that paſſed in Chriſtendom, from 1667 to 1672; and in 1703, a third volume, containing "Letters to King Charles II. the Prince of Orange, the chief Miniſters of State, and other Perſons," in 8vo. Sir William Temple had one ſon, John Temple, eſq. a man of great abilities and accompliſhments, and who, ſoon after the Revolution, was appointed ſecretary at war by King William; but he had ſcarce been a week in that office, when he drowned himſelf at London-Bridge, April 14, 1689. Mr. Temple had married Mademoiſelle Du Pleſſis Rombouillet, a French lady, who had by him two daughters, to whom Sir William bequeathed the bulk of his eſtate; but with an expreſs condition, that they ſhould not marry Frenchmen.

TEMPLE, *templum*, a public building, erected in honour of ſome deity, either true or falſe; and wherein the people meet to pay religious worſhip to the ſame. The word is formed from the Latin *templum*, which ſome derive from the Greek τεμενος, ſignifying the ſame thing; and others from τεμνω, *abſcindo*, "I cut off, I ſeparate," in regard a temple is a place ſeparated from common uſes; others with more probability derive it from the old Latin word *templare*, "to contemplate." It is certain the ancient augurs gave the name *templa* to thoſe parts of the heavens which were marked out for the obſervation of the flight of birds. Their formula was this: *Templa teſqua ſunto.* Temples were originally all open, and hence received their name. See Phil. Tranſ. n° 471. ſect. 5. where we have an account of an ancient temple in Ireland of the ſame ſort as our famous Stonehenge. The word *templum*, in its primary ſenſe, among the old Romans, ſignified nothing more than a place ſet apart and conſecrated by the augurs, whether incloſed or open, in the city or in the fields.

Clemens Alexandrinus and Euſebius refer the origin of temples to the ſepulchres built for the dead. This notion has been lately illuſtrated and confirmed by a variety of teſtimonies by Mr. Farmer in his Treatiſe on the Worſhip of Human Spirits, p. 373. &c. Herodotus and Strabo will have the Egyptians to have been the firſt who built temples to the gods. The firſt erected in Greece is aſcribed to Deucalion, by Apolonius, Argonaut. lib. iii. In antiquity we meet with many people who would not build any temples to their gods for fear of confining them to too narrow bounds. They performed their ſacrifices in all places indifferently, from a perſuaſion that the whole world is the temple of God, and that he required no other. This was the doctrine of the magi, followed by the Perſians, the Scythians, the Numidians, and many other nations mentioned by Herodotus, lib. I. Strabo, lib. xv. and Cicero in his ſecond oration againſt Verres.

The Perſians, who worſhipped the ſun, believed it would wrong his power to incloſe him in the walls of a temple, who had the whole world for his habitation; and hence, when Xerxes ravaged Greece, the magi exhorted him to deſtroy all the temples he met with. The Sicyonians would build no temple to their goddeſs Coronis; nor the Athenians, for the like reaſon, erect any ſtatue to Clemency, who, they ſaid, was to live in the hearts of men, not within ſtone walls. The Bithynians had no temples but the mountains to worſhip on; nor had the ancient Germans any other but the woods. Even ſome philoſophers have blamed the uſe and building of temples, particularly Diogenes, Zeno, and his followers the Stoics. But it may be ſaid, that if God hath no need of temples, men have need of places to meet in for the public offices of religion: accordingly temples may be traced back even into the remoteſt antiquity. See *Hoſpinian de Origine Templorum.*

The Romans had ſeveral kinds of temples; whereof thoſe built by the kings, &c. conſecrated by the augurs, and wherein the exerciſe of religion was regularly performed, were called, by way of eminence, *templa*, "temples." Thoſe that were not conſecrated, were called *ædes*. The little temples, that were covered or roofed they called *ædiculæ*, Thoſe open, *ſacella*. Some other edifices, conſecrated to particular myſteries of religion, they called *ſana* and *delubra*. All theſe kinds of temples, Vitruvius tells us, had other particular denominations, according to the form and manner of their conſtruction, as will be hereafter ſpecified. Indeed the Romans outdid all nations with regard to temples: they not only built temples to their gods, to their virtues, to their diſeaſes, &c. but alſo to their emperors, and that in their lifetime; inſtances whereof we meet with in medals, inſcriptions, and other monuments. Horace compliments Auguſtus hereupon, and ſets him above Hercules and all the heroes of fable; becauſe thoſe were admitted into temples only after their death, whereas Auguſtus had his temples and altars while living.

Præſenti tibi maturos largimur honores;
Jurandaſque tuum per nomen ponimus aras.

Epiſt. ad Aug.

Suetonius, on this occafion, gives an inftance of the modefty of that emperor, who would allow of no *temples* being erected to him in the city; and even in the provinces, where he knew it was ufual to raife temples to the very proconfuls, refufed any but thofe erected in the name of Rome as well as his own. The moft celebrated temples among the Romans were the Capitol and Pantheon. They had alfo the temple of Saturn, which ferved for the public treafury; and the temple of Janus.

The temple at Jerufalem was fimilar in its plan to the Tabernacle. The firft temple was begun by Solomon about the year of the world 2992, and before Chrift 1012 according to fome chronologers, and finifhed in eight years. Great miftakes have been committed refpecting the dimenfions of this temple, by confounding the emblematical defcription of Ezekiel with the plain account of it in the books of Kings and Chronicles. It confifted of the holy of holies, the fanctuary, and a portico. The holy of holies was a fquare room of 20 cubits; the fanctuary, or holy place, was 40 cubits long and 20 broad, confequently the length of both thefe together was 60 cubits. The portico, which ftood before the fanctuary, was 20 cubits long and 10 cubits broad. Whether the portico was feparated by a wall from the reft of the temple or not, is not mentioned in fcripture. If it was, the whole length of the temple, computing the cubit at 22 inches, did not exceed 110 feet in length and 36 feet 8 inches in breadth. In the portico ftood the two brazen pillars called *Jachin* and *Boaz*, which, upon comparing and reconciling the feemingly different account in different places, appear to have been 40 cubits high and about 4 cubits diameter. The court probably at firft extended all round the temple. Now we are told, that the court about the tabernacle was 100 cubits long and 50 broad; and as Solomon made every part of the temple about twice as large as the correfponding part in the tabernacle, we have reafon to conclude, that the court around the temple was 200 cubits long and 100 broad. According to this defcription, which is taken from the fcripture hiftory, the temple of Solomon was by no means fo large as it is commonly reprefented. Still, however, it was very magnificent in fize, and fplendid in ornament. It was plundered of its treafures in the reign of Rehoboam, and repaired by Joafh; it was again fpoiled in the time of Ahaz and of Hezekiah; and after being reftored by Jofiah, was demolifhed by Nebuchadnezzar in the year of the world 3416, after it had ftood 476 years according to Jofephus, and according to Ufher 428 years.

The fecond temple was built by the Jews, after their return from the Babylonifh captivity, under the direction and influence of Zerubbabel their governor, and of Jofhua the high-prieft, with the leave and encouragement of Cyrus the Perfian emperor, to whom Judea was now become a tributary kingdom. According to the Jews, this temple was deftitute of five remarkable appendages, which were the chief glory of the firft temple; viz. the ark and mercy-feat, the Shechinah, the holy fire on the altar, which had been firft kindled from heaven, the urim and thummim, and the fpirit of prophecy. This temple was plundered and profaned by Antiochus Epiphanes, who alfo caufed the public worfhip in it to ceafe; and afterwards purified by Judas Maccabæus, who reftored the divine worfhip; and after having ftood five hundred years, rebuilt by Herod, with a magnificence approaching to that of Solomon's. Tacitus calls it *immenfæ opulentiæ templum*; and Jofephus fays, it was the moft aftonifhing ftructure he had ever feen, as well on account of its architecture as its magnitude, and likewife the richnefs and magnificence of its various parts and the reputation of its facred appurtenances. This temple, which Herod began to build about fixteen years before the birth of Chrift, and fo far completed in nine years and a half as to be fit for divine fervice, was at length deftroyed by the Romans on the fame month and day of the month on which Solomon's temple was deftroyed by the Babylonians.

The Indian temples, or pagodas, are fometimes of a prodigious fize. They are commonly erected near the banks of the Ganges, Kiftna, or other facred rivers, for the benefit of ablution in the purifying ftream. Where no river flows near the foot of the pagoda, there is invariably in the front of it a large tank or refervoir of water. Thefe are, for the moft part, of a quadrangular form, are lined with freeftone or marble, have fteps regularly defcending from the margin to the bottom, and Mr. Crauford obferved many between three and four hundred feet in breadth. At the entrance of all the more confiderable pagodas there is a portico, fupported by rows of lofty columns, and afcended by a handfome flight of ftone fteps; fometimes, as in the inftance of Tripetti, to the number of more than a hundred. Under this portico, and in the courts that generally inclofe the whole building, an innumerable multitude affemble at the rifing of the fun; and, having bathed in the ftream below, and, in conformity to an immemorial cuftom over all the Eaft, having left their fandals on the border of the tank, impatiently await the unfolding of the gates by the miniftring brahmin. The gate of the pagoda univerfally fronts the eaft, to admit the ray of the folar orb; and, opening, prefents to the view an edifice partitioned out, according to M. Thevenot in his account of Chitanagar, in the manner of the ancient cave-temples of Elora, having a central nave or body; a gallery ranging on each fide; and, at the farther end, a fanctuary, or chapel of the deity adored, furrounded by a ftone balluftrade to keep off the populace. Thofe who wifh to perufe a more particular account of the Indian temples may confult Maurice's Indian Antiquities. See alfo Pagoda and Seringham.

Temple, in architecture. The ancient temples were diftinguifhed, with regard to their conftruction, into various kinds; as, *Temple in antæ, Ædes in antis.* Thefe, according to Vitruvius, were the moft fimple of all temples, having only angular pilafters, called *antæ* or *paraftatæ*, at the corners, and two Tufcan columns on each fide of the doors. *Temple, tetraftyle*, or fimple *tetraftyle*, was a temple that had four columns in front and as many behind. Such was the temple of Fortuna Virilis at Rome. *Temple, proftyle*, that which had only columns in its front or fore fide; as that of Ceres at Eleufis in Greece. *Temple, amphiproftyle*, or *double proftyle*, that which had columns both before and behind, and which was alfo tetraftyle. *Temple, periptere*, that which had four rows of infulated columns around, and was exhaftyle, *i. e.* had fix columns in front; as the temple of Honour at Rome. *Temple, diptere*, that which had two wings and two rows of columns around, and was alfo octoftyle, or had eight columns in front; as that of Diana at Ephefus.

Temples, among us, denote two inns of court in London, thus called, becaufe anciently the dwelling-houfe of the knights-templars. At the fuppreffion of that order, they were purchafed by the profeffors of the common law, and converted into *hofpitia* or inns. They are called the *inner* and *middle temple*, in relation to Effex-houfe; which was alfo a part of the houfe of the templars, and called the *outer temple*, becaufe fituated without Temple-Bar. In the middle temple, during the time of the templars, the king's treafure was kept; as was alfo that of the kings of France in the houfe-templars at Paris. The chief officer was the mafter of the temple, who was fummoned to parliament in

47 Hen. III. and from him the chief minifter of the temple-church is ftill called *mafter of the temple.*

Temples, in anatomy, a double part of the head, reaching from the forehead and eyes to the two ears. The temples are chiefly formed of two bones called *offa temporis.* Thefe parts, according to phyficians, were called *tempora*, from their fhowing the age or time of a man by the colour of the hair, which turns white in this part before any other; which Homer feems to have been aware of, by his calling men *poliocrotaphi, q. d.* "grey-templed."

TEMPORAL, a term generally ufed for fecular, as a diftinction from ecclefiaftical. Thus we fay temporal lords, and fpiritual or ecclefiaftical lords.

TEMPORALTIES *of* Bishops, are the revenues, lands, tenements, and lay-fees, belonging to bifhops, as they are barons and lords of parliament. The cuftody of the temporalties of bifhops forms a branch of the king's ordinary revenues (fee Revenue).—Thefe, upon the vacancy of the bifhopric, are immediately the right of the king, as a confequence of his prerogative in church matters; whereby he is confidered as the founder of all archbifhoprics and bifhoprics, to whom, during the vacancy, they revert. And for the fame reafon, before the diffolution of abbeys, the king had the cuftody of the temporalties of all fuch abbeys and priories as were of royal foundation (but not of thofe founded by fubjects), on the death of the abbot or prior. Another reafon may alfo be given why the policy of the law hath vefted this cuftody in the king; becaufe, as the fucceffor is not known, the lands and poffeffions of the fee would be liable to fpoil and devaftation if no one had a property therein. Therefore the law has given the king, not the temporalties themfelves, but the cuftody of the temporalties, till fuch time as a fucceffor is appointed; with power of taking to himfelf all the intermediate profits, without giving any account to the fucceffor; and with the right of prefenting (which the crown very frequently exercifes) to fuch benefices and other preferments as fall within the time of vacation. This revenue is of fo high a nature, that it could not be granted out to a fubject, before or even after it accrued: but now, by the ftatute 15 Edw. III. ft. 4. c. 4 & 5. the king may, after the vacancy, leafe the temporalties to the dean and chapter; faving to himfelf all advowfons, efcheats, and the like. Our ancient kings, and particularly William Rufus, were not only remarkable for keeping the bifhoprics a long time vacant, for the fake of enjoying the temporalties, but alfo committed horrible waftes on the woods and other parts of the eftate; and to crown all, would never, when the fee was filled up, reftore to the bifhop his temporalties again, unlefs he purchafed them at an exorbitant price. To remedy which, king Henry I. granted a charter at the beginning of his reign, promifing neither to fell, nor let to farm, or take any thing from, the domains of the church, till the fucceffor was inftalled. And it was made one of the articles of the great charter, that no wafte fhould be committed in the temporalties of bifhoprics, neither fhould the cuftody of them be fold. The fame is ordained by the ftatute of Weftminfter the firft; and the ftatute 14 Edw. III. ftat. 4. c. 4. (which permits a leafe to the dean and chapter) is ftill more explicit in prohibiting the other exactions. It was alfo a frequent abufe, that the king would, for trifling or no caufes, feize the temporalties of bifhops, even during their lives, into his own hands: but this is guarded againft by ftatute 1 Edw. III. ft. 2. c. 2. This revenue of the king, which was formerly very confiderable, is now by a cuftomary indulgence almoft reduced to nothing: for, at prefent, as foon as the new bifhop is confecrated and confirmed, he ufually receives the reftitution of his temporalties quite entire and untouched from the king; and then, and not fooner, he has a free-fimple in his bifhopric, and may maintain an action for the profits.

TENACITY, in natural philofophy, that quality of bodies by which they fuftain a confiderable preffure or force of any kind without breaking. It is the quality oppofite to fragility or brittlenefs. See Strength *of Materials.*

TENACULUM, in furgery, an inftrument ufed in amputation, for pulling out bleeding veffels that are to be tied by ligatures. See Surgery.

TENAILLES and TENAILLIONS. } See Fortification.

TENANT, one that holds lands or tenements of fome lord or landlord, by rent, fealty, &c. See Tenure.

TENAWWIT. See Loxia, fpecies 13.

TENCH, in ichthyology. See Cyprinus, fpecies 3.

TENDER, a fmall fhip in the fervice of men-of-war, for carrying men, provifions, or any thing elfe that is neceffary.

TENDONS, in anatomy, are white, firm, and tenacious parts, contiguous to the mufcles, and ufually forming their extremities. See Anatomy.

TENEBRIO, in natural hiftory, a genus of infects belonging to the order of *Coleoptera.* The antennæ are moniliform, the laft joint being roundifh; the thorax is plano-convex and marginated; the head projecting, and the elytra are fomewhat ftiff. Gmelin enumerates about 63 fpecies. The larvæ of fome live in damp places under ground among rubbifh; of others in flour and different kinds of food, where they undergo their metamorphofis. The perfect infects are very troublefome in houfes; eating bread, meat, &c. They precipitately avoid the light; reforting in troops to dark damp cellars, were putrefaction allures and nourifhes them. They are all of a very dark gloomy appearance, from which circumftance they take their name.

TENERIFFE, one of the Canary Iflands, the fecond in dignity, but the firft probably in point of extent, wealth, and fertility. Formerly it was called *Nivaria*, and is fuppofed to be the ifland of that name mentioned by Pliny the Elder; but this opinion is difputed. Sir Edward Scorey fays, that it derived the appellation Nivaria from the circle or collar of fnow that furrounds the peak of Tenda, now called *The Peak of Teneriffe:* this laft name, he alleges, was impofed by the inhabitants of Palma Ifland; for *tener* in their language fignifies fnow, and *effe* a mountain. The form is triangular, extending itfelf into three capes, the neareft being about eighty leagues or more from the coaft of Africa. What renders this ifland fo famous in hiftory, is the celebrated peak, of whofe height fo many marvellous ftories have been related, and which Scaliger is not afhamed to call fixty miles; Panicius, who lived in the ifland, feventy; Thevet, fifty-four; Nicolls, an Englifhman, who refided fome years here, forty-feven; and Varenius, four miles and five furlongs, in its perpendicular height. All the other writers, it is probable, compute by the oblique afcent of a perfon journeying to the fummit; and even then their relations feem extravagant. Sir Thomas Herbert affirms, that the top is feen at the diftance of 120 miles at fea, provided the weather is clear; but Sir Edmund Storey fays, that from the bafe, beginning at the town of Garrachico, to the very fummit, is but two days' journey and a half; which, in fact, is not equal to one day's journey, if we confider that travellers lie by during the heat, and have alfo to combat with fo many fteep afcents; that their pace muft be exceeding flow. Although the vortex appears fharp, and the exact refemblance of a cone, yet it is flat for the extent of an acre of ground, in the centre of which is a dreadful volcano, which frequently breaks out into flames, fo violent as to fhake the whole ifland

with an incredible force. Smoke conftantly iffues from the mountain, near its fummit, but no eruption has been fince the year 1704, when the port of Garrachica was deftroyed, and the harbour filled by the lava. The ifland of Teneriffe is divided in the middle by a ridge of mountains, which have been compared to the roof of a church, the peak forming the fpire or fteeple in the centre. An author well acquainted with the ifland, fays, that, if you divide it into twelve parts, ten of thefe confift of rocks, woody and inacceffible mountains and vineyards; and yet, from the fmall remainder of arable ground, he has feen 250,000 hanacks of wheat, befides immenfe quantities of rye and barley, produced. Nothing can be more delicately rich than the foil, if the Spaniards knew, or would take the trouble of properly cultivating it; for, befides the abundance in which it bears grain, fruits, and roots, it communicates to them a peculiar elegance of flavour, unknown in other countries under the fame parallel; two forts of wine are produced, the vidonia and malvefia, or malmfey. The firft is extracted from a long grape, and is a dull, heavy wine, greatly inferior to the other, which is drawn from a large round grape, in fuch quantities as to be exported to all the corners of the world. Mr. Anderfon, the companion of Captain Cook, in his voyage to the Pacific Ocean, fays, "To the eaftward of Santa Cruz, the ifland appears perfectly barren. Ridges of hills run toward the fea; between which ridges are deep valleys, terminating at mountains or hills that run acrofs, and are higher than the former. Thofe that run toward the fea, are marked by impreffions on their fides, which make them appear as a fucceffion of conic hills, with their tops very rugged. The higher ones that run acrofs, are more uniform in their appearance. After walking about three miles, I found no alteration in the appearance of the lower hills; which produce great quantities of the *euphorbia Canarienfis*. I met with nothing elfe growing there, but two or three fmall fhrubs, and a few fig-trees near the bottom of the valley. Moft of the laborious work in this ifland is performed by mules; horfes being to appearance fcarce, and chiefly referved for the ufe of the officers. They are of a fmall fize, but well fhaped and fpirited. Oxen are alfo employed to drag their cafks along, upon a large clumfy piece of wood. In my walks and excurfions I faw fome hawks, parrots, which are natives of the ifland, the fea fwallow or tern, fea gulls, partridges, wagtails, fwallows, martins, blackbirds, and Canary birds in large flocks. There are alfo lizards of the common, and another fort; fome infects, as locufts; and three or four forts of dragon-flies." Mr. Anderfon was informed that a fhrub is common here, agreeing exactly with the defcription given by Tournefort and Linnæus of the tea-fhrub, as growing in China and Japan. Another botanical curiofity, mentioned by him, is what they call the impregnated lemon. It is a perfect and diftinct lemon, inclofed within another, differing from the outer one only in being a little more globular. The leaves of the tree that produces this fort, are much longer than thofe of the common one; and it was reprefented to me as being crooked, and not equal in beauty. They reckon that 40,000 pipes of wine are annually made, the greateft part of which is either confumed in the ifland, or made into brandy, and fent to the Spanifh Weft-Indies and North America. The corn they raife is, in general, infufficient to maintain the inhabitants; but the deficiency ufed to be fupplied by importation from the North Americans, who took their wines in return. They make a little filk; but, unlefs we reckon the filtering-ftones, brought in great numbers from Grand Canary, the wine is the only confiderable article of the foreign commerce of Teneriffe. None of the race of inhabitants found here when the Spaniards difcovered the Canaries now remain a diftinct people, having intermarried with the Spanifh fettlers; but their defcendants are known, from their being remarkably tall, large-boned, and ftrong. The men are in general of a tawny colour, and the woman have a pale complexion, entirely deftitute of that bloom which diftinguifhes our northern beauties. The Spanifh cuftom of wearing black clothes continues amongft them; but the men feem more indifferent about this, and in fome meafure drefs like the French. Long. of the Peak 17. W. Greenwich. Lat. 28. 18. N.

TENESMUS, in medicine, a name given by medical writers to a complaint which is a continual defire of going to ftool, but without any ftool being ready to be voided. This is properly no primary difeafe, but merely a fymptomatic one, and differs in degree according to the difeafe on which it is an attendant. It is eafily relieved by laxatives or opiate clyfters.

TENIERS (David), the Elder, a Flemifh painter, born at Antwerp in 1582. He received the firft rudiments of his art from the famous Rubens, who highly efteemed him for his promifing genius, and with great fatisfaction examined and commended his defigns. From the fchool of that celebrated painter Teniers went to finifh his ftudies at Rome. He attached himfelf to Adam Elfheimer for fix years; and from the inftructions of two fuch incomparable mafters, he formed to himfelf a peculiar ftyle, which his fon cultivated fo happily afterward as to bring it to the utmoft perfection. His pictures were fmall; and his fubjects ufually fhops, elaboratories, humorous converfations, and rural feftivities. The demand for his pieces was univerfal; and even his mafter Rubens thought them an ornament to his cabinet. He died at Antwerp in 1649.

Teniers (David) the Younger, alfo an admirable painter, was the fon of the former, and was born at Antwerp in 1610. He obtained the name of *Ape of Painting*, from his imitating the manner of different painters with fuch exactnefs as to deceive even the niceft judges. He improved greatly under his father, and obtained fuch reputation as introduced him to the favour of the great. The Archduke Leopold William made him gentleman of his bedchamber; and all the pictures of his gallery were copied by Teniers, and engraved by his direction. The King of Spain and Don Juan of Auftria fet fo high a value on his pictures, that they built a gallery on purpofe for them. William prince of Orange, honoured him with his friendfhip: and Rubens not only efteemed his works, but affifted him with his advice. His principal talent lay in landfcapes adorned with fmall figures. He alfo painted men drinking and fmoking, chymifts' elaboratories, country fairs, and the like. His fmall figures are fuperior to his large ones. He died in 1694.

The works of the father and fon are thus diftinguifhed: the latter difcover a finer touch and frefher pencil, greater variety of attitudes, and a better difpofition of the figures. The father retained fomething of the tone of Italy in his colouring, which was ftronger than the fon's; befides, the fon ufed to put at the bottom of his pictures, David Teniers, junior.

Abraham Teniers, another fon of David the Elder, was equal, if not fuperior, to his father and brother in the expreffion of his characters, and his underftanding the *claro obfcuro*; though he was inferior in the fprightlinefs of his touch, and the lightnefs of his pencil.

TENISON (Dr. Thomas), Archbifhop of Canterbury, was born at Cottenham in Cambridgefhire in 1636: and ftudied at Corpus Chrifti College in Cambridge. In his

youth, while the fanatical government lasted, he applied himself to physic; but afterward went into orders and was some time minister of St. Andrew's church, Cambridge; where he attended the sick during the plague in 1665, which his parishioners acknowledged by the present of a piece of plate. He showed himself very active against the growth of Popery by his writings both in King Charles and King James's reigns: in 1680 he was presented to the vicarage of St. Martin's-in-the-Fields, London, to which parish he made several donations; and among others, endowed a free-school, and built a handsome library, which he furnished with useful books King William and Queen Mary, in 1689 presented him to the archdeaconry of London; in 1691 he was nominated to the see of Lincoln, and in 1694 he succeeded Dr. Tillotson as archbishop of Canterbury. He performed all the duties of a good primate for 20 years, and died in 1715.

TENNIS, a play at which a ball is driven by a racket.

As many persons would become players at tennis, provided they could easily understand the rudiments of the game, so as to form some judgment of the players, or at least to know who wins and who loses, we have here attempted to give so plain a description of it, that no one can be at a loss, if ever he should bett or play. As to the executive part, it requires great practice to make a good player, so that nothing can be done without it; all we presume to do is to give an insight into the game, whereby a person may not seem a total stranger to it when he happens to be in a tennis-court.

The game of tennis is played in most capital cities in Europe, particularly in France, from whence we may venture to derive its origin. It is esteemed with many to be one of the most ancient games in Christendom, and long before King Charles I.'s time it was played in England.

This game is as intricate as any game whatever; a person who is totally ignorant of it may look on for a month together, without being able to make out how the game is decided. Therefore we shall begin by describing the court in which it is played.

The size of a tennis-court is generally about 96 or 97 feet by 33 or 34, there being no exact dimension ascribed to its proportion, a foot more or less in length or width being of no consequence. A line or net hangs exactly across the middle, over which the ball must be struck, either with a racket or board to make the stroke good. Upon the entrance of a tennis-court, there is a long gallery which goes to the dedans, that is, a kind of front gallery, where spectators usually stand, into which, whenever a ball is struck, it tells for a certain stroke. This long gallery is divided into different compartments or galleries, each of which has its particular name as follows; from the line towards the dedans are the *first gallery, door, second gallery*, and the *last gallery*, which is called the *service side*. From the dedans to the last gallery are the figures 1, 2, 3, 4, 5, 6, at a yard distance each, by which the chaces are marked, and is one of the most essential parts of the game, as will appear in the following description.

On the other side of the line are also the *first gallery, door, second gallery*, and *last gallery*; which is called the *hazard-side*. Every ball struck into the last gallery on this side reckons for a certain stroke the same as the dedans. Between the second and this last gallery are the figures 1, 2, to mark the chaces on the hazard side. Over this long gallery, or these compartments, is a covering, called the pent-house, on which they play the ball from the service-side, in order to begin a set of tennis, from which it is called a *service*. When they miss putting the ball (so as to rebound from the pent-house) over a certain line on the service-side, it is deemed a fault, two of which are reckoned for a stroke. If the ball rolls round the pent-house, on the opposite side of the court, so as to fall beyond a certain line described for that purpose, it is called *passe*, reckons for nothing on either side, and the player must serve again.

On the right-hand side of the court from the dedans is what they call the *tambour*, a part of the wall which projects, and is so contrived in order to make a variety in the stroke, and render it more difficult to be returned by the adversary; for when a ball strikes the *tambour*, it varies its direction, and requires some extraordinary judgment to return it over the line. The last thing on the right-hand side is called the *grill*, wherein if the ball is struck, it is also 15, or a certain stroke.

The game of tennis is played by what they call *sets*; a set of tennis consists of six games: but if they play what is called an advantage-set, two above five games must be won on one side or the other successively, in order to decide; or, if it comes to six games all, two games must still be won on one side to conclude the set; so that an advantage-set may last a considerable time; for which kind of sets the court is paid more than for any other.

We must now describe the use of the chaces, and by what means these chaces decide or interfere so much in the game. When the player gives his service at the beginning of a set, his adversary is supposed to return the ball; and wherever it falls after the first rebound untouched, the chace is called accordingly; for example, if the ball falls at the figure 1, the chace is called at a yard, that is to say, at a yard from the dedans: this chace remains till a second service is given; and if the player on the service side lets the ball go after his adversary returns it, and if the ball falls on or between any of these figures or chaces, they must change sides, there being two chaces; and he who then will be on the hazard side, must play to win the first chace; which if he wins by striking the ball so as to fall, after its first rebound, nearer to the dedans than the figure 1, without his adversary's being able to return it from its first hop, he wins a stroke, and then proceeds in like manner to win the second chace, wherever it should happen to be. If a ball falls on the line with the first gallery door, second gallery, or last gallery, the chace is likewise called at such or such a place, naming the gallery, door, &c. When it is just put over the line, it is called a chace at the line. If the player on the service-side returns a ball with such force as to strike the wall on the hazard-side so as to rebound, after the first hop over the line, it is also called a chace at the line.

The chaces on the hazard-side proceed from the ball being returned either too hard or not quite hard enough; so that the ball after its first rebound falls on this side of the blue line, or line which describes the hazard-side chaces; in which case it is a chace at 1, 2, &c. provided there is no chace depending. When they change sides, the player, in order to win this chace, must put the ball over the line any-where, so that his adversary does not return it. When there is no chace on the hazard-side, all balls put over the line from the service-side, without being returned, reckon for a stroke.

As the game depends chiefly upon the marking, it will be necessary to explain it, and to recommend those who play at tennis to have a good and unbiassed marker, for on him the whole set may depend: he can mark in favour of the one and against the other in such a manner, as will render it two to one at starting, though even players. Instead of which the marker should be very attentive to the chaces, and not be anyway partial to either of the players.

This game is marked in a very singular manner, which makes it at first somewhat difficult to understand. The first stroke is called 15, the second 30, the third 40, and the fourth game, unless the players get four strokes each; in that case,

inſtead of calling it 40 all, it is called *deuce;* after which, as ſoon as any ſtroke is got, it is called *advantage;* and in caſe the ſtrokes become equal again, *deuce* again, till one or the other gets two ſtrokes following, which win the game; and as the games are won, ſo they are marked and called; as one game love, two games to one, &c. towards the ſet, of which ſo many of theſe games it conſiſts.

Although but one ball at a time is played with, a number of balls are made uſe of at this game to avoid trouble, and are handed to the players in baſkets for that purpoſe: by which means they can play as long as they pleaſe, without ever having occaſion to ſtoop for a ball.

As to the odds at tennis, they are by no means fixed, but are generally laid as follow:

Upon the firſt ſtroke being won between even players, that is, fifteen love, the odds are of the ſingle game	7	to	4
Thirty love	4		1
Forty love	8		1
Thirty fifteen	2		1
Forty fifteen	5		1
Forty thirty	3		1
The odds of a four game ſet when the firſt game is won, are	7		4
When two games love	4		1
Three games love	8		1
When two games to one	2		1
Three games to one	5		1
The odds of a ſix game ſet when the firſt game is won, are	3		2
When two games love	2		1
Three games love	4		1
Four games love	10		1
Five games love	21		1
When two games to one	8		5
Three games to one	5		2
Four games to one	5		1
Five games to one	15		1
When three games to two	7		4
Four games to two	4		1
Five games to two	10		1
When four games to three	2		1
Five games to three	5		1
The odds of an advantage ſet when the firſt game is won, are	5		4
When two games love	7		4
Three games love	3		1
Four games love	5		1
Five games love	15		1
When two games to one	4		3
Three games to one	2		1
Four games to one	7		2
Five games to one	10		1
When three games to two	3		2
Four games to two	3		1
Five games to two	8		1
When four games to three	8		5
Five games to three	3		1
When five games to four	2		1
When ſix games to five	5		2

The foregoing odds, as beforeſaid, are generally laid, but the chaces interfering makes the odds very precarious: for example, when there is a chace at half a yard, and a ſet is five games all, and in every other reſpect equal, the odds are a good five to four; and if it were ſix games to five, and forty thirty with the ſame chace, the odds then would be a guinea to a ſhilling; ſo that it is plain that the odds at this game differ from thoſe of any other: for one ſtroke will reduce a ſet, ſuppoſing the players to be five games all, from an even wager to three to two, and ſo on in proportion to the ſtage of the ſet.

There are various methods of giving odds at tennis, in order to make a match equal; and that they may be underſtood, we ſhall give the following liſt of them, with their meanings, ſo that any perſon may form a judgment of the advantage received or given.

The loweſt odds that can be given, excepting the choice of the ſides, is what they call a *biſque*, that is, a ſtroke to be taken or ſcored whenever the player, who receives the advantage, thinks proper: for inſtance, ſuppoſe a critical game of the ſet to be forty thirty, by taking the *biſque*, he who is forty becomes game, and ſo in reſpect of two *biſques*, &c.

The next greater odds are *fifteen*, that is, a certain ſtroke given at the beginning of each game.

After theſe, *half thirty*, that is, fifteen one game, and thirty the next. Then follow the whole *thirty*, *forty*, &c.

There are alſo the following kind of odds which are given, viz.

Round ſervices; thoſe are ſervices given round the penthouſe, ſo as to render it eaſy for the *ſtriker-out* (the player who is on the hazard-ſide) to return the ball.

Half-court, that is, being obliged or confined to play into the adverſary's half-court; ſometimes it is played ſtraightwiſe, and at other times acroſs; both which are great advantages given by him ſo confined, but the ſtraight half-court is the greateſt.

Touch-no-wall, that is, being obliged to play within the compaſs of the walls, or ſides of the court. This is a conſiderable advantage to him who receives it; as all the balls muſt be played gently, and conſequently they are much eaſier to take than thoſe which are played hard, or according to the uſual method of play.

Barring the hazards, that is, barring the dedans, tambour, grill, or the laſt gallery on the hazard-ſide, or any particular one or more of them.

Theſe are the common kind of odds or advantages given; but there are many others, which are according to what is agreed by the players: ſuch as playing with *board* againſt *racket*, *cricket bat* againſt *racket*, &c.

The game of tennis is alſo played by four perſons, two partners on each ſide. In this caſe, they are generally confined to their particular quarters, and one of each ſide appointed to ſerve and ſtrike out; in every other reſpect, the game is played in the ſame manner as when two only play.

Any thing more to be ſaid upon this ſubject would be needleſs, as nothing can be recommended, after reading this ſhort account of tennis, but practice and attention, without which no one can become a proficient at the game.

TENOR, or TENOUR, the purport or content of a writing or inſtrument in law, &c.

TENOR, in muſic, the firſt mean, or middle part, or that which is the ordinary pitch of the voice, when neither raiſed to a treble nor lowered to a baſs.

TENSE, in grammar, an inflection of verbs, whereby they are made to ſignify or diſtinguiſh the circumſtance of time in what they affirm. See GRAMMAR.

TENT, in war, a pavilion or portable houſe. Tents are made of canvas, for officers and ſoldiers to lie under when in the field. The ſize of the officers' tents is not fixed; ſome regiments have them of one ſize and ſome of another: a captain's tent and marquee is generally $10\frac{1}{2}$ feet broad, 14 deep, and 8 high: the ſubalterns' are a foot leſs; the major's and lieutenants-colonel's a foot larger; and the colonel's two feet larger. The ſubalterns of foot lie two in a tent, and thoſe of horſe but one. The tents of private men are $6\frac{1}{2}$ feet ſquare, and

5 feet high, and hold 5 foldiers each. The tents for horfe are 7 feet broad and 9 feet deep: they hold likewife five men and their horfe accoutrements.—The word is formed from the Latin *tentorium*, of *tendo* "I ftretch," becaufe tents are ufually made of canvas ftretched out, and fuftained by poles, with cords and pegs.

Tent, in furgery, a roll of lint made into the fhape of a nail with a broad flat head, occafionally proper in deep wounds and ulcers, to prevent the lips of the wound from uniting before it is healed from the bottom.

TENTER, Trier, or *Prover*, a machine ufed in the cloth manufactory, to ftretch out the pieces of cloth, ftuff, &c. or only to make them even and fet them fquare. It is ufually about $4\frac{1}{2}$ feet high, and for length exceeds that of the longeft piece of cloth. It confifts of feveral long fquare pieces of wood, placed like thofe which form the barriers of a manege; fo, however, as that the lower crofs pieces of wood may be raifed or lowered as is found requifite, to be fixed at any height by means of pins. Along the crofs pieces, both the upper and under one, are hooked nails, called *tenter-hooks*, driven in from fpace to fpace.

To put a piece of Cloth on the Tenter. While the piece is yet quite wet, one end is faftened to one of the ends of the tenter; then it is pulled by force of arms towards the other end, to bring it to the length required: that other end being faftened, the upper lift is hooked on to the upper crofs-piece, and the loweft lift to the loweft crofs-piece, which is afterwards lowered by force, till the piece have its defired breadth. Being thus well ftretched, both as to length and breadth, they brufh it with a ftiff hair brufh, and thus let it dry. Then they take it off; and, till they wet it again, it will retain the length and breadth the tenter gave it.

TENTHREDO, the saw-fly; a genus of infects belonging to the order of *hymenoptera*. The mouth is furnifhed with jaws, which are horny, arched, dentated within; the right jaw being obtufe at the apex: the lip cylindrical, trifid: there are four feelers, unequal and filiform: the wings are plain and turned: the fting confifts of two ferrated laminæ, and the fcutellum of two grains placed at a diftance. Gmelin mentions 143 fpecies. Thefe infects are not very fhy. Some, by means of their faw, depofit in the buds of flowers, others on the twigs of trees or fhrubs, eggs from which are produced caterpillars. The implement with which they are armed is nowife formidable; as it appears only deftined to the purpofe of depofiting their eggs.

TENTHS, and first fruits *of Spiritual Preferments*, a branch of the king's revenue. See Revenue. Thefe were originally a part of the Papal ufurpations over the clergy of this kingdom; firft introduced by Pandulph the pope's legate, during the reigns of king John and Henry III. in the fee of Norwich; and afterwards attempted to be made univerfal by the popes Clement V. and John XXII. about the beginning of the 14th century. The firft fruits, *primitiæ* or *annates*, were the firft year's whole profits of the fpiritual preferment, according to a rate or *valor* made under the direction of pope Innocent IV. by Walter, bifhop of Norwich, in 38 Hen. III. and afterwards advanced in value by commiffion from pope Nicholas III. A.D. 1292, 20 Edw. I.; which valuation of pope Nicholas is ftill preferved in the exchequer. The tenths, or *decimæ*, were the tenth part of the annual profit of each living by the fame valuation; which was alfo claimed by the holy fee, under no better pretence than a ftrange mifapplication of that precept of the Levitical law, which directs, that the Levites "fhould offer the tenth part of their tithes as a heave-offering to the Lord, and give it to Aaron the high-prieft. But this claim of the pope met with vigorous refiftance from the Englifh parliament; and a variety of acts were paffed to prevent and reftrain it, particularly the ftatute 6 Hen. IV. c. 1. which calls it a *horrible mifchief and damnable cuftom*. But the Popifh clergy, blindly devoted to the will of a foreign mafter, ftill kept it on foot; fometimes more fecretly, fometimes more openly and avowedly: fo that in the reign of Henry VIII. it was computed, that in the compafs of 50 years 800,000 ducats had been fent to Rome for firft fruits only. And as the clergy expreffed this willingnefs to contribute fo much of their income to the head of the church, it was thought proper (when in the fame reign the papal power was abolifhed, and the king was declared the head of the church of England) to annex this revenue to the crown; which was done by ftatute 26 Hen. VIII. c. 3. (confirmed by ftatute 1 Eliz. c. 4.); and a new *valor beneficiorum* was then made, by which the clergy are at prefent rated.

By thefe laft mentioned ftatutes all vicarages under ten pounds a-year, and all rectories under ten marks, are difcharged from the payment of firft fruits: and if, in fuch livings as continue chargeable with this payment, the incumbent lives but half a year, he fhall pay only one quarter of his firft fruits; if but one whole year, then half of them; if a year and a half, three quarters; and if two years, then the whole, and not otherwife. Likewife by the ftatute 27 Hen. VIII. c. 8. no tenths are to be paid for the firft year, for then the firft fruits are due: and by other ftatutes of queen Anne, in the fifth and fixth years of her reign, if a benefice be under 50l. *per annum* clear yearly value, it fhall be difcharged of the payment of firft fruits and tenths.

Thus the richer clergy being, by the criminal bigotry of their Popifh predeceffors, fubjected at firft to a foreign exaction, were afterwards, when that yoke was fhaken off, liable to a like mifapplication of their revenues through the rapacious difpofition of the then reigning monarch; till at length the piety of queen Anne reftored to the church what had been thus indirectly taken from it. This fhe did, not by remitting the tenths and firft fruits entirely; but, in a fpirit of the trueft equity, by applying thefe fuperfluities of the larger benefices to make up the deficiences of the fmaller. And to this end fhe granted her royal charter, which was confirmed by the ftatute 2 Ann. c. 11. whereby all the revenue of firft fruits and tenths is vefted in truftees for ever, to form a perpetual fund for the augmentation of poor livings. This is ufually called *Queen Anne's bounty*; which has been ftill farther regulated by fubfequent ftatutes.

TENURE, in law, fignifies the manner whereby lands or tenements are held, or the fervice that the tenant owes to his lord. Of this kingdom almoft all the real property is by the policy of our laws fuppofed to be granted by, dependent upon, and holden of, fome fuperior lord, by and in confideration of certain fervices to be rendered to the lord by the tenant or poffeffor of this property. The thing holden is therefore ftyled a *tenement*, the poffeffors thereof *tenants*, and the manner of their poffeffion a *tenure*. Thus all the lands in the kingdom is fuppofed to be holden, mediately or immediately, of the king; who is ftyled the *lord paramount*, or above all. Such tenants as held under the king immediately, when they granted out portions of the lands to inferior perfons, became alfo lords with refpect to thofe inferior perfons, as they were ftill tenants with refpect to the king; and, thus partaking of a middle nature, were called *mefne* or *middle lords*. So that if the king granted a manor to A, and he granted a portion of the land to B, now B was faid to hold of A, and A of the king; or, in other words, B held his lands immediately of A, but mediately of the king. The king therefore was ftyled *lord paramount*: A was both tenant and lord, or was a mefne lord; and B was called *tenant paravail*, or the *loweft tenant*, being he who was fuppofed to make avail, or profit of the land. In

this manner are all the lands of the kingdom holden which are in the hands of ſubjects: for, according to Sir Edward Coke, in the law of England we have not properly *allodium*, which is the name by which the feudiſts abroad diſtinguiſh ſuch eſtates of the ſubject as are not holden of any ſuperior. So that at the firſt glance we may obſerve, that our lands are either plainly feuds, or partake very ſtrongly of the feodal nature.

All tenures being thus derived, or ſuppoſed to be derived, from the king, thoſe that held immediately under him, in right of his crown and dignity, were called his *tenants in capite*, or *in chief*; which was the moſt honourable ſpecies of tenure, but at the ſame time ſubjected the tenants to greater and more burthenſome ſervices than inferior tenures did. And this diſtinction ran through all the different ſorts of tenure.

There ſeem to have ſubſiſted among our anceſtors four principal ſpecies of lay tenures, to which all other may be reduced: the grand criteria of which were the natures of the ſeveral ſervices or renders that were due to the lords from their tenants. The ſervices, in reſpect of their quality, were either *free* or *baſe* ſervices: in reſpect of their quantity and the time of exacting them were either *certain* or *uncertain*. Free ſervices were ſuch as were not unbecoming the character of a ſoldier or a freeman to perform; as to ſerve under his lord in the wars, to pay a ſum of money, and the like. Baſe ſervices were ſuch as were fit only for peaſants or perſons of a ſervile rank; as to plough the lord's land, to make his hedges, to carry out his dung, or other mean employments. The certain ſervices, whether free or baſe, were ſuch as were ſtinted in quantity, and could not be exceeded on any pretence; as, to pay a ſtated annual rent, or to plough ſuch a field for three days. The uncertain depended upon unknown contingencies; as, to do military ſervice in perſon, or pay an aſſeſſment in lieu of it when called upon; or to wind a horn upon the appearance of invaders; which are free ſervices; or to do whatever the lord ſhould command; which is a baſe or villein ſervice.

From the various combinations of theſe ſervices have ariſen the four kinds of lay-tenure which ſubſiſted in England till the middle of the laſt century; and three of which ſubſiſt to this day. Of theſe Bracton (who wrote under Henry the Third) ſeems to give the cleareſt and moſt compendious account of any author ancient or modern; of which the following is the outline or abſtract: "Tenements are of two kinds, *frank-tenement*, and *villenage*. And of frank-tenements, ſome are held freely in conſideration of homage and knight-ſervice; others in free-ſocage, with the ſervice of fealty only. And again, of villenages, ſome are *pure*, and others *privileged*. He that holds in pure villenage ſhall do whatſoever is commanded him, and always be bound to an uncertain ſervice. The other kind of villenage is called *villein ſocage*; and theſe villein-ſocmen do villein ſervices, but ſuch as are certain and determined." Of which the ſenſe ſeems to be as follows; firſt, where the ſervice was free, but uncertain, as military ſervice with homage, that tenure was called the *tenure in chivalry*, *per ſervitium militare*, or by knight ſervice. Secondly, where the ſervice was not only free, but alſo certain, as by fealty only, by rent and fealty, &c. that tenure was called *liberum ſocagium*, or *free ſocage*. Theſe were the only free holdings or tenements; the others were villenous or ſervile: as, thirdly, where the ſervice was baſe in its nature, and uncertain as to time and quantity, the tenure was *purum villenagium*, abſolute or pure villenage. Laſtly, where the ſervice was baſe in its nature, but reduced to a certainty, this was ſtill villenage, but diſtinguiſhed from the other by the name of *privileged villenage*, *villenagium privilegiatum*; or it might be ſtill called *ſocage* (from the certainty of its ſervices), but degraded by their baſeneſs into the inferior title of *villanum ſocagium*, villein-ſocage.

1. The military tenure, or that by knight-ſervice, was done away by ſtat. 12 Car. II. For an account of this ſpecies of tenure ſee FEODAL *Syſtem*, and KNIGHT-*Service*; and for its incidents, ſee RELIEF, PRIMER-SEISIN, WARDSHIP, MARRIAGE, FINES, and ESCHEAT.

2. The ſecond ſpecies of tenure or free-ſocage, not only ſubſiſts to this day, but has in a manner abſorbed and ſwallowed up (ſince the ſtatute of Charles the Second) almoſt every other ſpecies of tenure. See SOCAGE.

The other grand diviſion of tenure, mentioned by Bracton, is that of villenage, as contradiſtinguiſhed from *liberum tenementum*, or frank-tenure. And this (we may remember) he ſubdivides into two claſſes, pure and privileged villenage: from whence have ariſen two other ſpecies of our modern tenures.

3. From the tenure of pure villenage have ſprung our preſent copyhold tenures, or tenure by copy of court-roll at the will of the lord; in order to obtain a clear idea of which, it will be previouſly neceſſary to conſult the articles MANOR and VILLENAGE.

As a farther conſequence of what has been there explained, we may collect theſe two main principles, which are held to be the ſupporters of a copyhold tenure, and without which it cannot exiſt; 1. That the lands be parcel of and ſituate within that manor under which it is held. 2. That they have been demiſed, or demiſable, by copy of court-roll immemorially. For immemorial cuſtom is the life of all tenures by copy; ſo that no new copyhold can, ſtrictly ſpeaking, be granted at this day.

In ſome manors, where the cuſtom hath been to permit the heir to ſucceed the anceſtor in his tenure, the eſtates are ſtyled *copyholds of inheritance*; in others, where the lords have been more vigilant to maintain their rights, they remain copyholds for life only; for the cuſtom of the manor has in both caſes ſo far ſuperſeded the will of the lord, that, provided the ſervices be performed or ſtipulated for by fealty, he cannot in the firſt inſtance refuſe to admit the heir of his tenant upon his death; nor, in the ſecond, can he remove his preſent tenant ſo long as he lives, though he holds nominally by the precarious tenure of his lord's will.

The fruits and appendages of a copyhold tenure, that it hath in common with free tenures, are fealty, ſervices (as well in rents as otherwiſe), reliefs, and eſcheats. The two latter belong only to copyholds of inheritance; the former to thoſe for life alſo. But, beſides theſe, copyholds have alſo heriots, wardſhip, and fines. Heriots, which are agreed to be a Daniſh cuſtom, are a render of the beſt beaſt or other good (as the cuſtom may be) to the lord on the death of the tenant. This is plainly a relic of villein tenure; there being originally leſs hardſhip in it, when all the goods and chattels belonged to the lord, and he might have ſeized them even in the villein's lifetime. Theſe are incident to both ſpecies of copyhold; but wardſhip and fines to thoſe of inheritance only. Wardſhip, in copyhold eſtates, partakes both of that in chivalry and that in ſocage. Like that in chivalry, the lord is the legal guardian, who uſually aſſigns ſome relation of the infant tenant to act in his ſtead: and he, like guardian in ſocage, is accountable to his ward for the profits. Of fines, ſome are in the nature of primer-ſeiſins, due on the death of each tenant, others are mere fines for alienations of the lands; in ſome manors, only one of thoſe ſorts can be demanded, in ſome both, and in others neither. They are ſometimes arbitrary and at the will of the lord, ſometimes fixed by cuſtom; but, even when arbitrary, the courts of law, in favour of the liberty of copyholders, have tied them down to be reaſonable in their extent; otherwiſe they might amount to diſheriſon of the eſtate. No fine therefore is allowed to be taken upon deſcents and alienations

(unlefs in particular circumftances) of more than two years' improved value of the eftate. From this inftance we may judge of the favourable difpofition that the law of England (which is a law of liberty) hath always fhown to this fpecies of tenants, by removing, as far as poffible, every real badge of flavery from them, however fome nominal ones may continue. It fuffered cuftom very early to get the better of the exprefs terms upon which they held their lands; by declaring, that the will of the lord was to be interpreted by the cuftom of the manor; and, where no cuftom has been fuffered to grow up to the prejudice of the lord, as in this cafe of arbitrary fines, the law itfelf interpofes in an equitable method, and will not fuffer the lord to extend his power fo far as to difinherit the tenant.

4. There is yet a fourth fpecies of tenure, defcribed by Bracton, under the name fometimes of *privileged villenage*, and fometimes of *villein-focage*. See *Privileged* VILLENAGE.

Having in the prefent article and thofe referred to, taken a compendious view of the principal and fundamental points of the doctrine of tenures, both ancient and modern, we cannot but remark the mutual connection and dependence that all of them have upon each other. And upon the whole it appears, that, whatever changes and alterations thefe tenures have in procefs of time undergone, from the Saxon æra to the 12 Car. II. all lay-tenures are now in effect reduced to two fpecies; free tenure in common focage, and bafe tenure by copy of court-roll. But there is ftill behind one other fpecies of tenure, referved by the ftatute of Charles II. which is of a fpiritual nature, and called the tenure in FRANK-*Almoign*; fee that article.

A particular account of the ancient tenures would to many perfons be highly amufing. We can only felect a few of the moft fingular, referring the curious reader for more information to Anderfon's Origin of Commerce, Henry's Hiftory of Britain, and Blount's *Fragmenta Antiquitates*.

In the 19th of Henry III. Walter Gately held the manor of Wefcourt, in Bedington in Surrey, yielding yearly to the king one crofs-bow, *baliftam*, value twelve pence.

Anno tertio Edw. I. Otbert de Lonchamp, knight, held his lands of Ovenhelle in Kent, for perfonally guarding the king forty days into Wales at his own expence, with one horfe of five fhillings value, one fack worth fix pence, and one broch for that fack. *N. B.* All perfonal fervices, or attendances on our kings in thofe times, were limited to forty days, at their own expence.

The like the fame year of Laurence de Broke, who for his hamlet of Renham in Middlefex, found the king one foldier, a horfe worth five fhillings, a fack worth five pence, and a broch worth two pence (this broch was a kind of cup, jug, pot, or bafon), for forty days, at his own expence, wherever his army fhall be within the four feas. This was fettled (fays Mr. Blount) at the Stone Crofs, which ftood near the May-pole in the Strand, London, where the judges-itinerant ufed in old times to fit.

Robert Maunfel's tenure of lands in Peverel paid the fame fervice, and the horfe, fack, and broch, of the fame prices. 13*mo* Edw. I. Henry de Averning's tenure of the manor of Morton in Effex, was to find a man, a horfe worth ten fhillings, four horfe-fhoes, a leather fack, and an iron broch. The year following, three perfons held thirty acres of land in Carleton in Norfolk, by the fervice of bringing the king, whenever he fhall be in England, twenty-four pafties of frefh herrings, at their firft coming in. Another held his manor in Norfolk of that king, by annually fupplying him at his exchequer with two veffels, called *mues*, of wine made of pearmains. "Here (fays our author) it is worth obferving, that in King Edward the Firft's time pearmain cyder was called *wine*." This therefore feems to account for the mention of vineyards in old times in Kent, Suffex, and other parts of England, which has fo often puzzled many people to elucidate. Another perfon, in the 21ft of the faid king, held thirty acres of land, valued at ten fhillings yearly in the exchequer, or four pence *per* acre, in Cambridgefhire, for furnifhing a trufs of hay for the king's neceffary-houfe or privy, whenever he fhall come into that county. Another, in the 34th of that king, held a manor in Kent, for providing a man to lead three greyhounds when the king fhall go into Gafcony, fo long as a pair of fhoes of four pence fhould laft.

And that we may not again recur to thefe old tenures, we fhall further add, from the fame author, that in the firft year of King Edward II. Peter Spileman made fine to the king for his lands by ferjeantry, to find one to ferve as a foldier for forty days in England, with a coat of mail; alfo to find ftraw for the king's bed, and hay for his horfe. This article of ftraw for the king's bed we did not fo much wonder at, when we found it in an article in William the Conqueror's time; but it is fomewhat more remarkable fo late as the days of king Edward the Second.

Several others, we find, held their lands of the crown in thofe times by very different tenures. One, by paying two white capons annually; another, by carrying the king's ftandard whenever he happens to be in the county of Suffex; another, by carrying a rod or batoon before the king on certain occafions; another, by ferving the office of chamberlain of the exchequer, a very good place at prefent; another, by building and upholding a bridge; another, by being merechal (*meretricum*), *i. e.* as Mr. Blount tranflates it, of the laundreffes in the king's army; another, by acting as a ferjeant at arms for the king's army whilft in England; one fupplies a fervant for the king's larder; another, for his wardrobe; others, to find fervants for this or that foreft; another, a hawk; one prefents the king a pair of fcarlet hofe annually; others are bound to fupply foldiers with armour for certain days, for the keeping this or that caftle; one, viz. for the manor of Elfton in Nottinghamfhire, pays yearly rent of one pound weight of cummin feed, two pair of gloves, and a fteel needle; another, is to repair the iron work of the king's ploughs; Ela countefs of Warwick, in the 13th year of king Edward I. held the manor of Hokenorton in Oxfordfhire, in the barony of D'Oyly, by the ferjeanty of carving at the king's table on his birth-day, and fhe to have the knife the king then ufes at table.

TEOS, one of the twelve Ionian cities, was fituated on the fouth fide of the Ionian peninfula, and diftinguifhed by being the place where the poet Anacreon and the hiftorian Hecatæus were born.

TERAPHIM, or THERAPHIM, a word in the Hebrew language, which has exercifed much the ingenuity of the critics. It occurs thirteen or fourteen times in the Old Teftament, and is commonly interpreted *idols*. We will not trouble our readers with the numerous conjectures which have been formed refpecting the meaning of this word. The only way to determine it, if it be at all poffible, would be to examine and compare all the paffages in which it occurs, and to confult the ancient tranflations. Conjectures are ufelefs; every man may make a new one, which will have juft as good a title to belief as thofe which have been already propofed.

TERCERY, one of the largeft iflands of the Azores, or Weftern Iflands, lying in the Atlantic Ocean. It is about forty miles in circumference; and furrounded with craggy rocks, which render it almoft inacceffible. The foil is fertile, abounding in corn, wine, and fruits; and they have fuch plenty of cattle, that they fupply the fhips therewith that call

there. However, their principal trade is wood. The inhabitants are lively and well made; and they pretend to a great deal of religion and gallantry at the fame time. They pique themfelves upon points of honour, and are extremely revengeful. It is their cuftom to rove about in the night-time in queft of intrigues, and feldom fail in finding women for their purpofe. It is fubject to Portugal; and Angra is the capital town. W. Long. 27. 1. N. Lat. 28. 45.

TEREBELLA, the PIERCER, in natural hiftory, a genus of infects belonging to the clafs of *vermes*, and order of *mollufca*. The body is filiform, the mouth placed before; the preputium puts forth a pedunculated tubulous gland. There are feveral capillary tentacula about the mouth. There are ten fpecies.

TEREBINTHUS, in botany. See PISTACIA.

TEREDO, in natural hiftory, a genus of *vermes* belonging to the order of *teftacea*. The animal is a terebella; there are two valves, calcareous, hemifpherical, and cut off before, and two lanceolated. The fhell is tapering, bending, and capable of penetrating wood. There are only three fpecies; the *navalis*, *utriculis*, and *clava*.

The *navalis*, or fhip-worm, which has a very flender fmooth cylindrical fhell, inhabits the Indian feas, whence it was imported into Europe. It penetrates eafily into the ftouteft oak-planks, and produces dreadful deftruction to the fhips by the holes it makes in their fides; and it is to avoid the effects of this infect that veffels require fheathing.

The head of this creature is well prepared by nature for the hard offices which it has to undergo, being coated with a ftrong armour, and furnifhed with a mouth like that of the leech; by which it pierces wood as that animal does the fkin; a little above this it has two horns which feem a kind of continuation of the fhell; the neck is as ftrongly provided for the fervice of the creature as the head, being furnifhed with feveral ftrong mufcles; the reft of the body is only covered by a very thin and tranfparent fkin, through which the motion of the inteftines is plainly feen by the naked eye; and by means of the microfcope feveral other very remarkable particulars become vifible there. This creature is wonderfully minute when newly excluded from the egg, but it grows to the length of four or fix inches, and fometimes more.

When the bottom of a veffel, or any piece of wood which is conftantly under water, is inhabited by thefe worms, it is full of fmall holes; but no damage appears till the outer parts are cut away: then their fhelly habitations come into view; in which there is a large fpace for inclofing the animal, and furrounding it with water. There is an evident care in thefe creatures never to injure one another's habitations; by this means each cafe or fhell is preferved entire; and in fuch pieces of wood as have been found eaten by them into a fort of honeycomb, there never is feen a paffage or communication between any two of the fhells, though the woody matter between them often is not thicker than a piece of writing-paper.

They penetrate fome kinds of wood much more eafily than others. They make their way moft quickly into fir and alder, and grow to the greateft fize. In the oak they make fmall progrefs, and appear fmall and feeble, and their fhells much difcoloured.

Since each of thefe animals is lodged in a folitary cell, and has no accefs to thofe of its own fpecies, it has been matter of furprife how they fhould increafe to fo vaft a multitude. Upon diffecting them, it appears that every individual has the parts of both fexes, and is therefore fuppofed to propagate by itfelf.

The fea-worms, which are pernicious to our fhipping, appear to have the fame office allotted them in the waters which the termites have on the land (fee TERMES). They will appear, on a very little confideration, to be moft important beings in the great chain of creation, and pleafing demonftrations of that infinitely wife and gracious Power which formed, and ftill preferves, the whole in fuch wonderful order and beauty: for if it was not for the rapacity of thefe and fuch animals, tropical rivers, and indeed the ocean itfelf, would be choked with the bodies of trees which are annually carried down by the rapid torrents, as many of them would laft for ages, and probably be productive of evils, of which, happily, we cannot in the prefent harmonious ftate of things form any idea; whereas now being confumed by thefe animals, they are more eafily broken in pieces by the waves; and the fragments which are not devoured become fpecifically lighter, and are confequently more readily and more effectually thrown on fhore, where the fun, wind, infects, and various other inftruments, fpeedily promote their entire diffolution.

TERENCE, or PUBLIUS TERENTIUS AFER, a celebrated comic poet of ancient Rome, was born at Carthage in Africa. He was flave to Terentius Lucanus the fenator; who gave him his liberty on account of his wit, his good mien, and great abilities. Terence, on his becoming a freed man, applied himfelf to the writing of comedies; in the execution of which he imitated Menander and the other celebrated comic poets of Greece. Cicero gives him the moft pompous eulogiums, both for the purity of his language and the perfpicuity and beauty of his compofitions, which he confiders as the rule and ftandard of the Latin tongue; and obferves, that they were efteemed fo fine and elegant, that they were thought to have been written by Scipio and Lelius, who were then the greateft perfonages and the moft eloquent of the Roman people. Terence died while on a voyage into Greece, about the 15th year before the Chriftian era. There are fix of his comedies extant, of which the beft editions are the Elzevir one 1635, 12mo; that *cum integris notis Donati, et felectis variorum*, 1686, 8vo; Wefterhovius's, in two vols. 4to. 1726; and that of Bentley the fame year, 4to. Madam Dacier has given a beautiful French verfion of this author; and a very good Englifh tranflation was publifhed in 4to, 1768, by Mr. Colman.

TERM, in law, is generally taken for a limitation of time or eftate; as, a leafe for term of life or years. Term, however, is more particularly ufed for that time wherein our courts of juftice are open; in oppofition to which, the reft of the year is called *vacation*.

TERM, in grammar, denotes fome word or expreffion in a language. The word *term*, *terminus*, is borrowed metaphorically, by the grammarians and philofophers, from the meafurers or furveyors of lands: as a field is defined and diftinguifhed by its *termini*, or limits, fo is a thing or matter fpoken of by the word or term it is denoted by.

TERM *in the Arts*, or TERM *of Art*, is a word which, befides the literal and popular meaning which it has or may have in common language, bears a further and peculiar meaning in fome art or fcience.

TERMS, the feveral times or feafons of the year, wherein the tribunals, or courts of judicature, are open to all who think fit to complain of wrong, or to feek their rights by due courfe of law, or action; and during which the courts in Weftminfter-hall fit and give judgment. But the high court of parliament, the chancery, and inferior courts, do not obferve the terms; only the courts of king's-bench, common-pleas, and exchequer, which are the higheft courts at common law. In contradiftinction to thefe, the reft of the year is called *vacation*.

Of these terms there are four in every year, during which time matters of justice are dispatched. *Hilary-term*, which, at London, begins the 23d day of January, or if that be Sunday, the next day after; and ends the 12th of February following. *Easter-term*, which begins the Wednesday fortnight after Easter-day, and ends the Monday next after Ascension-day. *Trinity-term*, beginning the Friday next after Trinity-Sunday, and ending the Wednesday fortnight after. *Michaelmas-term*, which begins the sixth day of November, and ends the 28th of November following. Each of these terms have also their returns. These terms are supposed by Mr. Seldon to have been instituted by William the Conqueror; but Sir H. Spelman hath shewn, that they were gradually formed from the canonical constitutions of the church; being no other than those leisure seasons of the year which were not occupied by the great festivals or fasts, or which were not liable to the general avocations of rural business. Throughout all Christendom, in very early times, the whole year was one continual term for hearing and deciding causes. For the christian magistrates, in order to distinguish themselves from the heathens, who were very superstitious in the observation of their *dies fasti*, and *ne-fasti*, administered justice upon all days alike; till at length the church interposed, and exempted certain holy seasons from being profaned by the tumult of forensic litigations; as, particularly, the time of Advent and Christmas, which gave rise to the winter vacation; the time of Lent and Easter, which created that in the spring; the time of Pentecost, which produced the third; and the long vacation, between Midsummer and Michaelmas, which was allowed for the hay-time and harvest. All Sundays also, and some peculiar festivals, as the days of the purification, ascension, &c. were included in the same prohibition, which was established by a canon of the church, A.D. 517, and fortified by an imperial constitution of the younger Theodosius, comprized in the Theodosian code. Afterwards, when our own legal constitution was established, the commencement and duration of our law terms were appointed, with a view to these canonical prohibitions; and it was ordered by the laws of King Edward the Confessor, that from Advent to the octave of the Epiphany, from Septuagesima to the octave of Easter, from the Ascension to the octave of Pentecost, and from three in the afternoon of all Saturdays till Monday morning, the peace of God and holy church shall be kept throughout the whole kingdom.

And so extravagant was afterwards the regard paid to these holy times, that though the author of the Mirror mentions only one vacation of considerable length, containing the months of August and September, yet Britton says, that in the reign of King Edward I. no secular plea could be held, nor any man sworn on the Evangelists, in the time of Advent, Lent, Pentecost, harvest, and vintage, the days of the great litanies, and all solemn festivals. He adds, that the bishops and prelates granted dispensations for taking assizes and juries in some of these holy seasons, upon reasonable occasions; and soon after a general dispensation was established in parliament by stat. Westm. 1. 3 Edw. I. cap. 51. that assizes of novel disseisin, *mort d'ancestor*, and darrein presentment, should be taken in Advent, Septuagesima, and Lent, as well as inquests; at the special request of the king to the bishops. The portions of time that were not included within these prohibited seasons fell naturally into a fourfold division; and from some festival, or saint's day, that immediately preceded their commencement, were denominated the terms of *St. Hilary*, of *Easter*, of the *Holy Trinity*, and of *St. Michael:* which terms have been since regulated and abbreviated by several acts of parliament; particularly Trinity-term by stat. 32 Hen. VIII. cap. 2. and Michaelmas-term by stat. 16 Car. I. cap. 6. and again by stat. 24 Geo. II. cap. 48.

TERMS, *Oxford*. Hilary or Lent-term begins January 14th, and ends the Saturday before Palm-Sunday. Easter-term begins the tenth day after Easter, and ends the Thursday before Whitsunday. Trinity-term begins the Wednesday after Trinity-Sunday, and ends after the act, or 6th of July, sooner or later, as the vice-chancellor and convocation please. Michaelmas-term begins October the 10th, and ends December the 17th.

TERMS, *Cambridge*. Lent-term begins January the 14th, and ends Friday before Palm-Sunday. Easter-term begins the Wednesday after Easter-week, and ends the week before Whitsunday. Trinity-term begins the Wednesday after Trinity-Sunday, and ends the Friday after the commencement, or 2d of July. Michaelmas-term begins October the 10th, and ends December the 16th.

TERMS, *Scottish*. The court of session has two terms, the winter and summer. The winter begins on 12th November, and ends 11th March, only there is a recess of three weeks at Christmas. The summer-term commences 12th May, and ends 11th July. The court of exchequer has four terms: 1. Candlemas-term begins 15th January, and ends 3d February; 2. Whitsuntide-term begins 12th May, and ends 2d June; 3. Lammas-term begins 17th June, and ends 5th July; 4. Martinmas-term begins 24th November, and ends 20th December.

TERMS, *Irish*. In Ireland the terms are the same as at London, except Michaelmas-term, which begins October the 13th, and adjourns to November the 3d, and thence to the 6th.

TERMES, in entomology; a genus of insects belonging to the order of *aptera*, according to Linnæus, but by others it is arranged more properly under the *neuroptera*. The mouth has two horny jaws; the lip is horny and quadrifid, the laciniæ being linear and acute: there are four feelers, which are equal and filiform. The antennæ are moniliform in most species, and the eyes two. There are eight species, according to Gmelin; the *fatale, destructor, arda, mordax, capense, fatidicum pulsatorium*, and *divinatorium*. But as Gmelin has followed the classification of Linnæus in arranging the termes under the order of aptera, it is not improbable that several of these which are mentioned as species of the termes may belong to a different genus. It will be sufficient, in the present article, to describe the fatale, which we are enabled to do from very accurate information.

The *termes fatale, bellicosus*, or white ant, is of a yellow colour above; the wings also yellowish; the costa is ferruginous; the stemmata are near the eyes, the central point being somewhat prominent. Of the white ant we have a very curious and interesting description, in the Philosophical Transactions for 1781, by Mr. Henry Smeathman of Clement's Inn. According to this account, the works of these insects surpass those of the bees, wasps, beavers, and other animals, as much at least as those of the most polished European nations excel those of the least cultivated savages. And even with regard to man, his greatest works, the boasted pyramids, fall comparatively far short, even in size alone, of the structures raised by these insects. The labourers among them employed in this service are not a quarter of an inch in length; but the structures which they erect rise to ten or twelve feet and upwards above the surface of the earth. Supposing the height of a man to be six feet, the author calculates, that the buildings of these insects may be considered, relatively to their size, and that of a man, as being raised to near five times the height of the greatest of the Egyptian pyramids; that is, corresponding with considerably more than half a mile. We may add, that, with re-

ſpect to the interior conſtruction, and the various members and diſpoſitions of the parts of the building, they appear greatly to exceed that or any other work of human conſtruction.

The moſt ſtriking parts of theſe ſtructures are, the royal apartments, the nurſeries, magazines of proviſions, arched chambers and galleries, with their various communications; the ranges of Gothic-ſhaped arches, projected, and not formed by mere excavation, ſome of which are two or three feet high, but which diminiſh rapidly, like the arches of ailes in perſpectives; the various roads, ſloping ſtaircaſes, and bridges, conſiſting of one vaſt arch, and conſtructed to ſhorten the diſtance between the ſeveral parts of the building, which would otherwiſe communicate only by winding paſſages. In ſome parts near Senegal, their number, magnitude, and cloſeneſs of ſituation, make them appear like the villages of the natives. But theſe and many other curious inſtances of the great ſagacity and powers of theſe inſects cannot be underſtood, without viewing the plates in which their feeble frames, and comparatively ſtupendous works, are delineated. See Phil. Tranſ. above referred to.

The economy of theſe induſtrious inſects appears to have been very attentively obſerved by the ingenious author, as well as their buildings. There are three diſtinct ranks or orders among them, conſtituting a well-regulated community. Theſe are firſt, the *labourers*, or working inſects; next the *ſoldiers*, or fighting order, who do no kind of labour, and are about twice as long as the former, and equal in bulk to about fifteen of them; and laſtly, the winged or perfect inſects, which may be called the *nobility* or *gentry* of the ſtate; for they neither labour nor fight, being ſcarcely capable even of ſelf-defence. "Theſe only are capable of being elected *kings* or *queens*; and nature has ſo ordered it, that they emigrate within a few weeks after they are elevated to this ſtate, and either eſtabliſh new kingdoms, or periſh within a day or two."

The firſt order, the working inſects, are moſt numerous, being in the proportion of 100 to one of the ſoldiers. In this ſtate they are about a quarter of an inch long, and twenty-five of them weigh about a grain, ſo that they are not ſo large as ſome of our ants. See Plate 30. fig. 1. and 2.

The ſecond order, or ſoldiers, have a very different form from the labourers, and have been by ſome authors ſuppoſed to be the males, and the former neuters; but they are, in fact, the ſame inſects as the foregoing, only they have undergone a change of form, and approached one degree nearer to the perfect ſtate. They are now much larger, being half an inch long, and equal in bulk to fifteen of the labourers (fig. 3. and 4).

The third order, or the inſect in its perfect ſtate, varies its form ſtill more than ever. The head, thorax, and abdomen, differ almoſt entirely from the ſame parts in the labourers and ſoldiers; and, beſides this, the animal is now furniſhed with four fine large browniſh, tranſparent, wings, with which it is at the time of emigration to wing its way in ſearch of a new ſettlement. It differs ſo much from the other two, that they have not hitherto been ſuppoſed to belong to the ſame community. In fact, they are not to be diſcovered in the neſt till juſt before the commencement of the rainy ſeaſon; when they undergo the laſt change, which is preparative to the formation of new colonies. They are equal in bulk to two ſoldiers and about thirty labourers (ſee fig. 5.), and by means of the wings with which they are furniſhed they roam about for a few hours; at the end of which time they loſe their wings, and become the prey of innumerable birds, reptiles, and inſects; while probably not a pair out of many millions of this unhappy race get into a place of ſafety, fulfil the firſt law of nature, and lay the foundation of a new community. In this ſtate many fall into the neighbouring waters, and are eaten with avidity by the Africans. The author found them delicate, nouriſhing, and wholeſome, without ſauce or other help from cookery than merely roaſting them in the manner of coffee.

The few fortunate pairs who happen to ſurvive this annual maſſacre and deſtruction, are repreſented by the author as being caſually found by ſome of the labourers, that are continually running about on the ſurface of the ground, and are elected kings and queens of new ſtates. Thoſe who are not ſo elected and preſerved certainly periſh, and moſt probably in the courſe of the following day. By theſe induſtrious creatures the king and queen elect are immediately protected from their innumerable enemies, by incloſing them in a chamber of clay; where the buſineſs of propagation ſoon commences. Their "voluntary ſubjects" then buſy themſelves in conſtructing wooden nurſeries, or apartments entirely compoſed of wooden materials, ſeemingly joined together with gums. Into theſe they afterwards carry the eggs produced from the queen, lodging them there as faſt as they can obtain them from her. The author even furniſhes us with plauſible reaſons to believe, that they here form a kind of garden for the cultivation of a ſpecies of microſcopical muſhroom; which Mr. Konig (in an Eſſay on the Eaſt-Indian Termites, read before the Society of Naturaliſts of Berlin) conjectures to be the food of the young inſects. But perhaps the moſt wonderful, and at the ſame time beſt authenticated, part of the hiſtory of theſe ſingular inſects, is that which relates to the queen or mother of the community in her pregnant ſtate.

After impregnation, a very extraordinary change begins to take place in her perſon, or rather in her abdomen only. It gradually increaſes in bulk, and at length becomes of ſuch an enormous ſize as to exceed the bulk of the reſt of her body 1500 or 2000 times. She becomes 1000 times heavier than her conſort, and exceeds 20,000 or 30,000 times the bulk of one of the labourers. In this ſtate, the matrix has a conſtant periſtaltic or undulating motion; the conſequence of which is (as the author as counted them) (fig. 8.) the protruſion of 80,000 eggs in twenty-four hours.

Theſe eggs, ſays the author, "are inſtantly taken from her body by her attendants (of whom there always are, in the royal chamber and the galleries adjacent, a ſufficient number in waiting) and carried to the nurſeries, which are ſometimes four or five feet diſtant in a ſtraight line. Here, after they are hatched, the young are attended and provided with every thing neceſſary, until they are able to ſhift for themſelves, and take their ſhare of the labours of the community.

Many curious and ſtriking particulars are related of the great devaſtations committed by this powerful community; which conſtruct roads, or rather covered ways, diverging in all directions from the neſt, and leading to every object of plunder within their reach. Though the miſchiefs they commit are very great, ſuch is the economy of nature, that it is probably counterbalanced by the good produced by them; in quickly deſtroying dead trees and other ſubſtances, which, as the author obſerves, would, by a tedious decay, ſerve only to encumber the face of the earth. Such is their alacrity and diſpatch in this office, that the total deſtruction of deſerted towns is ſo effectually accompliſhed, that in two or three years a thick wood fills the ſpace; and not the leaſt veſtige of a houſe is to be diſcovered.

From the many ſingular accounts here given of the police of theſe inſects, we ſhall mention one reſpecting the different functions of the labourers and ſoldiers, or the civil and military eſtabliſhments in this community, on an attempt to examine their neſt or city.

On making a breach in any part of the ſtructure with a hoe

or pick-axe, a ſoldier immediately appears, and walks about the breach, as if to ſee whether the enemy is gone, or to examine whence the attack proceeds. In a ſhort time he is followed by two or three others, and ſoon afterwards by a numerous body, who ruſh out as faſt as the breach will permit them; their numbers increaſing as long as any one continues to batter the building. During this time they are in the moſt violent buſtle and agitation; while ſome of them are employed in beating with their forceps upon the building, ſo as to make a noiſe that may be heard at three or four feet diſtance. On ceaſing to diſturb them, the ſoldiers retire, and are ſucceeded by the labourers, who haſten in various directions towards the breach, each with a burden of mortar in his mouth ready tempered. Though there are millions of them, they never ſtop or embarraſs each other; and a wall gradually ariſes that fills up the chaſm. A ſoldier attends every 600 or 1000 of the labourers, ſeemingly as a director of the works; for he never touches the mortar, either to lift or carry it. One in particular places himſelf cloſe to the wall which they are repairing, and frequently makes the noiſe above mentioned; which is conſtantly anſwered by a loud hiſs from all the labourers within the dome: and at every ſuch ſignal, they evidently redouble their pace, and work as faſt again.

The work being completed, a renewal of the attack conſtantly produces the ſame effects. The ſoldiers again ruſh out, and then retreat, and are followed by the labourers loaded with mortar, and as active and diligent as before. "Thus, ſays the author, the pleaſure of ſeeing them come out to fight or to work alternately may be obtained as often as curioſity excites or time permits; and it will certainly be found, that the one order never attempts to fight, or the other to work, let the emergency be ever ſo great." The obſtinacy of the ſoldiers is remarkable. "They fight to the very laſt, diſputing every inch of ground ſo well as often to drive away the negroes, who are without ſhoes, and make white people bleed plentifully through their ſtockings."

Such is the ſtrength of the buildings erected by theſe puny inſects, that when they have been raiſed to little more than half their height, it is always the practice of the wild bulls to ſtand as centinels upon them, while the reſt of the herd is ruminating below. When at their full height of ten or twelve feet, they are uſed by the Europeans as places to look out from over the top of the graſs, which here grows to the height of thirteen feet upon an average. The author has ſtood with four men on the top of one of theſe buildings, in order to get a view of any veſſel that might come in ſight.

It may appear ſurpriſing how a Being perfectly good ſhould have created animals which ſeem to ſerve no other end but to ſpread deſtruction and deſolation wherever they go. But let us be cautious in ſuſpecting any imperfection in the Father of the Univerſe. What at firſt ſight may ſeem only productive of miſchief, will, upon mature deliberation, be found worthy of that wiſdom which planned the moſt beautiful parts of the world. Many poiſons are valuable medicines; the ſtorms are beneficial; and diſeaſes often promote life. Theſe termites, indeed, are frequently pernicious to mankind, but they are alſo very uſeful and even neceſſary; one valuable purpoſe which they ſerve is, to deſtroy decayed trees and other ſubſtances, which, if left on the ſurface of the ground in hot climates, would in a ſhort time pollute the air. In this reſpect they reſemble very much the common flies, which are regarded by mankind in general as noxious, and at beſt as uſeleſs beings in the creation; but this is certainly for want of conſideration. There are not probably in all nature animals of more importance; and it would not be difficult to prove, that we ſhould feel the want of one or two ſpecies of large quadrupeds much leſs than of one or two ſpecies of theſe deſpicable-looking inſects. Mankind in general are ſenſible that nothing is more diſagreeable, or more peſtiferous, than putrid ſubſtances; and it is apparent to all who have made obſervation, that thoſe little inſects contribute more to the quick diſſolution and diſperſion of putreſcent matter than any other. They are ſo neceſſary in all hot climates, that even in the open fields a dead animal or ſmall putrid ſubſtance cannot be laid upon the ground two minutes before it will be covered with flies and their maggots, which inſtantly entering quickly devour one part, and perforating the reſt in various directions, expoſe the whole to be much ſooner diſſipated by the elements. Thus it is with the termites; the rapid vegetation in hot climates, of which no idea can be formed by any thing to be ſeen in this, is equalled by as great a degree of deſtruction from natural as well as accidental cauſes. It ſeems apparent, that when any thing whatever is arrived at its laſt degree of perfection, the Creator has decreed it ſhall be totally deſtroyed as ſoon as poſſible, that the face of nature may be ſpeedily adorned with freſh productions in the bloom of ſpring or the pride of ſummer: ſo when trees, and even woods, are in part deſtroyed by tornadoes or fire, it is wonderful to obſerve how many agents are employed in haſtening the total diſſolution of the reſt; but in the hot climates there are none ſo expert, or who do their buſineſs ſo expeditiouſly and effectually, as theſe inſects, who in a few weeks deſtroy and carry away the bodies of large trees, without leaving a particle behind, thus clearing the place for other vegetables, which ſoon fill up every vacancy; and in places where two or three years before there has been a populous town, if the inhabitants, as is frequently the caſe, have choſen to abandon it, there ſhall be a very thick wood, and not the veſtige of a poſt to be ſeen, unleſs the wood has been of a ſpecies which, from its hardneſs, is called *iron wood*.

Fig. 1. repreſents a labourer. Fig. 2. a labourer magnified. Fig. 3. a ſoldier. Fig. 4. a ſoldier, forceps, and part of his head magnified. Fig. 5. a perfect termes bellicoſus. Fig. 6. the head of a perfect inſect magnified. Fig. 7. a head with ſtemmata magnified. Fig. 8. a queen. Fig. 9. a king. Fig. 10. is a ſection of the building raiſed by theſe inſects, as it would appear on being cut down through the middle from the top a foot lower than the ſurface of the ground. AA, an horizontal line from A on the left, and a perpendicular line from A at the bottom, will interſect each other at the royal chamber. The darker ſhades near it are the empty apartments and paſſages, which it ſeems are left ſo for the attendants on the king and queen, who, when old, may require near 100,000 to wait on them every day. The parts which are the leaſt ſhaded and dotted are the nurſeries, ſurrounded, like the royal chamber, by empty paſſages, on all ſides, for the more eaſy acceſs to them with the eggs from the queen, the proviſion for the young, &c. *N. B.* The magazines of proviſions are ſituated without any ſeeming order among the vacant paſſages which ſurround the nurſeries. B, the top of the interior building, which often ſeems, from the arches carrying upward, to be adorned on the ſides with pinnacles. C, the floor of the area or nave. DDD, the large galleries which aſcend from under all the buildings ſpirally to the top. EE, the bridges.

TERMINALIA, in antiquity, feaſts celebrated by the Romans in honour of the god Terminus.

TERMINALIA, in botany: a genus of plants belonging to the claſs of *polygamia*, and order of *monœcia*. The male calyx is quinquepartite; there is no corolla; the ſtamina are ten in number. The hermaphrodite flower is the ſame with that of the male; there is one ſtyle; the fruit, which is a drupe or

plum, is below, and ſhaped like a boat. There are two ſpecies; the eatappa, and anguſtifolia or benzoin. This ſpecies does not, however, yield benzoin. See STYRAX

TERMINI, in architecture, denotes a kind of ſtatues or columns, adorned on the top with the figure of a man's, woman's, or ſatyr's head, as a capital; and the lower part ending in a kind of ſheath or ſcabbard.

TERMINUS, in Pagan worſhip, an ancient deity among the Romans, who preſided over the ſtones or land marks, called *termini*, which were held ſo ſacred, that it was accounted ſacrilege to move them; and as the criminal became devoted to the gods, it was lawful for any man to kill him. The worſhip of this deity was inſtituted by Numa Pompilius, who, to render land marks, and eonſequently the property of the people, ſacred, erected a temple on the Tarpeian mount to Terminus.

TERN, in ornithology. See STERNA.

TERNATE, the moſt northerly of the Molucca or Clove Iſlands in the Eaſt-Indies. It abounds in cocoa-nuts, bananas, citrons, oranges, almonds, and other fruit proper to the torrid zone; but cloves are the moſt valuable produce. It is in the poſſeſſion of the Dutch. Malaya is the capital town. E. Long. 129. 0. N. Lat. 1. 0.

TERNI, a town of Italy in the Pope's territories, and in the duchy of Spolletto, with a biſhop's ſee. It is but a ſmall place; though there are very beautiful ruins of antiquity, it having been a very eonſiderable Roman colony. It is ſituated on the top of a high mountain, and to the weſt of it are fields which are extremely fertile. E. Long. 12. 40. N. Lat. 42. 34.

TERNSTROMIA, in botany: a genus of plants belonging to the claſs of *polyandria*, and order of *monogynia*. The ealyx is monophyllous and quinquepartite: the corolla is monopetalous, quinquepartite or ſexpartite, globular, and bell-ſhaped: the berry is dry, biloeular, and valveleſs. There is only one ſpecies, the meridionalis.

TERPANDER, a celebrated Greek poet and muſician. The Oxford marbles tell us that he was the ſon of Derdeneus of Leſbos, and that he flouriſhed in the 381ſt year of theſe records; which nearly anſwers to the 27th Olympiad, and 671ſt year B.C. The marbles inform us likewiſe, that he taught the *nomes*, or airs, of the lyre and flute, which he performed himſelf upon this laſt inſtrument, in eoncert with other players on the flute. Several writers tell us that he added three ſtrings to the lyre, which before his time had but four. Of the works of this poet only a few fragments are now remaining.

TERRA AUSTRALIS INCOGNITA, a name for a large unknown continent, ſuppoſed to lie towards the South Pole, and which for a long time was ſought after by navigators. The late voyages of Captain Cook have aſcertained this matter as much as it probably ever will be. See SOUTH-*Sea* and COOK. On this ſubject Captain Cook expreſſes himſelf as follows: "I had now made the circuit of the Southern Ocean in a high latitude, and traverſed it in ſuch a manner as to leave not the leaſt room for the poſſibility of there being a eontinent, unleſs near the pole, and out of the reach of navigation. By twice viſiting the tropical ſea, I had not only ſettled the ſituation of ſome old diſcoveries, but made there many new ones, and left, I conceive, very little more to be done even in that part. Thus I flatter myſelf, that the intention of the voyage has in every reſpect been fully anſwered; the ſouthern hemiſphere ſufficiently explored; and a final end put to the ſearching after a ſouthern continent, which has at times engroſſed the attention of ſome of the maritime powers for near two centuries paſt, and been a favourite theory amongſt the geographers of all ages. That there may be a continent, or large tract of land near the pole, I will not deny: on the contrary, I am of opinion there is; and it is probable that we have ſeen a part of it. The exceſſive eold, the many iſlands, and vaſt floats of ice, all tend to prove that there muſt be land to the ſouth; and for my perſuaſion that this ſouthern land muſt lie or extend fartheſt to the north, oppoſite to the Southern Atlantic and Indian Oceans, I have already aſſigned ſome reaſons; to which I may add, the greater degree of eold experienced by us in theſe ſeas than in the Southern Pacific Oecan under the ſame parallels of latitude."

TERRA *Firma*. Under this name is eomprehended a vaſt extent of eountry, and, conſidered as a government under the authority of the crown of Spain, comprehends ſeveral extenſive provinces, and three audiences, which are fixed at Panama, Quito, and Santa Fè de Bogota; the large provinces are Terra Firma Proper, or Darien, Popayan, Quito, and New Grenada, all of which are again ſubdivided into ſeveral ſmaller provinces or juriſdictions.

TERRA *Firma Proper*, or *Kingdom of Terra Firma*; a province of South America, bounded on the north by the Spaniſh Main, on the eaſt by the river and Gulf of Darien, which ſeparates it from the province of Carthagena, on the ſouth by Popayan and the Pacific Ocean, and on the weſt by the Pacific Ocean and province of Veragua. It is divided into the four provinces of Panama, Darien, Choco, and Boriquetta. The whole country is an alternate mixture of valleys and hills of different heights, with abundance of rivers running towards each ſea. The climate is very hot, yet the humidity is greater, in proportion, than the heat, conſequently the air muſt be rendered unwholeſome. What has been ſaid under the different heads of Panama, Darien, and Portobello, includes, perhaps, every thing that need be ſaid to give the reader a general idea of this country.

TERRA *Japonica*, more commonly ealled *catechu*, a drug formerly ſuppoſed to be an extract from the ſeeds of the areca catechu, but lately diſcovered by Mr. Kerr, aſſiſtant ſurgeon to the civil hoſpital at Bengal, to be obtained from the *mimoſa catechu*. Mr. Kerr gives the following account of the manner in which the extract is made: "After felling the trees, the manufacturer earefully cuts off all the exterior white part of the wood. The interior eoloured wood is cut into ehips, with which he fills a narrow-mouthed unglazed earthen pot, pouring water upon them until he ſees it among the upper chips; when this is half evaporated by boiling, the decoction, without ſtraining, is poured into a flat earthen pot, and boiled to one-third part; this is ſet in a cool place for one day, and afterwards evaporated by the heat of the ſun, ſtirring it ſeveral times in the day. When it is reduced to a eonſiderable thickneſs, it is ſpread upon a mat or cloth, which has previouſly been covered with the aſhes of cow-dung; this maſs is divided into ſquare or quadrangular pieces by a ſtring, and completely dried by turning them frequently in the ſun until they are fit for ſale. This extract is called *cutt* by the natives, by the Engliſh *cutch*, and by different authors *terra japonica, catechu, khaath, cate, cachou*, &c. "In its pureſt ſtate it is a dry pulverable ſubſtance, outwardly of a reddiſh colour, internally of a ſhining, dark brown, tinged with a reddiſh hue; in the mouth it diſcovers conſiderable aſtringency, ſucceeded by a ſweetiſh mueilaginous taſte." According to Lewis, "it diſſolves almoſt totally in water, excepting the impurities; which are uſually of the ſandy kind, and amounting in the ſpecimens I examined to about one-eighth of the maſs. Of the pure matter, rectified ſpirit diſſolves about ſeven-eighths into a deep red liquor: the part which it leaves undiſſolved is an almoſt inſipid mucilaginous ſubſtance."

Catechu may be uſefully employed for moſt purpoſes where an aſtringent is indicated. This extract is the baſis of ſeveral fixed formulæ in our pharmacopœias, particularly of a tincture and an electuary: but one of the beſt forms under which it

can be exhibited, is that of a ſimple infuſion in warm water, with a proportion of cinnamon or caſſia.

Terra *Puzzolana*. See Puzzolana.

Terræ *Filius, Son of the Earth*, a ſtudent of the univerſity of Oxford, formerly appointed in public acts to make ſatirical and jeſting ſpeeches againſt the members thereof, to tax them with any growing corruptions, &c.

Terra *Sigillata Lemnia*. See Adansonia.

TERRACE, a walk or bank of earth, raiſed in a garden or court to a due elevation for a proſpect. The name is alſo given to the roofs of houſes that are flat, and whereon we may walk.

TERRAQUEOUS, in geography, a name given to our globe, becauſe conſiſting of land and water.

TERRAS, or Traas, in mineralogy, a ſpecies of argillaceous earth. It differs but little in its principles from puzzolana, but is much more compact and hard, porous and ſpongy. It is generally of a whitiſh yellow colour, and contains more heterogeneous particles, as ſpar, quartz, ſhoerl, &c. and ſomething more of calcareous earth; it efferveſces with acids, is magnetic, and fuſible *per ſe*. When pulverized, it ſerves as a cement, like puzzolana. It is found in Germany and Sweden.

A ſpecies of red earth has been found in the pariſh of St. Elizabeth in Jamaica, which turns out to be an excellent ſubſtitute for terras or puzzolana earth, and may therefore be of great value to the inhabitants of the Weſt-Indies. One meaſure of this earth, mixed with two of well-ſlacked lime and one of ſand, form a cement that anſwers extremely well for building any dam or bridge, or any ſtructure in water, for it will ſoon harden and become like a ſtone.

TERRASSON (Abbé John), a French writer born at Lyons in 1669. He diſtinguiſhed himſelf in the diſpute concerning Homer, between La Motte and Madam Dacier, by writing a *Diſſertation contre l'Iliade*. He wrote a political and moral romance called *Sethos*, full of learning and philoſophy, and another capital work of his is a French tranſlation of Diodorus Siculus. He died in 1750.

TERRE *Verte*, in the colour-trade, the name of a green earth much uſed by painters, both ſingly for a good ſtanding green, and in mixture with other colours. The name is French, and ſignifies "green earth." It is an indurated clay, of a deep bluiſh green colour, and is found in the earth, not in continued ſtrata or beds, as moſt of the other earths are, but in large flat maſſes of different ſizes, imbedded in other ſtrata; theſe break irregularly in the cutting, and the earth is generally brought out of the pit in lumps of different ſizes. It is of a fine, regular, and even ſtructure, and not very hard. It is of an even and gloſſy ſurface, very ſmooth to the touch, and in ſome degree reſembling the morochthus or French chalk, but adhering firmly to the tongue. It does not ſtain the hands in touching it; but being drawn along a rough ſurface, it leaves an even white line, with a greeniſh caſt. It does not ferment with acids, and it burns to a duſky brown colour. It is dug in the iſland of Cyprus, and in many parts of France and Italy. That from the neighbourhood of Verona has been eſteemed the beſt in the world; but of late there has been ſome dug in France that equals it. There is alſo an earth dug on Mendip Hills, in the ſinking for coal, which, though wholly unobſerved, is nearly, if not wholly, of equal value. When ſcraped, and the finer parts ſeparated, it is ready to be made up with oil for the uſe of the painters, and makes the moſt true and laſting green of any ſimple body they uſe.

TERRESTRIAL, ſomething partaking of the nature of earth, or belonging to the globe of earth; thus we ſay, the terreſtrial globe, &c.

TERRIER, a ſmall hound to hunt the fox or badger; ſo called becauſe he creeps into the ground, as ferrets do into the coney-burrows, after the fox, &c.

TERRITORY in geography, denotes an extent or compaſs of land, within the bounds or belonging to the juriſdiction of any ſtate, city, or other ſubdiviſion of a country.

TERTIAN fever. See Medicine.

TERTULLIAN, or Quintus Septimus Florens Tertullianus, a celebrated prieſt of Carthage, was the ſon of a centurion in the militia, who ſerved as proconſul of Africa. He was educated in the Pagan religion; but being convinced of its errors, embraced Chriſtianity, and became a zealous defender of the faith. He married, it is thought, after his baptiſm. Afterwards he took orders, and went to Rome; where, during the perſecution under the emperor Severus, he publiſhed his Apology for the Chriſtians, which is, in its kind, a maſter-piece of eloquence and learning; and at the beginning of the third century he embraced the ſect of the Montaniſts. He lived to a very great age, and died under the reign of Antoninus Caracalla, about the year 216. Many of his works are ſtill extant, in all of which he diſcovers a great knowledge of the Holy Scriptures, a lively imagination, a ſtrong, elevated, and impetuous ſtyle, great eloquence and ſtrength of reaſoning; but is ſometimes obſcure. His Apology and Preſcriptions are moſt eſteemed. The beſt editions of his works are thoſe of Rigault; eſpecially that of Venice in 1746, folio. Pamelius and Alix, Mr. Thomas, and the Sieur du Foſſé, have written his life; and Rigault, M. de l'Aube Epine, Father Petau, and other learned men, have publiſhed notes on his works.

TERUNCIUS, in antiquity, a very ſmall braſs coin in uſe among the Romans. The inconvenience of ſuch very ſmall pieces being ſoon found, the teruncius became diſuſed, but its name is ſtill retained in reckoning, and thus it became a money of account. The teruncius at firſt was a quarter of the as, or libra; hence, as the as contained twelve ounces, the teruncius contained three, whence the name, which is formed of the Latin *tres unciæ*. Teruncius was alſo uſed for the quarter of the denarius; ſo that when the denarius was at ten aſes, the teruncius was worth two and a half; and when the denarius was riſen to ſixteen, the teruncius was worth four. See Denarius.

TESSELATED pavements, thoſe of rich Moſaic work made of curious ſquare marbles, bricks, or tiles, called *teſſelæ* from their reſembling dice.

TESSERA, in Roman antiquity, denoted in its primary ſenſe a cube or dye; ſo called from the Greek word τεσσαρα, or τεσσερα, *four*; reſpect being had to its number of ſides, diſtinct from the two horizontal planes above and below. And it was thus diſtinguiſhed from the talus, which being round at each end, contained only four planes or faces on which it could ſtand; and therefore when thrown had no more than two ſide faces in view. Hence *ludere talis et ludere teſſeris* are ſpoken of by Roman writers as two different games. The ſyllable tes. occurs often in Roman inſcriptions. The word *teſſera* was applied to many other things, not ſo much from a ſimilude in the figure, as from the relation they bore to ſome other thing of which they were the ſign or token; as the points on the upper plane of the dye denoted the good or ill ſucceſs of the caſt.

The *teſſera hoſpitalis* was either public or private. As to the former, we find among the inſcriptions publiſhed by Gruter inſtances of two municipal towns which put themſelves under the patronage of the Roman governor; and the reciprocal engagement between them, engraved on two copper plates, in the form of an oblong ſquare, with a pediment at the top, is called in both *teſſer hoſpitalis*. The deſign of it

was to cultivate or maintain a lafting friendfhip between private perfons and their families; and gave a mutual claim to the contracting parties and their defcendants of a reception and kind treatment at each other's houfes, as occafion offered. For which end thofe tefferæ were fo contrived as beft to preferve the memory of that tranfaction to pofterity. And one method of doing this was by dividing one of them lengthwife into two equal parts; upon each of which one of the parties wrote his name, and interchanged it with the other. From this cuftom came the prevailing expreffion *tefferam hofpitalem confringere*, applied to perfons who violated their engagements.

The *tefferæ frumentariæ* were fmall tallies given by the emperors to the populace at Rome, entitling them to the reception of a quantity of corn from the public at ftated feafons. The perfon who had the infpection of thefe was called *tefferarius*. They were made of wood and of ftone.

There was another kind of teffera which intitled perfons to a fight of the public games and other diverfions, ufually made in the form of an oblong fquare.

The *teffera militaris* was a fignal given by the general, or chief commander of an army, as a direction to the foldiers for executing any duty or fervice required of them. This, upon urgent occafions, was only vocal; but, in ordinary cafes, it was written on a tablet, commonly made of wood. Befide thefe civil and military tefferæ, there are others which relate to religious affairs, and may be called *facred*.

TESSON, or TESTON. See TESTER.

TESSOUWA, a confiderable town in Africa, fituated eaft of Mourzouk, the capital of the kingdom of Fezzan. Near this town a deep and rapid ftream is faid to have exifted, but was overwhelmed by the moving fands fo frequent in Africa.

TEST, a veffel ufed in metallurgy for abforbing the fcoriæ of metallic bodies when melted. See CUPEL. Some of the German writers recommend, both for tefts and cupels, a fort of friable opake ftone, called *white fpath*, which appears to be a fpecies of gypfum, or of the ftones from which plafter of Paris is prepared. The fpath is directed to be calcined with a gentle fire, in a covered veffel, till the flight crackling, which happens at firft, has ceafed, and the ftone has fallen in part into powder: the whole is then reduced into fubtle powder, which is paffed through a fine fieve, and moiftened with fo much of a weak folution of green vitriol as is fufficient for making it hold together. Gellert, however, finds, that if the ftone is of the proper kind, which can be known only by trials, calcination is not neceffary. Scheffer obferves, that thefe kinds of tefts are liable to foften or fall afunder in the fire, and that this inconvenience may be remedied by mixing with the uncalcined ftone fomewhat lefs than equal its weight, as eight-ninths of fuch as has been already ufed and is penetrated by the fcoria of the lead, taking only that part of the old teft which appears of a green-grey colour, and rejecting the red cruft on the top. Tefts or cupels made of the fpath are faid not to require fo much caution in nealing and heating them as the common ones; it appears, however, from Scheffer's account, that they are lefs durable than thofe made of the afhes of bones, though greatly fuperior to thofe of wood-afhes. Vegetable afhes, which ftand pretty well the tefting of filver, can fcarcely bear any great quantity of gold, this metal requiring a confiderably ftronger fire than the other; but bone-afhes anfwer fo effectually, and are among us fo eafily procurable, that it is not needful for the refiner to fearch for any other materials; though thofe who work off large quantities of lead, in order to gain a little filver or gold contained in it, may poffibly, in places remote from populous cities, avail themfelves of fubftances fimilar to the fpath above mentioned.

The teft, for its greater fecurity, is fixed in the mould in which it was formed; which is fometimes a fhallow veffel made of crucible earth or caft-iron, more commonly an iron hoop, with three bars arched downwards acrofs the bottom, about two inches deep, and of different widths, from three or four inches to fifteen or more, according to the quantity of metal to be tefted at once. The afhes or earthy powder, moiftened as for making cupels, are preffed down in the mould fo as to completely fill it or rife a little above the fides; with care to make the mafs equally folid, and to put in at once, or at leaft after the bottom has been preffed clofe, as much of the matter as will be fufficient for the whole; for any additional quantity will not unite thoroughly with the reft, but be apt to part from it in the fire. The edges are pared fmooth, and a portion cut out from the middle with a bent knife, fo as to leave a proper cavity, which is fmoothed by ftrewing fome dry powder on the furface, and rolling on it a wooden, or rather a glafs ball.

The procefs of tefting is often performed in the fame manner as that of cupellation: but where great quantities of bafe metal are to be worked off from a little gold, recourfe is had to a more expeditious method, that of tefting before the bellows.

An oval teft is placed in a cavity, made in a hearth of a convenient height, and fome moiftened fand or afhes preffed round it to keep it fteady: the nofe of a bellows is directed along its furface, in fuch a manner, that if afhes are fprinkled in the cavity of the teft, the bellows may blow them completely out: fome have an iron plate fixed before the bellows, to direct the blaft downwards. To keep the furface of the teft from being injured in putting in the metal, fome cloths or pieces of paper are interpofed. The fuel confifts of billets of barked oak laid on the fides of the teft, with others laid crofswife on thefe: the bellows impel the flame on the metal, clear the furface of afhes or fparks of coal, haften the fcorification of the lead, and blow off the fcoria, as faft it forms, to one end of the teft, where it runs out through a notch made for that purpofe. About two thirds of the fcorified lead may thus be collected; the reft being partly abforbed by the teft, and partly diffipated by the action of the bellows. Care muft be taken not to urge the blaft too ftrongly, left fome portion of the gold fhould be carried away by the fumes impetuoufly forced off from the lead, and fome minute particles of it entangled and blown off with the fcoriæ.

TEST-*Act*, in law, is the ftatute 25 Car. II. cap. 2. which directs all officers, civil and military, to take the oaths, and make the declaration againft tranfubftantiation, in the court of King's Bench or Chancery, the next term, or at the next quarter-feffions, or (by fubfequent ftatutes) within fix months after their admiffion; and alfo within the fame time to receive the facrament of the Lord's Supper, according to the ufage of the church of England, in fome public church, immediately after divine fervice or fermon, and to deliver into court a certificate thereof, figned by the minifter and church warden, and alfo to prove the fame by two credible witneffes, upon forfeiture of 500l. and difability to hold the faid office.

The avowed object of this act was to exclude from places of truft all members of the church of Rome; and hence the diffenters of that age, if they did not fupport the bill when paffing through the two houfes of parliament, gave it no oppofition. For this part of their conduct they have been often cenfured with feverity, as having betrayed their rights from refentment to their enemies. But is this a fair ftate of the cafe? Were any rights in reality betrayed? That the dread of a popifh fucceffor and of popifh influence was the immediate and urgent caufe of paffing the *teft-act*, is indeed true; but that the legiflature, when guarding againft an impending evil, had not likewife a retrofpect to another from which they had

ſo recently been delivered, is not ſo evident. If it be proper to ſupport an eſtabliſhed church as a branch of the conſtitution, and if the teſt-act be calculated to afford that ſupport to the church of England, it is probable that the deliberations of parliament were as much influenced by the dread of puritanic fury, and a renewal of the covenant, as by apprehenſions of a perſecution from a popiſh king and popiſh councils. That the members of the church eſtabliſhed by law in England had as much reaſon to dread the effects of power in the hands of Puritans as in the hands of Papiſts, no impartial man will controvert, who is not a ſtranger to that period of our national hiſtory; and that it was the duty of the legiſlature by every method in their power to provide for the ſecurity of the conſtitution againſt the machinations of both its enemies, will be admitted by all but ſuch as are in love with anarchy on the one hand, or with deſpotiſm on the other.

TEST *for Acid and Alkalis.* See CHEMISTRY.

TEST *Liquors for Wines.* See LEAD and ARSENIC.

TESTACEA, in the Linnæan ſyſtem of natural hiſtory, the third order of vermes. This order comprehends all ſhell-fiſh arranged by Linnæus under thirty-ſix genera. Shell-fiſh are animals with a ſoft body, covered by or incloſed in a firm, hard, and as it were ſtony habitation, compoſed, according to their three ſeparate orders, firſt, Of many parts which are ranged under the name of *multivalves*; ſecond, Of two parts which are called *bivalves*; third, Of one part or piece only, which we call *univalves.* Thoſe parts, pieces, or valves, are more or leſs moveable at the animal's pleaſure. The animals included in theſe hard habitations have moſt of them the characters of one or other of the genera vermium, and might be reduced under the ſame genera with the molluſca: but as theſe characters are few, and the ſhells very numerous, and different in their form and ſtructure, it will tend more to make this part of natural hiſtory eaſy, to arrange the ſubjects according to the diſtinctions of the ſhells themſelves. There is this farther conſideration in favour of this arrangement, viz. that the animals themſelves are rarely ſeen, and never can be preſerved in cabinets; whereas the ſhells make a figure in them, and great numbers have been met with empty of the animal.

TESTACEOUS, in natural hiſtory, an epithet ſynonymous with TESTACEA. In medicine, all preparations of ſhells, and ſubſtances of the like kind, are called *teſtaceous.* Such are powders of crabs claws and eyes, pearl, &c. They are of great uſe in abſorbing acidities of the ſtomach.

TESTAMENT, or LAST WILL. Teſtaments both Juſtinian and Sir Edward Coke agree to be ſo called, becauſe they are *teſtatio mentis*: an etymon which ſeems to favour too much of conceit; it being plainly a ſubſtantive derived from the verb *teſtari*, in like manner as *juramentum, incrementum*, and others, from other verbs. The definition of the old Roman lawyers is much better than their etymology; *voluntatis noſtræ juſta ſententia de eo, quod quis poſt mortem ſuam fieri velit*: which may be thus rendered into Engliſh, "the legal declaration of a man's intentions, which he wills to be performed after his death." It is called *ſententia*, to denote the circumſpection and prudence with which it is ſuppoſed to be made: it is *voluntatis noſtræ ſententia*, becauſe its efficacy depends on its declaring the teſtator's intention, whence in Engliſh it is emphatically ſtyled his *will*: it is *juſta ſententia*; that is, drawn, atteſted, and publiſhed, with all due ſolemnities and forms of law: it is *de eo, quod quis poſt mortem ſuam fieri velit*, becauſe a teſtament is of no force till after the death of the teſtator.

Theſe teſtaments are divided into two ſorts; written, and verbal or nuncupative: of which the former is committed to writing; the latter depends merely upon oral evidence, being declared by the teſtator *in extremis*, before a ſufficient number of witneſſes, and afterwards reduced to writing.

But as nuncupative wills and CODICILS (which were formerly more in uſe than at preſent when the art of writing is become more general) are liable to great impoſitions, and may occaſion many perjuries, the ſtatute of frauds, 29 Car. II. c. 3. enacts, 1. That no written will ſhall be revoked or altered by a ſubſequent nuncupative one, except the ſame be in the lifetime of the teſtator reduced to writing, and read over to him, and approved; and unleſs the ſame be proved to have been ſo done by the oaths of three witneſſes at the leaſt, who, by ſtatute 4 & 5 Anne, c. 16. muſt be ſuch as are admiſſible upon trials at common law. 2. That no nuncupative will ſhall in anywiſe be good, where the eſtate bequeathed exceeds 30l. unleſs proved by three ſuch witneſſes, preſent at the making thereof (the Roman law requiring ſeven), and unleſs they or ſome of them were ſpecially required to bear witneſs thereto by the teſtator himſelf; and unleſs it was made in his laſt ſickneſs, in his own habitation or dwelling-houſe, or where he had been previouſly reſident ten days at the leaſt, except he be ſurpriſed with ſickneſs on a journey, or from home, and dies without returning to his dwelling. 3. That no nuncupative will ſhall be proved by the witneſſes after ſix months from the making, unleſs it were put in writing within ſix days. Nor ſhall it be proved till fourteen days after the death of the teſtator, nor till proceſs hath firſt iſſued to call in the widow, or next of kin, to conteſt it if they think proper. Thus hath the legiſlature provided againſt any fraud in ſetting up nuncupative wills, by ſo numerous a train of requiſites, that the thing itſelf has fallen into diſuſe; and hardly ever heard of, but in the only inſtance where favour ought to be ſhown to it, when the teſtator is ſurpriſed by ſudden and violent ſickneſs. The teſtamentary words muſt be ſpoken with an intent to bequeath, not any looſe idle diſcourſe in his illneſs; for he muſt require the byſtanders to bear witneſs of ſuch his intention: the will muſt be made at home, or among his family or friends, unleſs by unavoidable accident, to prevent impoſitions from ſtrangers: it muſt be in his laſt ſickneſs; for if he recovers, he may alter his diſpoſitions, and have time to make a written will: it muſt not be proved at too long a diſtance from the teſtator's death, leſt the words ſhould eſcape the memory of the witneſſes; nor yet too haſtily and without notice, leſt the family of the teſtator ſhould be put to inconvenience or ſurpriſed.

As to written wills, they need not any witneſs of their publication. We ſpeak not here of deviſes of lands, which are entirely another thing, a conveyance by ſtatute, unknown to the feodal or common law, and not under the ſame juriſdiction as perſonal teſtaments. But a teſtament of chattels, written in the teſtator's own hand, though it has neither his name nor ſeal to it, nor witneſſes preſent at its publication, is good; provided ſufficient proof can be had that it is his handwriting. And though written in another man's hand, and never ſigned by the teſtator, yet if proved to be according to his inſtructions and approved by him, it hath been held a good teſtament of the perſonal eſtate. Yet it is the ſafer and more prudent way, and leaves leſs in the breaſt of the eccleſiaſtical judge, if it be ſigned or ſealed by the teſtator, and publiſhed in the preſence of witneſſes; which laſt was always required in the time of Bracton; or rather he in this reſpect has implicitly copied the rule of the civil law.

No teſtament is of any effect till after the death of the teſtator; *nam omne teſtamentum morte conſummatum eſt, et voluntas teſtatoris eſt ambulatoria uſque ad mortem.* And there-

fore, if there be many teftaments, the laft will overthrows all the former; but the republication of a former will revoke one of a later date, and eftablifhes the firft again.

Regularly, every perfon hath full power and liberty to make a will, that is not under fome fpecial prohibition by law or cuftom: which prohibitions are principally upon three accounts; for want of fufficient difcretion; for want of fufficient liberty and free-will; and on account of criminal conduct.

1. In the firft fpecies are to be reckoned infants, under the age of fourteen if males, and twelve if females; which is the rule of the civil law. For though fome of our common lawyers have held that an infant of any age (even four years old) might make a teftament, and others have denied that under eighteen he is capable; yet as the ecclefiaftical court is the judge of every teftator's capacity, this cafe muft be governed by the rules of the ecclefiaftical law. So that no objection can be admitted to the will of an infant of fourteen, merely for want of age; but if the teftator was not of fufficient difcretion, whether at the age of fourteen or twenty-four, that will overthrow his teftament. Madmen, or otherwife *non compotes*, idiots or natural fools; perfons grown childifh by reafon of old age or diftemper, fuch as have their fenfes befotted with drunkennefs, all thefe are incapable, by reafon of mental difability, to make any will fo long as fuch difability lafts. To this clafs alfo may be referred fuch perfons as are born deaf, blind, and dumb: who, as they have always wanted the common inlets of underftanding, are incapable of having *animum teftandi*, and their teftaments are therefore void.

2. Such perfons as are inteftable for want of liberty or freedom of will, by the civil law are of various kinds; as prifoners, captives, and the like. But the law of England does not make fuch perfons abfolutely inteftable; but only leaves it to the difcretion of the court to judge upon the confideration of their particular circumftances of durefs, whether or no fuch perfons could be fuppofed to have *liberum animum teftandi*. And, with regard to feme-coverts, our laws differ ftill more materially from the civil. Among the Romans there was no diftinction; a married woman was as capable of bequeathing as a feme-fole. But with us a married woman is not only utterly incapable of devifing lands, being excepted out of the ftatute of wills, 34 & 35 Hen. VIII. c. 5. but alfo fhe is incapable of making a teftament of chattels, without the licence of her hufband. For all her perfonal chattels are abfolutely his own; and he may difpofe of her chattels real, or fhall have them to himfelf if he furvives her: it would be therefore extremely inconfiftent to give her a power of defeating that provifion of the law, by bequeathing thofe chattels to another. The queen confort is an exception to this general rule, for fhe may difpofe of her chattels by will, without the confent of her lord; and any feme-covert may make her will of goods which are in her poffeffion *in auter droit*, as executrix or adminiftratrix; for thefe can never be the property of the hufband: and if fhe has any pin-money or feparate maintenance, it is faid fhe may difpofe of her favings thereout by teftament, without the controul of her hufband. But if a feme-fole makes her will, and afterwards marries, fuch fubfequent marriage is efteemed a revocation in law, and entirely vacates the will.

3. Perfons incapable of making teftaments on account of their criminal conduct, are in the firft place all traitors and felons, from the time of conviction; for then their goods and chattels are no longer at their own difpofal, but forfeited to the king. Neither can a *felo de fe* make a will of goods and chattels, for they are forfeited by the act and manner of his death; but he may make a devife of his lands, for they are not fubject to any forfeiture. Outlaws alfo, though it be but for debt, are incapable of making a will fo long as the outlawry fubfifts, for their goods and chattels are forfeited during that time. As for perfons guilty of other crimes, fhort of felony, who are by the civil law precluded from making teftaments (as ufurers, libellers, and others of a worfe ftamp), at the common law their teftaments may be good. And in general the rule is, and has been fo at leaft ever fince Glanvil's time, *quod libera fit cujufcunque ultima voluntas*.

Teftaments may be avoided three ways: 1. If made by a perfon labouring under any of the incapacities before mentioned; 2. By making another teftament of a later date; and, 3. By cancelling or revoking it. For though I make a laft will and teftament irrevocable in the ftrongeft words, yet I am at liberty to revoke it; becaufe my own act or words cannot alter the difpofition of law, fo as to make that irrevocable which is in its own nature revocable. For this, faith lord Bacon, would be for a man to deprive himfelf of that which, of all other things, is moft incident to human condition; and that is, alteration or repentance. It hath alfo been held, that, without an exprefs revocation, if a man, who hath made his will, afterwards marries and hath a child, this is a prefumptive or implied revocation of his former will which he made in his ftate of celibacy. The Romans were alfo wont to lay afide teftaments as being *inofficiofa*, deficient in natural duty, if they difinherited or totally paffed by (without affigning a true and fufficient reafon) any of the children of the teftator. But if the child had any legacy, though ever fo fmall, it was a proof that the teftator had not loft his memory or his reafon, which otherwife the law prefumed; but was then fuppofed to have acted thus for fome fubftantial caufe: and in fuch cafe no *querela inofficiofi teftamenti* was allowed. Hence probably has arifen that groundlefs vulgar error of the neceffity of leaving the heir a fhilling, or fome other exprefs legacy, in order to difinherit him effectually; whereas the law of England makes no fuch wild fuppofition of forgetfulnefs or infanity; and therefore, though the heir or next of kin be totally omitted, it admits no *inofficiofi* to fet afide fuch a teftament.

Testament (Old and New). See Bible and Scripture.

TESTATOR, the perfon who makes his will and teftament.

TESTER, Teston, the name of a coin ftruck in France by Louis XII. in 1513, and in Scotland in the time of Francis II. and Mary queen of Scotland, fo called from the head of the king, which was engraved upon it. The filver it contained was 11 deniers 18 grains, its weight 7 deniers 11⅓ gr. and its value 10 fols. The coinage of it was prohibited by Henry III. in 1575, when the value of it was augmented to 14 fols fix deniers. The tefton or tefter among us was rated at 12d. in the reign of Henry VIII. and afterwards reduced to 6d.

TESTES, in anatomy, the tefticles. See the next article.

TESTICLE (*teftis*), a double part in animals of the male kind, ferving for the office of generation.—See Anatomy. They are called *tefticles*, by diminution of *teftes*, "witneffes;" as giving teftimony of virility. The Greeks call them *didymi*, or "twins." In man and moft animals, the tefticles are exterior; in fome, as fowls, interior. Some men have only one, ordinarily they have two; fome have naturally had three; nay, anatomifts affure us they have known four.

TESTIMONY. See Logic and Metaphysics.

Testimony, in law. See Evidence.

TESTUDO, the Tortoise, in zoology: a genus belonging to the clafs of *amphibia*, and order of *reptilia*. The body has a tail, and is defended with a bony or coriaceous covering. The mouth has naked mandibles without teeth. There are thirty-three fpecies, of which the *midas* or common fea-turtle

is the most remarkable. It is found in the island of Ascension and other places in the South Sea. The shell is so very strong that it can carry more than 600lbs. on its back, or as many men as can stand on it loaded. It digs round holes in the sand, in which it lays a vast number of eggs yearly, to the amount of 1000, it is said. It broods on them during the night. Its flesh is of a greenish colour, makes excellent food, and is the favourite dish of sailors as well as of epicures. It lives on cuttle and shell fish, and grows to a prodigious size, some having been found to weigh 480lbs.

The Americans find so good account in catching turtle, that they have made themselves very expert at it: they watch them from their nests on shore, in moon-light nights; and, before they reach the sea, turn them on their backs, and leave them till morning; when they are sure to find them, since they are utterly unable to recover their former posture: at other times they hunt them in boats, with a peculiar kind of spear, striking them with it through the shell; and as there is a cord fastened to the spear, they are taken much in the same manner as the whales.

Mr. White, in his Natural History of Selborne, mentions a land-tortoise which had been kept for thirty years at Ringmer near Lewes. It retired under ground about the middle of November, and came forth again about the middle of April. At its first appearance in spring it showed little inclination for food; in the height of summer it became voracious; its appetite again diminished towards autumn, so that for the last six weeks it scarcely ate any thing at all. It lived chiefly on milky plants, such as lettuces, dandelions, and sow-thistles. Nothing surprised Mr. White more than the extreme timidity it always showed for rain; for though it had a shell that would secure it against the wheel of a loaded cart, yet it discovered as much solicitude about rain as a fine lady dressed in her best attire, shuffling away on the first sprinklings, and running its head up in a corner. It not only slept during winter, but for a great part of the summer; for it went to bed in the longer days at four in the evening, and often did not stir in the morning till it was late. There was one season, usually about the beginning of June, when its exertions were remarkable. It then rose by five in the morning, and walked on tip toe, traversing the garden, examining every wicket and interstice in the fences. The motives that led it to these rambles seemed to be of the amorous kind. M. White says it was an excellent weather-glass; for whenever it walked upright and fed with great avidity in the morning, it rained before night. It showed great sagacity in discerning those who did it kind offices; for whenever the old lady who had fed it for thirty years came in sight, it hobbled towards her with awkward alacrity.

Testudo, in antiquity, was particularly used among the poets, &c. for the ancient lyre; because it was originally made by its inventor, Mercury, of the back or hollow of the testudo aquatica, or sea-tortoise, which he accidentally found on the banks of the river Nile. See Lyre.

Testudo, in the military art of the ancients, was a kind of cover or screen which the soldiers, *e. gr.* a whole company, made themselves of their bucklers, by holding them up over their heads, and standing close to each other. This expedient served to shelter them from darts, stones, &c. thrown upon them, especially those thrown from above, when they went to the assault.

Testudo, was also a kind of large wooden tower which moved on several wheels, and was covered with bullock hides, serving to shelter the soldiers when they approached the walls to mine them, or to batter them with rams. It was called *testudo*, from the strength of its roof, which covered the workmen as the shell does the tortoise.

TETANUS, dreadful spasmodic disorder, in which the whole body becomes rigid and inflexible. It most commonly proves mortal. See Medicine.

TETHYS, a genus of insects belonging to the class of *vermes*, and order of *mollusca*. The body is oblong, fleshy, and without feet; the mouth consists of a cylindrical proboscis under the duplicature of a lip; and there are two foramina at the left side of the neck. The species are two, both inhabitants of the ocean.

TETRACERA, in botany: a genus of plants belonging to the class of *polyandria*, and order of *tetragynia*, and in the natural system ranging under the doubtful. The calyx is hexaphyllous, and the capsules four. There is only one species, the volubilis.

TETRADYNAMIA (τεσσαρες "four," and δυναμις "power"), four powers; the name of the 15th class in Linnæus's Sexual System, consisting of plants with hermaphrodite flowers, having six stamina, four of which are long, and two short; it corresponds to the *siliquosæ* of Ray, and *cruciformes* of Tournefort. All the species belonging to this class are distinguished by cruciform flowers. It comprehends two orders, *gymnospermia*, those plants which have naked seeds, being four in number (except phryma which is monospermous); and *angiospermia*, which contains those plants the seeds of which are inclosed in a capsule. See Botany.

TETRAGONIA, in botany: a genus of plants belonging to the class of *icosandria*, and order of *monogynia*; and in the natural system ranging under the 13th order, *succulentæ*. The calyx is divided into three, four, or five parts. There is no corolla; the drupe is beneath, and the nut three or eight-celled. There are seven species; the puticosa, decumbens, herbacea, echinata, expansa, crystallina, and the japonica.

TETRAGRAMMATON, τετραγραμματον, a denomination given by the Greeks to the Hebrew name of God יהוה, "*Jehova*," because in the Hebrew it consists of four letters.

TETRAGYNIA (τεσσαρες, "four," and γυνη, "a woman"); the name of an order, or secondary division in the 4th, 5th, 6th, 8th, and 13th classes in the Sexual System; consisting of plants which, to the classic character, whatever it is, add the circumstance of having four styles or female organs. Herb-paris and grass of Parnassus furnish examples.

TETRANDRIA (τεσσαρες "four," and ανηρ "a man or husband"); the name of the fourth class in Linnæus's Sexual System, consisting of plants with hermaphrodite flowers, which have four stamina or male organs that are of equal length. In this last circumstance consists the main difference, according to Linnæus, between the plants of the class in question, and those of the 14th class *didynamia*, in which the four stamina are of unequal length, two of them being long, and two short.—The orders of this numerous class are three, founded upon the number of styles or female organs. Scabious, teazel, barren wort, the starry plants of Ray, and the greater number of genera in this class, have one style; dodder and hypecoum have two: holly and a few others have four.

TETRAO, in ornithology: a genus of birds belonging to the order of *gallinæ*, and is thus characterized by Linnæus: there is a spot near the eyes naked or papillose, or covered, though more rarely, with feathers. Gmelin has enumerated about 66 species. The genus tetrao comprehended both the grous, partridge, and quail; but Dr. Latham, with great judgment and propriety, has made two genera of them, under the names of *tetrao*, comprehending the grous; and *perdix*, comprehending the partridge and quail. Dr. Latham thus distinguishes the genus *tetrao*: the bill is like

a crooked cone, with a naked ſcarlet ſkin above each eye, and the feet feathered to the toes. The *perdix* he characterizes by a bill convex, ſtrong, and ſhort; the noſtrils are covered above with a callous prominent rim; the orbits are papilloſe; the feet naked, and moſt of the ſpecies are furniſhed with ſpurs. He reckons twenty ſpecies under the *tetrao*, and forty-eight under the *perdix*. As we highly approve of this new arrangement of Dr. Latham, we are diſpoſed to follow it; but as a reference has been made from PERDIX to this place, it is proper that we ſhould alſo give ſome account of that genus.

I. TETRAO. Of this genus the following ſpecies are found in Britain: 1. The *urogallus*, or wood-cock, inhabits woody and mountainous countries; in particular, foreſts of pines, birch-trees, and junipers; feeding on the tops of the former and berries of the latter; the firſt often infects the fleſh with ſuch a taſte as to render it ſcarcely eatable. In the ſpring it calls the females to its haunts with a loud and ſhrill voice; and is at that time ſo very inattentive to its ſafety, as to be very eaſily ſhot. It ſtands perched on a tree, and deſcends to the females on their firſt appearance. They lay from eight to ſixteen eggs; eight at the firſt, and more as they advance in age.

This bird is common to Scandinavia, Germany, France, and ſeveral parts of the Alps.—It is found in no other part of Great Britain than the Highlands of Scotland, north of Inverneſs; and is very rare even in thoſe parts. It is there known by the name of *capercalzie*, *auer-calzie*, and in the old law-books *caperkally*; the laſt ſignifying the horſe of the woods: this ſpecies being, in compariſon of others of the genus, pre-eminently large.

The length of the male is two feet nine inches; its weight ſometimes fourteen pounds. The female is much leſs, the length being only twenty-ſix inches. The ſexes differ alſo greatly in colours. The bill of the male is of a pale yellow; the head, neck, and back, are elegantly marked, ſlender lines of grey and black running tranſverſely. The upper part of the breaſt is of a rich gloſſy green; the reſt of the breaſt and the belly black, mixed with ſome white feathers; the ſides are marked like the neck; the coverts of the wings croſſed with undulated lines of black and reddiſh brown; the exterior webs of the greater quill feathers are black: the tail conſiſts of eighteen feathers, the middle of which is the longeſt; theſe are black, marked on each ſide with a few white ſpots. The legs are very ſtrong, and covered with brown feathers; the edges of the toes are pectinated.—Of the female, the bill is duſky; the throat red; the head, neck, and back, are marked with tranſverſe bars of red and black: the breaſt has ſome white ſpots on it, and the lower part is of a plain orange colour; the belly is barred with pale orange and black; the tips of the feathers are white. The tail is of a deep ruſt colour barred with black, tipped with white, and conſiſts of ſixteen feathers.

2. The *tetrix*, black grous, or black-cock, like the former ſpecies, is fond of woody and mountainous ſituations; feeding on bilberries and other mountain fruits, and in the winter on the tops of the heath. In the ſummer they frequently deſcend from the hills to feed on corn. They never pair: but in the ſpring the male gets upon ſome eminence, crows and claps his wings; on which ſignal all the females within hearing reſort to him. The hen lays ſeldom more than ſix or ſeven eggs. When the female is obliged, during the time of incubation, to leave her eggs in queſt of food, ſhe covers them up ſo artfully with moſs or dry leaves, that is it very difficult to diſcover them. On this occaſion ſhe is extremely tame and tranquil, however wild and timorous at other times. She often keeps to her neſt, though ſtrangers attempt to drag her away. As ſoon as the young ones are hatched, they are ſeen running with extreme agility after the mother, though ſometimes they are not entirely diſengaged from the ſhell. The hen leads them forwards for the firſt time into the woods, to ſhow them ants' eggs and the wild mountain-berries, which, while young are their only food. As they grow older their appetites grow ſtronger, and they then feed upon the tops of heather and the cones of the pine-tree. In this manner they ſoon come to perfection; they are hardy birds, their food lies every-where before them, and it would ſeem that they ſhould increaſe in great abundance. But this is not the caſe; their numbers are thinned by rapacious birds and beaſts of every kind, and ſtill more by their own ſalacious conteſts.—As ſoon as the hatching is over, which the female performs in the manner of an hen, the whole brood follows the mother for about a month or two; at the end of which the young males entirely forſake her, and keep in great harmony together till the beginning of ſpring. At this ſeaſon they begin for the firſt time to feel the amorous paſſions; and then adieu to all their former friendſhips! They begin to conſider each other as rivals; and the rage of concupiſcence quite extinguiſhes the ſpirit of ſociety. They fight each other like game cocks; and at that time are ſo inattentive to their own ſafety, that it often happens that two or three of them are killed at a ſhot. It is probable that in theſe conteſts the bird which comes off victorious takes poſſeſſion of the female ſeraglio, as it is certain they have no faithful attachments.

An old black cock is in length twenty-two inches, and weighs near four pounds. The bill is duſky; and the plumage of the whole body black, gloſſed over the neck and rump with a ſhining blue. The coverts of the wings are of a duſky brown; the inner coverts white; the thighs and legs are covered with dark brown feathers; the toes reſemble thoſe of the former ſpecies. The tail conſiſts of ſixteen black feathers, and is much forked; the exterior feathers bend greatly outwards, and their ends ſeem as if cut off.—The female weighs only two pounds; and its length is one foot ſix inches. The head and neck are marked with alternate bars of dull red and black; the breaſt with duſky black and white; but the laſt predominates. The back, coverts of the wings, and tail, are of the ſame colours as the neck, but the red is deeper. The tail is ſlightly forked; it conſiſts of eighteen feathers variegated with red and black. The feathers under the tail are white, marked with a few bars of black and orange. This bird hatches its young late in the ſummer. It lays from ſix to eight eggs, of a dull yellowiſh white colour, marked with numbers of very ſmall ferruginous ſpecks; and towards the ſmaller end with ſome blotches of the ſame hue.

3. The *ſcoticus*, red game, or moor-fowl, is peculiar to the Britiſh iſlands. The male weighs about nineteen ounces; and is in length $15\frac{1}{2}$ inches. The bill is black; the irides hazel-coloured. The throat is red. The plumage on the head and neck is of a light tawny red; each feather is marked with ſeveral tranſverſe bars of black. The back and ſcapular feathers are of a deeper red; and on the middle of each feather is a large black ſpot; the breaſt and belly are of a dull purpliſh brown, croſſed with numerous narrow duſky lines; the quill-feathers are duſky; the tail conſiſts of ſixteen feathers of an equal length, all of them (except the four middlemoſt) are black, and the middle feathers are barred with red: the thighs are of a pale red, barred obſcurely with black; the legs and feet clothed to the very claws with thick ſoft white feathers. The claws are whitiſh, very broad and ſtrong. The female weighs only fifteen ounces.—The colours in general are duller than thoſe of the male: the breaſt and belly are ſpotted with white; and the tips of ſome of the coverts of the wings are of

the ſame colour.—Theſe birds pair in the ſpring, and lay from ſix to ten eggs. The young brood follow the hen the whole ſummer; in the winter they join in flocks of forty or fifty, and become remarkably ſhy and wild; they always keep on the tops of the hills, are ſcarce ever found on the ſides, and never deſcend into the valleys. Their food is the mountain berries and tops of the heath.

4. The *lagopus*, white game or ptarmigan, is fifteen inches in length, and weighs nineteen ounces. Its plumage is of a pale brown or aſh-colour, elegantly croſſed or motled with ſmall duſky ſpots and minute bars; the head and neck with broad bars of black, ruſt colour, and white: the belly and wings are white; but the ſhafts of the greater quill-feathers black. In the male, the grey colour predominates, except on the head and neck, where there is a great mixture of red, with bars of white. The females and young birds have a great deal of ruſt-colour in them. The tail conſiſts of ſixteen feathers; the two middle of which are aſh-coloured, motled with black, and tipped with white; the two next black, ſlightly marked with white at their ends, the reſt wholly black: the feathers incumbent on the tail are white, and almoſt entirely cover it.

Ptarmigans are found in theſe kingdoms only on the ſummits of the higheſt hills of the Highlands of Scotland, of the Hebrides and Orkneys; and a few ſtill inhabit the lofty hills near Keſwick in Cumberland as well as the mountains of Wales. They live amidſt the rocks, perching on the grey ſtones, the general colour of the ſtrata in thoſe exalted ſituations. They are very ſilly birds; ſo tame as to bear driving like poultry; and, if provoked to riſe, take very ſhort flights, making a great circuit like pigeons. Like the grous, they keep in ſmall packs; but never, like thoſe birds, take ſhelter in the heath, but beneath looſe ſtones. To the taſte they ſcarce differ from a grous.

Theſe birds are called by Pliny *lagopi*, their feet being clothed with feathers to the claws; as the hare's are with fur: the nails are long, broad, and hollow. The firſt circumſtance guards them from the rigour of the winter; the latter enables them to form a lodge under the ſnow, where they lie in heaps to protect themſelves from the cold. The feet of the grous are clothed in the ſame manner; but thoſe of the two firſt ſpecies here deſcribed, which perch upon trees, are naked, the legs only being feathered, not being in want of ſuch a protection.

II. Perdix, comprehends both the partridge and quail.

The common partridge is ſo well known that a deſcription of it is unneceſſary, and we have not room to deſcribe the foreign ſpecies. We refer thoſe who wiſh complete information to the accurate and valuable Syſtem of Ornithology publiſhed by Dr. Latham. The ſcientific ornithologiſt will find much ſatisfaction in his *Index Ornithologus*, publiſhed in 2 vols. 4to.; and he who wiſhes to be acquainted with the nature and diſpoſitions of birds, will read his *Synopſis* with pleaſure, publiſhed in 7 vols, 4to.

The following general account of the partridge will ſuffice. "Theſe birds (ſays Willoughby) hold the principal place in the feaſts and entertainments of princes; without which their feaſts are eſteemed ignoble, vulgar, and of no account. The Frenchmen do ſo highly value, and are ſo fond of the partridge, that if they be wanting, they utterly ſlight and deſpiſe the beſt ſpread tables; as if there could be no feaſt without them." But however this might be in the time of our hiſtorian, the partridge is now too common in France to be conſidered as a delicacy; and this, as well as every other ſimple diſh, is exploded for luxuries of a more compound invention. In England, where the partridge is much ſcarcer, and a great deal dearer, it is ſtill a favourite delicacy at the tables of the rich; and the deſire of keeping it to themſelves has induced them to make laws for its preſervation, no way harmoniſing with the general ſpirit of Engliſh legiſlation.

The partridge ſeems to be a bird well known over all the world, as it is found in every country and in every climate; as well in the frozen regions about the pole, as the torrid tracks under the equator. It even ſeems to adapt itſelf to the nature of the climate where it reſides. In Greenland, the partridge, which is brown in ſummer, as ſoon as the icy winter ſets in, begins to take a covering ſuited to the ſeaſon: it is then clothed with a warm down beneath; and its outward plumage aſſumes the colour of the ſnow among which it ſeeks its food. Thus it is doubly fitted for the place, by the warmth and the colour of its plumage; the one to defend it from the cold, the other to prevent its being noticed by the enemy. Thoſe of Barakonda, on the other hand, are longer legged, much ſwifter of foot, and chooſe the higheſt rocks and precipices to reſide in.—They all, however, agree in one character, of being immoderately addicted to venery; and, as ſome writers affirm, often to an unnatural degree. It is certain, the male will purſue the hen even to her neſt; and will break her eggs rather than not indulge his inclinations. Though the young ones have kept together in flocks during the winter, when they begin to pair in ſpring their ſociety diſperſes; and combats, very terrible with reſpect to each other, enſue. Their manners in other circumſtances reſemble all thoſe of poultry in general; but their cunning and inſtinct ſeem ſuperior to thoſe of the larger kinds. Perhaps, as they live in the very neighbourhood of their enemies, they have more frequent occaſion to put their little arts in practice, and learn by habit the means of evaſion or ſafety. Whenever therefore a dog or other formidable animal approaches their neſt, the female uſes every means to draw him away. She keeps juſt before him, pretends to be incapable of flying, juſt hops up, and then falls down before him, but never goes off ſo far as to diſcourage her purſuer. At length, when ſhe has drawn him entirely away from her ſecret treaſure, ſhe at once takes wing, and fairly leaves him to gaze after her in deſpair. After the danger is over, and the dog withdrawn, ſhe then calls her young, who aſſemble at once at her cry, and follow where ſhe leads them. There are generally from ten to fifteen in a covey; and, if unmoleſted, they live from fifteen to ſeventeen years. There are ſeveral methods of taking them, as is well known; that by which they are taken in a net with a ſetting dog is the moſt pleaſant, as well as the moſt ſecure. The dog, as every body knows, is trained to this exerciſe by a long courſe of education: by blows and careſſes he is taught to lie down at the word of command; a partridge is ſhown him, and he is then ordered to lie down; he is brought into the field, and when the ſportſman perceives where the covey lies, he orders his dog to crouch: at length the dog, from habit, crouches wherever he approaches a covey; and this is the ſignal which the ſportſman receives for unfolding and covering the birds with his net. A covey thus caught is ſometimes fed in a place proper for their reception; but they can never be thoroughly tamed like our domeſtic poultry. See Partridge and Shooting.

2. The *coturnix*, or common quail, is not above half the ſize of the partridge. The feathers of the head are black, edged with ruſty brown; the breaſt is of a pale yellowiſh red, ſpotted with black; the feathers on the back are marked with lines of pale yellow, and the legs are of a pale hue. Except in the colours thus deſcribed, and the ſize, it every way re-

fembles a partridge in fhape, and except that it is a bird of paffage, it is like all others of the poultry kind in its habits and nature.

The quail feems to fpread entirely throughout the old world, but does not inhabit the new; it is feen from the Cape of Good Hope quite to Iceland, and is faid to be found in Falkland ifles; alfo in New Zealand, throughout Ruffia, Tartary, and China; and in fhort is mentioned by fo many travellers, and in fo many places, that we may almoft call it an inhabitant of all. It is obferved to fhift quarters according to the feafon, coming northward in fpring, and departing fouth in autumn, and in vaft flocks, like other migrating birds. Twice in a year it comes in fuch vaft quantities into Capri, that the bifhop of the ifland draws the chief part of his revenue from them; hence he is called the *quail Bifhop*. But this does not ftand alone; almoft all the iflands in the Archipelago, on the oppofite coafts, are at times covered with thefe birds, and fome of them obtain a name from this circumftance. On the weft coaft of the kingdom of Naples, within the fpace of four or five miles, an hundred thoufand have been taken in a day, which have been fold for eight livres per hundred to dealers who carry them for fale to Rome. Great quantities alfo fometimes alight in fpring on the coafts of Provence, efpecially in the diocefe of the bifhop of Frejus, which is near the fea, and appear, at their firft landing, fo much fatigued that they are often taken by the hand. Thefe circumftances then leave not a doubt of their being the fame kind of birds which the divine hand of providence thought right to direct in fuch quantities as to cover the camp of the murmuring Ifraelites.

"In the autumn, great quantities are frequently imported into England from France for the table; which we have frequently feen (fays Dr. Latham) on their paffage to London by the ftage-coaches, about an hundred in a large fquare box, divided into five or fix partitions one above another, juft high enough to admit of the quails ftanding upright; thefe boxes have wires on the fore-part, and each partition furnifhed with a little trough for food; and I have been told, fays our author, they may be conveyed thus to great diftances without difficulty."

With us they may be faid not to be plenty at any time. They breed with us, and the major part migrate fouth in autumn; the reft only fhift their quarters, as they have been met with on the coafts of Effex, and in Hampfhire, in the winter-feafon, retiring there in October.

It feeds like the partridge, and like that bird makes no neft, except a few dry leaves or ftalks fcraped together may be called fo, and fometimes an hollow on the bare ground fuffices. In this the female lays her eggs to the number of fix or feven, of a whitifh colour, marked with irregular ruft-coloured fpots: the young follow the mother as foon as hatched, like young partridges. They have but one brood in a year.

Quail-fighting was a favourite amufement among the Athenians. They abftained from the flefh of this bird, deeming it unwholefome, as fuppofing that it fed upon the white hellebore: but they reared great numbers of them for the pleafure of feeing them fight; and ftaked fums of money, as we do with regard to cocks, upon the fuccefs of the combat. Fafhion, however, has at prefent changed with regard to this bird: we take no pleafure in its courage, but its flefh is confidered as a very great delicacy.—Quails are eafily caught by a call: the fowler early in the morning having fpread his net, hides himfelf under it among the corn; he then imitates the voice of the female with his quail-pipe, which the cock hearing, approaches with the utmoft affiduity; when he has got under the net, the fowler then difcovers himfelf, and terrifies the quail, who attempting to get away, entangles himfelf the more in the net, and is taken.

TETRODON, in ichthyology; a genus of fifhes arranged by Linnæus under the clafs of *amphibia*, and order of *nantes*; but placed by Gmelin under the clafs of *pifces*, and order of *branchioftegi*. The jaws are bony, ftretched out, and cloven at the point: the aperture of the gills is linear; the body is muricated beneath, and there are no ventral fins. There are thirteen fpecies; of which the moft remarkable is the lineatus, called by Mr. Haffelquift *fahaka*, which is the Egyptian and Arabic name. It has of late been found in the Nile about Cairo, but was never known in former times. It is faid to grow to a prodigious fize. When juft caught, it pricks the fkin if it is taken in the bare hands, and produces fmall puftules in the fame manner as nettles. The flefh is poifonous. Mr. Forfter confirms the account of the poifonous nature of a fpecies of tetrodon, in his account of New Caledonia.

TETRARCH, a prince who holds and governs a fourth part of a kingdom. Such originally was the import of the title *tetrarch*; but it was afterwards applied to any petty king or fovereign; and became fynonymous with ethnarch, as appears from the following confiderations: 1. That Pliny makes mention of fix tetrarchies within the city of Decapolis. 2. That Herod's kingdom was only divided into three parts, which yet were called *tetrarchies*, and the fovereigns thereof, Luke iii. 1. *tetrarchs*. 3. Jofephus tells us, that, after the battle of Philippi, Antony, going into Syria, conftituted Herod *tetrarch*; and on medals the fame Herod is called *ethnarch*.

TETRASTYLE, in the ancient architecture, a building, and particularly a temple, with four columns in its front.

TETUAN, an ancient and pleafant town of Africa in the kingdom of Fez, and in the province of Habata. It is pretty well built, and the inhabitants are about 15,000 in number, who call themfelves *Andalufians*, and almoft all fpeak Spanifh; but they are great pirates. Some fay there are 30,000 Moorifh inhabitants, and 5000 Jews. W. Long. 5. 26. N. Lat. 35. 27.

TEUCRIUM, GERMANDER, in botany: a genus of plants belonging to the clafs of *didynamia*, and order of *gymnofpermia*; and in the natural fyftem ranging under the 42d order, *Verticillatæ*. The corolla has no upper lip, is divided into two parts beyond the bafe, and is divaricated where the ftamina iffue out. There are thirty fpecies; of which the fcorodonia, fcordium, and chamædrys, are natives of Great Britain. 1. The *fcorodonia*, wood fage, or germander, is diftinguifhed by leaves which are heart-fhaped, ferrated, and petiolated; by racemi, which are lateral and ranged in one row; and by an erect ftem. The flowers are ftraw-coloured, and the filaments red. The plant has a bitter tafte, and fmells like hops with a little mixture of garlic. It is ufed in brewing in the ifle of Jerfey inftead of hops. 2. The *fcordium*, or common water-germander, hath creeping perennial roots, fending up many fquare, procumbent, or trailing ftalks, branching diffufely; oblong, indented, ferrated, clofe-fitting, oppofite leaves; and fmall reddifh flowers, generally two together, from the fides of the ftalks and branches, in July and Auguft. This plant was formerly confidered as medicinal, but has now fallen into difufe. It grows naturally in marfhy places, in the ifle of Ely and other parts of England, and moft parts of Europe; and is fometimes admitted into gardens, in moift places, for variety, and as a medical plant. 3. The *chamædrys*, or fmaller creeping germander, hath fibrous, very creeping, fpreading roots; many four-cornered, very branching, trailing ftalks, near a foot long; oval, cu-

neiform, cut, crenated leaves on short footstalks; and reddish flowers, growing almost in a verticillus, or whorls, round the stalk, three on each peduncle: appearing in June and July.

TEUTHIS, in ichthyology, a genus of fishes belonging to the order of *abdominales*. The head is somewhat truncated on the forepart; the branchil membrane has five rays; the teeth equal, rigid, near each other, forming a regular series. There are two species, the hepatus and java.

TEUTONES, or TEUTONI (anc. geog.), a people always by historians joined with the Cimbri; both seated, according to Mela, beyond the Elbe, on the Sinus Codanus, or Baltic; and there, it is supposed, lay the country of the Teutones, now *Ditmarsh*; diversity of dialects producing the different terms *Teut*, *Tut*, *Dit*, *Tid*, and *Thod*, which in the ancient German language signified *people*. Of these Teutones, Virgil is to be understood in the epithet *Teutonicus*, an appellation which more lately came to be applied to the Germans in general, and later still the appellation *Alemanni*. The Teutones, in conjunction with the Cimbri and Ambrones, made war on the Romans, and marched towards Italy in the year 101 B.C. We are told, that the Teutones alone were so numerous, that they were six whole days without intermission in passing by the Roman camp. In Transalpine Gaul they engaged the Roman consul Marius; but were defeated with incredible slaughter; 100,000 of them, according to the lowest calculations, being killed on the spot. According to others, the number of those killed and taken prisoners amounted to 290,000. The inhabitants of the neighbouring country made fences for vineyards of their bones. Their king Teutobochus, said to be a monstrous giant, was taken prisoner and carried to Rome. See the article GIANT.

TEUTONIC, something belonging to the Teutones. The Teutonic language is supposed to have been the language of the ancient Germans, and hence is reckoned amongst the mother-tongues. See PHILOLOGY.

TEUTONIC *Order*, an order of military knights, established towards the close of the 12th century, on the following occasion.—When the emperor Barbarossa engaged in a crusade for the recovery of the Holy Land out of the hands of Saladin, he was followed by great numbers of German volunteers, who from various motives enlisted under his banners. After the death of Barbarossa, the Germans, who had signalized themselves before Acre or Ptolemais, resolved to choose another leader; and at last fixed their choice upon Frederic Duke of Suabia, second son to the emperor, and Henry Duke of Brabant. Under these generals they behaved with so much bravery, that Henry King of Jerusalem, the patriarch, and several other princes, determined to reward their valour by instituting an order of knighthood in their favour. This was accordingly done; and our new knights had at first the title of the *knights of St. George*, afterwards it was thought proper to put them under the tutelage of the Virgin Mary, to whom there was already an hospital dedicated on Mount Zion, for the relief of German pilgrims. From this time they were called *Equites Mariani*, or knights of St. Mary. Laws, regulations, and statutes were drawn up for them by the christian kings in Syria and the patriarch; and among other obligations it was required, that every person admitted to the privileges of the order should be of noble parentage; that the order should defend the christian religion and the Holy Land; that they should exercise hospitality towards the Christians in general, but particularly those of their own country; and that they should with all their power endeavour to propagate and extend the christian faith and the religion of JESUS. In the year 1190, having become rich by donations from the superstitious, they elected their first grandmaster Henry Walpot, a German, who had distinguished himself by his zeal and valour; and their choice was confirmed by the emperor. The following year, pope Celestine III. confirmed their privileges already granted, giving them the title of the *Teutonic knights of the hospital of St. Mary the Virgin*. By the conditions of this bull, they vowed perpetual continence, obedience and poverty; obligations which it may well be imagined were not very strictly kept.

TEWKESBURY, a town in Gloucestershire, formerly noted for its monastery. It is now a large handsome corporation, containing about 500 houses, with a magnificent church. It is seated at the confluence of the rivers Severn and Avon, has a cotton manufactory, and sends two members to parliament. W. Long. 2. 13. N. Lat. 52. 0.

TEXEL, a town of the United Provinces, in north Holland, seated at the mouth of the Zuyder-Zee, with a good harbour and a strong fort. It is seated in a fruitful island, known all over the world by the great number of ships that pass this way every day from all parts; it is about six miles long, and five broad, lying a little northward to the continent of Holland, between which and the island is one of the principal passages out of the Zuyder-Zee into the ocean. It is defended from the sea by sand-hills and strong banks. Most of the soil is applied to feed sheep, of which they have great flocks; and the cheese made of their milk is said to vie with the Parmesan. This island contains several fair villages, and a town on the east side, called *Burch*, strongly fortified and garrisoned, and inhabited chiefly by fishermen. N. Lat. 53. 8. E. Long. 4. 51.

TEXT, a relative term, contradistinguished to gloss or commentary, and signifying an original discourse exclusive of any note or interpretation. This word is particularly used for a certain passage of scripture, chosen by a preacher to be the subject of his sermon.

TEXTURE, properly denotes the arrangement and cohesion of several slender bodies or threads interwoven or entangled among each other, as in the webs of spiders, or in the cloths, stuffs, &c. Texture is also used in speaking of any union or constituent particles of a concrete body, whether by weaving, hooking, knitting, tying, chaining, indenting, intruding, compressing, attracting, or any other way. In which sense we say, a close compact texture, a lax porous texture, a regular or irregular texture, &c.

TEWIT, in ornithology. See TRINGA.

THABOR. See TABOR.

THALES, a celebrated Greek philosopher, and the first of the seven wise men of Greece, was born at Miletus about 640 B.C. In order to improve himself in the knowledge of the sciences, he travelled into Egypt, where he discoursed with the priests and other learned men. Some say that he married; but others observe, that he eluded the solicitations of his mother on this head, by telling her, when he was young, that it was too soon; and afterwards, that it was too late. Thales acquired great reputation by his wisdom and learning: he was the first among the Greeks who foretold eclipses of the sun, and made extraordinary discoveries in astronomy. Thales was the author of the Ionian sect of philosophers, who were thus called from his being born at Miletus, a city of Ionia. He maintained that water was the principle of which all the bodies in the universe are composed; that the world was the work of God; and that God sees the most secret thoughts in the heart of man. He said, "That the most difficult thing in the world is to know ourselves; the most easy to advise others; and the most sweet to accomplish our desires. That, in order to live well, we ought to abstain from what we find fault with in others. That the bodily felicity consists in health,

and that of the mind in knowledge. That the moſt ancient of beings is God, becauſe he is uncreated: that nothing is more beautiful than the world, becauſe it is the work of God; nothing more extenſive than ſpace, quicker than ſpirit, ſtronger than neceſſity, wiſer than time." It was alſo one of his ſentences, "That we ought never to ſay that to any one that may be turned to our prejudice; and that we ſhould live with our friends as with perſons that may become our enemies." He thanked God for three things; that he was born of the human, not of the brute ſpecies; a man, and not a woman; a Greek, and not a barbarian. None of the ancient philoſophers ever applied themſelves more earneſtly to the ſtudy of aſtronomy than Thales. Diogenes Laertius reports, that leaving his lodging with an old woman to contemplate the ſtars, he fell into a ditch; on which the good woman cried, "How canſt thou know what is doing in the heavens, when thou canſt not perceive what is at thy feet?" He went to ſee Crœſus, who was marching with a powerful army into Cappadocia, and enabled him to paſs the river Halys without making a bridge. Thales died ſoon after, at about ninety years of age. He compoſed ſeveral treatiſes in verſe, on meteors, the equinoxes, &c. but they are all loſt.

THALIA, in Pagan mythology, one of the nine muſes. She preſided over comedy; and is repreſented crowned with a garland of ivy, holding a maſk in her hand, and wearing buſkins on her feet.

THALIA, in botany: a genus of plants belonging to the claſs of *monandria*, and order of *monagynia*; and in the natural ſyſtem ranging under the eighth order, *Scitamineæ*. The corolla is pentapetalous and undulated; and the drupe has a bilocular kernel. There is only one ſpecies, the geniculata.

THALICTRUM, MEADOW-RUE, in botany: a genus of plants belonging to the claſs of *polyandria*. and order of *polygynia;* and in the natural ſyſtem ranging under the twenty-ſixth order, *Multiſitiquæ*. There is no calyx; the petals are four or five in number, and the ſeeds are naked and without a tail. There are fifteen ſpecies; three of which are indigenous, the *flavum*, *minus*, and *alpinum*. 1. The *flavum*, or common meadow-rue, has a leafy furrowed ſtalk, and a manifold erect panicle. It has commonly twenty-four ſtamina, and from ten to ſixteen piſtils. The root and leaves of this plant dye a yellow colour, and cattle are fond of it. It grows on the banks of ſome rivers: it is found at North Queen's-ferry, Fifeſhire. 2. The *minus*, or ſmall meadow-rue, has ſexpartite leaves, and bending flowers. The ſtalk is ſtriated, and about a foot high; the leaves are lax and divaricated, having rigid footſtalks; they are ſmooth and glaucous, and their lobes generally trifid; the panicle is branched and open, and the flowers nod: the petals are pale green, tinged with red; the ſtamina are from fifteen to twenty: the ſeeds deeply ſtriated, and from two to ſeven in number. This plant is frequent in ſandy ſoils and mountainous paſtures. 3. The *alpinum*, or alpine meadow-rue, has a very ſimple ſtalk, and almoſt naked; and a racemus ſimple and terminal. It is a pretty little plant, about a finger's length in height; the leaves all riſe from the root, the ſtalk being naked and branched; the flowers nod, and have four petals, twelve ſtamina, and eight piſtils. It is frequent on the ſides of rivulets in the highland mountains and other places.

THAMES, the fineſt river in Great Britain, which takes its riſe from a copious ſpring, called *Thames Head*, two miles ſouth-weſt of Cirenceſter in Glouceſterſhire. It has been erroneouſly ſaid, that its name is Iſis till it arrives at Dorcheſter, fifteen miles below Oxford, when, being joined by the Thame or Tame, it aſſumes the name of the Thames, which, it has been obſerved, is formed from a combination of the word Thame and Iſis. What was the origin of this vulgar error, cannot now be traced. Poetical fiction, however, has perpetuated this error, and inveſted it with a kind of claſſical ſanctity. "It plainly appears (ſays Camden), that the river was always called *Thames* or *Tems*, before it came near the Thame; and in ſeveral ancient charters granted to the abbey of Malmſbury, as well as that of Enſham, and in the old deeds relating to Cricklade, it is never conſidered under any other name than that of *Thames*." He likewiſe ſays, that it occurs no-where under the name of Iſis. All the hiſtorians who mention the incurſions of Ethelwold into Wiltſhire in the year 905, or of Canute in 1016, concur likewiſe in the ſame opinion, by declaring that they paſſed over the Thames at Cricklade in Wiltſhire. It is not probable, moreover, that Thames Head, an appellation by which the ſource has uſually been diſtinguiſhed, ſhould give riſe to another of the name of Iſis; which river, after having run half its courſe, ſhould reaſſume the name of Thames, the appellation of its parent ſpring. About a mile below the ſource of the river is the firſt corn-mill, which is called *Kemble Mill*. Here the river may properly be ſaid to form a conſtant current; which, though not more than nine feet wide in the ſummer, yet in the winter becomes ſuch a torrent as to overflow the meadows for many miles around. But, in the ſummer, the Thames Head is ſo dry, as to appear nothing but a large dell, interſperſed with ſtones and weeds. From Somerford the ſtream winds to Cricklade, where it unites with many other rivulets. Approaching Kemsford, it again enters its native county, dividing it from Berkſhire at Ingleſham. It widens conſiderably in its way to Lechlade: and being there joined by the Lech and Coln, at the diſtance of 138 miles from London, it becomes navigable for veſſels of ninety tons. At Enſham, in its courſe north-eaſt, to Oxford, is the firſt bridge of ſtone; a handſome one, of three arches, built by the Earl of Abingdon. Paſſing by the ruins of Godſtow nunnery, where the celebrated Fair Roſamond was interred, the river reaches Oxford, in whoſe academic groves its poetical name of Iſis has been ſo often invoked. Being there joined by the Charwell, it proceeds ſouth-eaſt to Abingdon, and thence to Dorcheſter, where it receives the Tame. Continuing its courſe ſouth-eaſt by Wallingford to Reading, and forming a boundary to the counties of Berks, Bucks, Surry, Middleſex, Eſſex and Kent, it waſhes the towns of Henly, Marlow, Maidenhead, Windſor, Eton, Egham, Staines, Lalcham, Chertſey, Weybridge, Shepperton, Walton, Sunbury, Eaſt and Weſt Mouſley, Hampton, Thames Ditton, Kingſton, Teddington, Twickenham, Richmond, Iſleworth, Brentford, Kew, Mortlake, Barnes, Chiſwick, Hammerſmith, Putney, Fulham, Wandſworth, Batterſea, Chelſea, and Lambeth. Then, on the north bank of the river, are Weſtminſter and London, and, on the oppoſite ſide, Southwark; forming together one continued city, extending to Limehouſe and Deptford; and hence the river proceeds to Greenwich, Erith, Greenhithe, Gray's Thurrock, Graveſend, and Leigh, into the ocean. It receives in its courſe from Dorcheſter the rivers Kennet, Loddon, Coln, Wey, Mole, Wandle, Lea, Roding, Darent, and Medway. The juriſdiction of the lord mayor of London over the Thames extends from Coln Ditch, a little to the weſt of Staines, to Yendal or Yenleet to the eaſt, including part of the rivers Medway and Lea; and he has a deputy, named the water-bailiff, who is to ſearch for and puniſh all offenders againſt the laws for the preſervation of the river and its fiſh. Eight times a year the lord mayor and aldermen hold courts of conſervance for the four counties of Surry, Middleſex, Eſſex, and Kent. Though the Thames is ſaid to be navigable 138 miles above the bridge; yet there are ſo many flats, that in ſummer

the navigation westward would be entirely stopped, when the springs are low, were it not for a number of locks. But these are attended with considerable expence: for a barge from Lechlade to London pays for passing through them 13l. 15s. 6d. and from Oxford to London 12l. 18s. This charge, however, is in summer only, when the water is low; and there is no lock from London Bridge to Bolter's Lock; that is, for 51½ miles above the bridge. The plan of new cuts has been adopted in some places, to shorten and facilitate the navigation. There is one near Lechlade, which runs nearly parallel to the old river, and contiguous to St. John's Bridge; and there is another a mile from Abingdon, which has rendered the old stream toward Culham Bridge useless. But a much more important undertaking has lately been accomplished; namely, the junction of this river with the Severn. A canal had been made, by virtue of an act of parliament in 1730, from the Severn to Wall Bridge, near Stroud. A new canal now ascends by Stroud, through the Vale of Chalford, to the height of 343 feet, by means of twenty-eight locks, and thence to the entrance of a tunnel near Sapperton, a distance of near eight miles. The canal is forty-two feet in width at top and thirty at the bottom. The tunnel (which is extended under Sapperton Hill, and under that part of Earl Bathurst's grounds called *Haley Wood*, making a distance of two miles and three furlongs) is near fifteen feet in width, and can navigate barges of seventy tons. The canal descending hence 134 feet, by fourteen locks, joins the Thames at Lechlade, a distance of above twenty miles. In the course of this vast undertaking the canal, from the Severn at Froomlade to Inglesham, where it joins the Thames, is a distance of more than thirty miles The expence of it exceeded the sum of 200,000l. of which 3000l. are said to have been expended in gunpowder alone, used for the blowing up of the rock. This new canal was completed in 1789, in less than seven years from its commencement A communication, not only with the Trent, but with the Mersey, has likewise been effected by a canal from Oxford to Coventry; another canal extends from this, at Braunston, to the Thames at Brentford, called *The Grand Junction Canal*. On the extensive advantages resulting from these navigable communications from the metropolis with the ports of Bristol, Liverpool, Hull, &c. and the principal manufacturing towns in the inland parts of the kingdom, it is needless to expatiate. The tide flows up the Thames as high as Richmond, which, following the winding of the river, is seventy miles from the ocean; a greater distance than the tide is carried by any other river in Europe. The water is esteemed extremely wholesome, and fit for use in very long voyages, during which it will work itself perfectly fine.

Thames is also the name of a river in the state of Connecticut in America. See the article Connecticut.

THANE, or Thanus, a name given to the nobility in Britain before the time of William the Conqueror. It signifies a minister or honourable retainer, from the verb *thenian* "to minister." There were several degrees of nobility among the Anglo-Saxons; but those most commonly mentioned are the king's thanes and the alderman's thanes. The king's thanes seem to have been of three different degrees, according to their different degrees of wealth or favour at court. The alderman's thanes seem to have been of the lowest degree of nobility, and next to them those who were promoted to that dignity from their advancement in the church, from their valour, success in agriculture or commerce: for if a ceorl or farmer applied to learning and attained to priests orders, if he acquitted himself so well as to obtain from a nobleman five hythes of land, or a gilt sword, helmet, and breast-plate, the reward of his valour; or if by his industry he had acquired the property of five hythes of land; or if he applied to trade, and made three voyages beyond sea in a ship of his own, and a cargo belonging to himself—he was denominated a *thane*.

The thanes, who were the only nobility among the Anglo-Saxons, were a very numerous body of men, comprehending all the considerable landholders in England, and filling up that space in society between the ceorls or yeomanry on the one hand, and the royal family on the other; which is now occupied both by the nobility and gentry. In times of war, they constituted the flower of their armies, and in times of peace they swelled the trains of their kings, and added greatly to the splendour of their courts, especially at the three great festivals of Christmas, Easter, and Whitsuntide. From this body all the chief officers, both civil and military, as aldermen, greeves, earls, heretogens, &c. were taken; and to obtain some of these offices was the great object of their ambition. Before they obtained an office, their lands were their only support; and they lived in greater or less affluence, according to the extent of their estates. These they divided into two parts, one of which they called their *inlands*, and the other their *outlands*. Their inlands they kept in their own immediate possession, and cultivated them by the hands of their slaves and villains, in order to raise provisions for their families; their outlands they granted to ceorls or farmers, either for one year, or for a term of years; for which they received a certain stipulated proportion of their produce annually. These customs had long prevailed among their ancestors in Germany, and were adhered to by their posterity in England till the conquest.

The thanes were under no obligations on account of their lands, except the three following, which were indispensably necessary to the defence and improvement of their country: to attend the king with their followers in military expeditions, to assist in building and defending the royal castles, and in keeping the bridges and highways in proper repair. To these obligations all proprietors of land (even the churchmen for a long time not excepted) were subjected; and these services were considered as due to their country, rather than to the persons of their kings; and were agreed to by all as being necessary to their own preservation and conveniency.

This title of thane was abolished in England at the conquest, upon the introduction of the feudal system by William. The titles of earl and baron were about the same period introduced into Scotland by Malcolm Canmore, and the title of thane fell into disuse.

THANET, an island of England, situated at the north-east part of the county of Kent, and only divided from the rest of the county by the river Stour, and on the west by a rivulet; on the north and east it is bounded by the sea. The extent is about nine miles from east to west, and eight from north to south. The soil is fertile, and consists principally of corn land. It contains ten parishes; the principal towns are Margate and Ramsgate.

THASPIA, the deadly carrot, in botany: a genus of plants belonging to the class of *pentandria*, and order of *digynia*; and in the natural system ranging under the 45th order, *Umbellatæ*. The fruit is oblong and girt with a membrane. There are five species; the villosa, fœtida, asclepium, garganica, and trifoliata. The roots of the fœtida were formerly ordered in medicine, but are now entirely disused; a small dose operating with extreme violence both upwards and downwards.

THAWING, the refolution of ice into its former fluid ftate by the warmth of the air. See CONGELATION and FROST.

THEA, in botany. See TEA.

THEATINES, a religious order in the Romifh church, fo called from their principal founder John Peter Caraffa, then bifhop of Theate, or Chieti, in the kingdom of Naples, and afterwards pope, under the name of Paul IV. The names of the other founders were Gaetan, Boniface, and Configlieri. Thefe four pious men defiring to reform the ecclefiaftical ftate, laid the foundation of an order of regular clerks at Rome in the year 1524. Pope Clement VII. approved the inftitution, and permitted the brethren to make the three religious vows, to elect a fuperior every three years, and to draw up ftatutes for the regulation of the order. They firft endeavoured, by their example, to revive among the clergy the poverty of the apoftles and firft difciples of our Saviour, and were the firft who affumed the title of *regular clerks*.

THEATRE, a place in which fhows or dramatic reprefentations are exhibited.

For the origin of the dramatic art we always turn our eyes to Greece, the nurfery of the arts and fciences. It may indeed have been known among more ancient nations, but no records remain fufficient to fupport this opinion. The different ftates of Greece afferted their claim to the honour of having given it birth, but the account of the Athenians is moft generally received. It derived its origin from the hymns which were fung in the feftivals of Bacchus in honour of that deity. While thefe refounded in the ears of the multitude, chorufes of Bacchants and Fauns, ranged round certain obfcene images which they carried in triumphal proceffion, chanted lafcivious fongs, and fometimes facrificed individuals to public ridicule.

This was the practice in the cities; but a ftill greater licentioufnefs reigned in the worfhip paid to the fame divinity by the inhabitants of the country, and efpecially at the feafon when they gathered the fruits of his beneficence. Vintagers, befmeared with wine-lees, and intoxicated with joy and the juice of the grape, rode forth in their carts, and attacked each other on the road with grofs farcafms, revenging themfelves on their neighbours with ridicule, and on the rich by publifhing their injuftice.

Among the poets who flourifhed at that time, fome celebrated the great actions and adventures of gods and heroes, and others attacked with afperity the vices and abfurdities of individuals. The former took Homer for their model, and fupported themfelves by his example, of which they made an improper ufe. Homer, the moft tragic of poets, the model of all who have fucceeded him, had in the Iliad and the Odyffey brought to perfection the heroic poem, and in his Margites had employed pleafantry. But as the charm of his works depends in a great meafure on the paffions and motion with which he knew to animate them, the poets who came after him endeavoured to introduce into theirs an action which might excite emotion or mirth in the fpectators: fome even attempted to produce both, and ventured certain rude effays, which have fince been ftyled indifferently either tragedies or comedies, becaufe they unite the charactersof thefe two dramas. The authors of thefe fketches have been diftinguifhed by no difcovery; they only form in the hiftory of the art a fucceffion of names which it would be ufelefs to recal to light.

The neceffity and power of theatrical intereft was already known. The hymns in honour of Bacchus, while they defcribed his rapid progrefs and fplendid conquefts, became imitative; and in the contefts of the Pythian games, the players on the flute who entered into competition were enjoined by an exprefs law to reprefent fucceffively the circumftances that had preceded, accompanied, and followed the victory of Apollo over Python.

Some years after this regulation, Sufarion and Thefpis, both born in a fmall borough of Attica, named *Icaria*, appeared each at the head of a company of actors, the one on a kind of ftage, the other in a cart (A). The former attacked the vices and abfurdities of his time; and the latter treated more noble fubjects, which he took from hiftory.

The comedies of Sufarion were in the fame tafte with thofe indecent and fatirical farces which were afterwards performed in fome of the cities of Greece. They were long the favourite entertainment of the country people. Athens did not adopt this fpecies of exhibition until after it was brought to perfection in Sicily.

Thefpis had more than once feen in the feftivals, in which as yet hymns only were fung, one of the fingers, mounted on a table, form a kind of dialogue with the chorus. From this hint he conceived the idea of introducing into the tragedies an actor who, by fimple recitals introduced at intervals, fhould give relief to the chorus, divide the action, and render it more interefting. This happy innovation, together with fome other liberties in which he had allowed himfelf, gave alarm to the legiflator of Athens, who was more able than any other perfon to difcern the value or danger of the novelty. Solon condemned a fpecies of compofition in which the ancient traditions were difguifed by fictions. "If we applaud falfehood in our public exhibitions (faid he to Thefpis), we fhall foon find that it will infinuate itfelf into our moft facred engagements."

The exceffive approbation and delight with which both the city and country received the pieces of Thefpis and Sufarion, at once juftified and rendered ufelefs the fufpicious forefight of Solon. The poets, who till then had only exercifed their genius in dithyrambics and licentious fatire, ftruck with the elegant forms which thefe fpecies of compofition began to affume, dedicated their talents to tragedy and comedy. Soon after a greater variety was introduced in the fubjects of the former of thefe poems. Thofe who judge of their pleafures only from habit exclaimed, that thefe fubjects were foreign to the worfhip of Bacchus; but the greater number thronged with ftill more eagernefs after the new pieces.

Phrynichus, the difciple of Thefpis, made choice of that kind of verfe which is moft fuitable to the drama, was the author of fome other changes, and left tragedy in its infancy.

Æfchylus received it from his hands enveloped in a rude veftment, its vifage covered with falfe colours, or a mafk inexpreffive of character, without either grace or dignity in its motions, infpiring the defire of an intereft which it with difficulty excited, ftill attached to the buffooneries which had amufed its infant years, and expreffing its conceptions fometimes with elegance and dignity, but frequently in a feeble and low ftyle, polluted with grofs obfcenities.

In his firft tragedies he introduced a fecond actor; and afterward, copying the example of Sophocles, who had juft entered on his theatrical career, he admitted a third, and

(A) Sufarion reprefented his firft pieces towards the year 580 before Chrift. Some years after, Thefpis made his firft attempts in tragedy, and acted his Alceftis in 536.

ſometimes even a fourth. By this multiplicity of perſonages, one of his actors became the hero of the piece, and attracted to himſelf the principal intereſt; and as the chorus now held only a ſubaltern ſtation, Æſchylus took care to ſhorten its part, and perhaps even carried this precaution too far.

He is cenſured for having admitted mute characters into his drama. Achilles, after the death of his friend, and Niobe, after the deſtruction of her children, appear on the ſtage and remain during ſeveral ſcenes motionleſs, with their heads covered with a veil, and without uttering a word; but if their eyes had overflown with tears, and they had poured forth the bittereſt lamentations, could they have produced an effect ſo terrible as this veil, this ſilence, and this abandonment to grief?

It was not ſufficient that the noble and elevated ſtyle of tragedy ſhould leave in the minds of the auditors a ſtrong impreſſion of grandeur; to captivate the multitude it was requiſite that every part of the ſpectacle ſhould concur to produce the ſame effect. It was then the general opinion that nature, by beſtowing on the ancient heroes a more lofty ſtature, had impreſſed on their perſons a majeſty which procured them as much reſpect from the people as the enſigns of dignity by which they were attended. Æſchylus therefore raiſed his actors on high ſtilts or buſkins. He covered their features, which were frequently diſagreeable, with a maſk that concealed their irregularity. He clothed them in flowing and magnificent robes, the form of which was ſo decent, that the prieſts of Ceres have not bluſhed to adopt it. The inferior actors were alſo provided with maſks and dreſſes ſuited to their parts.

Inſtead of thoſe wretched ſcaffolds which were formerly erected in haſte, he obtained a theatre furniſhed with machines and embelliſhed with decorations. Here the ſound of the trumpet was reverberated, incenſe was ſeen to burn on the altars, the ſhades of the dead to ariſe from the tomb, and the furies to ruſh from the gulphs of Tartarus. In one of his pieces theſe infernal divinities appeared, for the firſt time, with maſks of a horrid paleneſs, torches in their hands, ſerpents intertwined in their hairs, and followed by a numerous retinue of dreadful ſpectres. It is ſaid that, at the ſight of them, and the ſound of their terrific howlings, terror ſeized on the whole aſſembly, women miſcarried, and children expired with fear; and that the magiſtrates to prevent ſimilar accidents in future, commanded that the chorus ſhould conſiſt only of fifteen actors inſtead of fifty.

The effect of ſo many new objects could not but aſtoniſh the ſpectators; nor were they leſs ſurpriſed and delighted at the intelligence diſplayed in the performance of the actors, whom Æſchylus almoſt always exerciſed himſelf. He regulated their ſteps and taught them to give additional force to the action by new and expreſſive geſtures.

The progreſs of the art was extremely rapid. Æſchylus was born 525 years before Chriſt, 11 years after Theſpis had acted his Alceſtis. He had for competitors Chœrilus Pratenas, and Phrynichus, whoſe glory he eclipſed, and Sophocles, who rivalled his own. Sophocles was born about the year 497 B.C. about 14 years before Euripides. Theſe carried tragedy to the higheſt perfection to which it attained among the Greeks. Æſchylus painted men greater than they can be, Sophocles as they ought to be, and Euripides as they are.

Invented towards the 50th Olympiad about 580 B.C.), and adapted to the rude manners of the ruſtics, comedy ventured not to approach the capital; and if by chance ſome companies of actors, who were unconnected with any others, found their way into the city, and performed their indecent farces, they were leſs authoriſed than tolerated by the government. It was not till after a long infancy that this ſpecies of drama began ſuddenly to make a rapid improvement in Sicily. Inſtead of a ſucceſſion of ſcenes without connection or tendency, the philoſopher Epicharmus introduced an action, all the parts of which had a dependence on each other; and conducted his ſubject, without wandering from it, through a juſt extent to a determinate end. His pieces, ſubjected to the ſame laws as tragedy, were known in Greece, where they were conſidered as models; and comedy ſoon ſhared with her rival the ſuffrages of the public, and the homage due to genius. The Athenians, eſpecially, received her with the ſame tranſports as they would have teſtified at the news of a victory: many of their poets exercifed their genius in this novel ſpecies of compoſition; and their names adorn the numerous liſt of writers who have been diſtinguiſhed in comedy from the time of Epicharmus. Such were, among the more ancient Magnes, Cratinus, Crates, Pherecrates, Eupolis, and Ariſtophanes. They all flouriſhed in the age of Pericles.

If we peruſe the comic pieces which have come down to us, we ſhall be convinced that the ſole object of the authors was to pleaſe the multitude. The gods and heroes were traveſtied, groſs and obſcene language was often employed, and virulent invectives were often thrown out againſt individuals of the firſt rank for genius and virtue. Towards the end of the Peloponneſian war the licentiouſneſs of comedy was reſtrained. The chorus was laid aſide, becauſe the rich citizens were alarmed, and would no longer contribute money to ſupport it, nor provide maſks with portraits for expoſing individuals.

The poets being thus reſtrained from mentioning names of living perſons on the ſtage, invented falſe names. They ſtill expoſed real and known characters; and thus gave a more exquiſite gratification to the ſpectators, who were highly amuſed with finding out the perſons intended. The conſequence of the law was only to make that done with delicacy which was formerly done in the moſt indecent and ſcurrilous manner. Ariſtophanes, in ſome of his lateſt pieces, has given us ſome good examples of this kind of comedy, which is ſometimes called the middle comedy.

Comedy was ſtill liable to abuſe, and therefore required farther reformation. As the uſe of real names had formerly been prohibited, real ſubjects were alſo forbidden; and comedy from that time was no longer a fury armed with torches, or a firebrand ſcattering miſchief, but a pleaſing and inſtructive companion. This is called the new comedy. The moſt eminent among the Greeks in this improved ſpecies was Menander. His writings are now loſt; but we may form a good eſtimate of their merit from the comedies of Terence, which are ſaid to have been borrowed from Menander, and to have nearly reſembled the original, though inferior in that *vis comica* by which the elegant Grecian was diſtinguiſhed. The comedy of Menander is that which has been cultivated in modern times.

To give ſome idea of a Grecian theatre, we ſhall deſcribe very ſhortly the theatre of Bacchus in Athens, which was built by the famous architect Philos in the time of Pericles. The part intended for the ſpectators was of a ſemicircular form, at the diameter of which was erected the ſtage. The orcheſtra occupied the ſpace where the pit in modern theatres is ſituated, where the muſic, the chorus, and the mimi were placed. It was four feet elevated above the ground. The ſpectators were arranged in three galleries round all the ſides of the orcheſtra except that next the ſtage, each gallery containing eight rows of ſeats. At the farther end of the orcheſtra, where the ſtage is erected in modern thea-

tres, stood the thymele or logion, but projecting a little towards the audience. It was a little higher than the orchestra, and did not extend the whole breadth of it. In some theatres it was only six feet square. Here the principal part of the chorus made their recitations, and in comical interludes the mimi performed. Behind the thymele appeared the stage or proscenion considerably elevated. No part of this theatre was covered except the stage, and a high gallery called *circys* set apart for the women. The Athenians, being exposed to the weather, came usually with great cloaks, to secure them from the rain or the cold; and for defence against the sun, they had the *sciadion*, a kind of parasol, which the Romans used also in their theatres by the name of *umbellæ*; but when a sudden storm arose, the play was interrupted, and the spectators dispersed.

A sort of tent work over the entire area of the edifice might have been contrived as a shelter from the rain and a shade from the sun. Such a covering would have obviated the inconveniences of roofed theatres, which obstruct the free communication of the air, and of unroofed theatres, which do not keep out the weather. At Athens the plays were always represented in the day-time, which made the unroofed theatres less inconvenient.

Plays were represented only during the three festivals solemnized in honour of Bacchus. The first of these was celebrated at the Piræus, where some of Euripides's pieces were first performed. The second which lasted only one day, was kept at the end of January or beginning of February. The third called the greater *Dionysia* was celebrated a month after. It continued several days, and attracted a great multitude of spectators. In the festivals which lasted only one day, five or six dramatic pieces, either tragedies or comedies, were performed. But in the greater Dionysia, which continued longer, twelve or fifteen, and sometimes more, were acted. The performance began early in the morning, and sometimes lasted the whole day.

The chorus, according as the subject demanded, was composed of men and women, old men or youths, citizens or slaves, priests, soldiers, &c. to the number of fifteen in tragedy, and twenty-four in comedy. The chorus came upon the stage preceded by a flute-player, who regulated their steps; sometimes one after the other, but in tragedy more frequently three in front and five in depth, or five in front and three in depth.

The same persons performed both in tragedy and comedy; but, as among ourselves, it was rare to meet with any who excelled in both. The pay of those who had acquired great reputation was considerable. Polus gained a talent in two days (equal to *L* 225 sterling). Players of eminence were solicited by different actors of Greece to attend their festivals. If, after making an engagement, they failed, they were obliged to pay a certain sum of money; and if they were absent during the festivals of their own republic, they were condemned to a heavy fine.

The actors had habits and symbols suited to their parts. Kings wore a diadem, leaned on a sceptre which supported an eagle on its top, and were dressed in long robes of purple or other splendid colours ornamented with gold. Heroes, besides having their stature frequently increased to six feet English, and their bulk in proportion, were frequently covered with the skin of a lion or a tyger, and armed with swords, quivers, and clubs. All who suffered misfortunes wore a black, brown, or dirty white garment, which frequently hung in tatters. There were various kinds of masks for tragedy, comedy, and satire. These certainly took away the pleasure arising from the expression of the countenance; but at any rate, little pleasure could be derived from this circumstance in a Grecian theatre, from its immense size, and the great distance of the audience from the stage.

Dramatic entertainments were introduced at Rome in the year of the city 391. They were called *ludi scenici*, because they were first acted in a shade formed by the branches and leaves of trees. They were borrowed immediately from Etruria, whence also they received their first players. These Etrurians at first only danced to a flute, without either singing or acting. The Roman youth soon imitated them at their solemn festivals, adding raillery in rude verses, and gestures adapted to the subject. These verses were called *Fescennini*, from Fescennia, a city of Etruria. Livius Andronicus was the first poet who wrote a regular play in Latin. This happened in the year of Rome 512 or 514, about 160 years after the death of Sophocles and Euripides, and fifty-two after that of Menander. The Grecian model was afterwards introduced and cultivated much by succeeding dramatic writers. This was the model of Menander, for the old and middle comedy was unknown at Rome. As the Romans were only imitators of the Greeks in the dramatic art, as well as in most of the arts and sciences, nothing more is necessary to be said in addition to the account which we have already given of the Grecian stage.

The origin of the English stage is hid in obscurity. It was not however, copied from the Grecian or Roman; for it was evidently different in form as well as in matter, and may with more propriety be deduced from a Gothic original. It appears that there were theatrical entertainments in England almost as early as the conquest; for we are told by William Stephanides or Fitz-Stephen, a monk, who in the reign of Henry II. wrote his *Descriptio Nobilissimæ Civitatis Londoniæ*, that London, instead of the common interludes of the theatre, had plays of a more holy kind; representations of the miracles of confessors, and the sufferings of martyrs. At this time there were also certain sets of idle people, who travelled the countries and were called *Mummers*, a kind of vagrant comedians, whose excellence consisted altogether in mimickry and humour.

It is probable that, soon after this time, the dramatic representations called *Mysteries* were exhibited. These mysteries were taken from scripture history: some represented the creation of the world, with the fall of Adam and Eve; some the story of Joseph; and others even the incarnation and sufferings of the Son of God. These pieces were exhibited in a manner so ridiculous as to favour libertinism and infidelity, as appears by a petition of the chaunters of St. Paul's cathedral to Richard II. in 1378, praying that "some unexpert people might be prohibited from representing the history of the Old Testament to the prejudice of the said clergy, who had been at great expence to represent it publicly at Christmas."

In the year 1390, the parish clerks of London are said to have played interludes at Skinner's well on three successive days in July; and in 1409, to have acted for eight days successively a play concerning the creation of the world, at the same place which thence acquired the name of *Clerkenwell*.

These Mysteries were succeeded by Moralities, in which there were some rude traces of a fable and a moral; and some also of poetry, the virtues, vices, and other affections of the mind, being frequently personified.

After these Moralities came what were called Interludes, which made some approaches to wit and humour. Many of these pieces were written by John Heywood, jester to Henry VIII.

In the time of Henry VIII. one or two pieces had been published under the classical names of *Comedy* and *Tragedy*,

but they appear not to have been intended for popular ufe. It was not till the religious ferments had fubfided that the public had leifure to attend to dramatic poetry. In the reign of Elizabeth, tragedies and comedies began to appear in form, and could the poets have perfevered, the firft models were good. *Gorboduc*, a regular tragedy, was acted in 1561; and Gafcoigne, in 1566, exhibited *Jocafta*, a tranflation from Euripides, as alfo *The Suppofes*, a regular comedy, from Ariofto, near thirty years before any of Shakfpeare's were printed.

The people however ftill retained a relifh for their old myfteries and moralities, and the popular dramatic poets feem to have made them their models. The graver fort of moralities appear to have given birth to our modern tragedy; as our comedy evidently took its rife from the lighter interludes of that kind. And as moft of thefe pieces contain an abfurd mixture of religion and buffoonery, an eminent critic has well deduced from thence the origin of our unnatural tragi comedies. Even after the people had been accuftomed to tragedies and comedies, moralities ftill kept their ground. One of them, intitled *The New Cuftom*, was printed fo late as 1573. At length they affumed the name of *mafques*, and, with fome claffical improvements, became in the two following reigns the favourite entertainments of the court.

As for the old myfteries, which ceafed to be acted after the reformation, they feem to have given rife to a third fpecies of ftage exhibition; which, though now confounded with tragedy or comedy, were by our firft dramatic writers confidered as quite diftinct from them both: thefe were hiftorical plays, or hiftories; a fpecies of dramatic writing which refembled the old myfteries in reprefenting a feries of hiftorical events fimply in the order of time in which they happened, without any regard to the three great unities. Thefe pieces feem to differ from tragedy juft as much as hiftorical poems do from epic: as the Pharfalia does from the Æneid. What might contribute to make dramatic poetry take this turn was, that foon after the myfteries ceafed to be exhibited, there was publifhed a large collection of poetical narratives, called *the Mirror for Magiftrates*, wherein a great number of the moft eminent characters in Englifh hiftory are drawn relating their own misfortunes. This book was popular and of a dramatic caft; and therefore, as an elegant writer has well obferved, might have its influence in producing hiftoric plays. Thefe narratives probably furnifhed the fubjects, and the ancient myfteries fuggefted the plan.

That our old writers confidered hiftorical plays as fomewhat diftinct from tragedy and comedy, appears from numberlefs paffages of their works. "Of late days (fays Stow in his Survey of London), inftead of thofe ftage plays have been ufed comedies, tragedies, interludes, and hiftories, both true and fained." Beaumont and Fletcher, in the prologue to the *Captain*, fay,

"This is nor comedy, nor tragedy,
"Nor *hiftory*."——

Polonius in *Hamlet* commends the actors as the beft in the world, either for tragedie, comedie, hiftorie, paftorall, &c. And Shakfpeare's friends, Heminge and Condell, in the firft folio edition of his plays, in 1623, have not only intitled their book "Mr. William Shakfpeare's Comedies, Hiftories, and Tragedies," but, in their table of contents, have arranged them under thofe three feveral heads; placing in the clafs of hiftories, "King John, Richard II. Henry IV. 2 pts, Henry V. Henry VI. 3 pts, Richard III. and Henry VIII."

This diftinction deferves the attention of the critics: for if it be the firft canon of found criticifm to examine any work by thofe rules the author prefcribed for his firft obfervance; then we ought to try Shakfpeare's hiftories by the general laws of tragedy and comedy. Whether the rule itfelf be vicious or not, is another inquiry; but certainly we ought to examine a work only by thofe principles according to which it was compofed. This would fave much impertinent criticifm.

Not fewer than nineteen playhoufes had been opened before the year 1633, when Prynne publifhed his *Hiftriomaftix*. From this writer we learn that tobacco, wine, and beer, were in thofe days the ufual accommodations in the theatre, as now at Sadler's Wells. With regard to the ancient prices of admiffion, the playhoufe called the *Hope* had five different priced feats, from fixpence to half-a-crown. Some houfes had penny benches. The two-penny gallery is mentioned in the prologue to Beaumont and Fletcher's *Woman Hater*; and feats of threepence and a groat in the paffage of Prynne laft referred to. But the general price of what is now called the *Pit* feems to have been a fhilling. The time of exhibition was early in the afternoon, their plays being generally acted by day light. All female parts were performed by men, no actrefs being ever feen on the public ftage before the civil wars. And as for the playhoufe furniture and ornaments, they had no other fcenes nor decorations of the ftage, but only old tapeftry, and the ftage ftrewed with rufhes, with habits accordingly; as we are affured in a fhort Difcourfe on the Englifh Stage, fubjoined to Flecknoe's *Love's Kingdom*, 1674, 12mo.

(B) For the ftate of the theatre during the time of Shakfpeare, fee PLAYHOUSE; where a full account of it is given from the late valuable edition of our illuftrious poet's works by Mr. Malone. During the whole reign of James I. the theatre was in great profperity and reputation: dramatic authors abounded, and every year produced a number of new plays; it became a fafhion for the nobility to celebrate their weddings, birth days, and other occafions of rejoicing, with mafques and interludes, which were exhibited with furprifing expence; our great architect, Inigo Jones, being frequently employed to furnifh decorations, with all the luxuriance of his invention and magnificence of his art. The king and his lords, and the queen and her ladies, frequently performed in thefe mafques at court, and the nobility at their private houfes; nor was any public entertainment thought complete without them. This tafte for theatrical entertainments continued during great part of the reign of King Charles the Firft; but, in the year 1633, it began to be oppofed by the Puritans from the prefs; and the troubles that foon after followed entirely fufpended them till the reftoration of King Charles the fecond in 1660.

The king, at his reftoration, granted two patents, one to Henry Killigrew, efq; and the other to Sir William Davenant, and their heirs and affigns, for forming two diftinct companies of comedians. Killigrew's were called the

(B) We have been anxious to give as full an account of the ancient Englifh drama as we could: we muft not omit, however, to inform our readers what Mr. Malone fays of the old plays, *viz.* that not one play publifhed before 1592 will bear a fecond reading; and that exclufive of myfteries, moralities, and tranflations, there are but 34 pieces extant which were publifhed before that period.

King's Servants, and Davenant's the *Duke's Company.* About ten of the company called the *King's Servants* were on the royal houfehold eftablifhment, having each ten yards of fcarlet cloth, with a proper quantity of lace allowed them for liveries; and in their warrants from the lord chamberlain they were ftyled *gentlemen of the great chamber.*

Till this time no woman had been feen upon the Englifh ftage, the characters of women having always been performed by boys, or young men of an effeminate afpect, which probably induced Shakfpeare to make fo few of his plays depend upon female characters, as they muft have been performed to great difadvantage. The principal characters of his women are innocence and fimplicity, fuch are Defdemona and Ophelia; and his fpecimen of fondnefs and virtue in Portia is very fhort. But the power of real and beautiful women was now added to the ftage; and all the capital plays of Shakfpeare, Fletcher, and Ben Jonfon, were divided between the two companies, by their own alternate choice, and the approbation of the court.

The king's fervants feem to have been allowed to be the beft company; and when the variety of plays began to be exhaufted, they drew the greater audiences. Davenant, therefore, to make head againft them, firft added fpectacle and mufic to action, and introduced a new fpecies of plays, fince called *dramatic operas;* among thefe were, *The Tempeft, Pfyche,* and *Circe;* which, with many others, were fet off with the moft expenfive decorations of fcenes and habits, and with the beft voices and dancers.

In 1684 the two houfes united, and continued together for ten years. In 1690 the play began at four o'clock; and, we are told, the ladies of fafhion ufed to take the evening air in Hyde-park after the reprefentation: by which it appears that the exhibitions were in fummer too. The principal actors were, Betterton, Montford, Kynafton, Sandford, Nokes, Underhill, and Leigh, commonly called *Tony Leigh;* the actreffes were, Mrs. Betterton, Barry, Leigh, Butler, Montford, and Bracegirdle; and to this company, in this year, old Cibber was admitted as a performer in the loweft rank. It was a rule with the patentees, that no young perfon, who offered himfelf as an actor, fhould be admitted into pay till after at leaft half a year's probation; and Cibber waited full three quarters of a year before he was taken into a falary of 10s. a week.

In 1695 a new theatre was opened with Mr. Congreve's comedy of Love for Love, which had fuch extraordinary fuccefs (fays Cibber) that fcarce any other play was acted there till the end of the feafon; but when the feafon ended, which appears to have begun in June, he does not tell us, and it is indeed difficult to guefs; for though the company acted in fummer, it feems improbable that they fhould fhut up the houfe in winter, as it is difficult to conceive any reafon for fo doing. Congreve was then in fuch high reputation, that this company offered him a whole fhare (but into how many fhares the whole was divided Colley has not told us) upon condition he would give them a new play every year. This offer he accepted, and received the advantage, though he never fulfilled the condition; for it was three years before he produced the *Mourning Bride,* and three more before he gave them *The Way of the World.*

It is not neceffary that we give in detail the remaining hiftory of the Englifh ftage; thofe who are anxious to be acquainted with it may confult Cibber's Hiftory of the Stage, continued by Victor, under the title of *A Hiftory of the Theatres of London and Dublin from the year* 1730.

It has been frequently a fubject of debate, whether the ftage be favourable to morals. We do not mean to enter into the controverfy; but we fhall make an obfervation or two. It will be allowed by all, that the intention of the players in acting, is to procure money; and the intention of the audience in attending the theatre, is to feek amufement. The players then will only act fuch plays as they believe will anfwer their intention. And what fort of plays are thefe? They are fuch as correfpond with the opinions, manners, and tafte, of the audience. If the tafte of the audience be grofs, therefore the plays will be grofs; if delicate and refined, they will be the fame. And if we go back to the time of Shakfpeare, we fhall find that this has been uniformly the cafe. The conclufion, then, which we draw, is this, if the tafte of the audience be pure, free from licentioufnefs, the plays will be the fame, and the ftage will be favourable to virtue.

THEBAID, a celebrated heroic poem of Statius, the fubject whereof is the civil war of Thebes, between the two brothers Eteocles and Polynices; or Thebes taken by Thefeus.

THEBES, or Thive, a celebrated city of Livadia, with a bifhop's fee. It is nothing now to what it was formerly, and yet is four miles in circumference, but fo full of ruins, that there are not above 4000 Turks and Chriftians in it. It is famous for a fine fort of white clay, of which bowls for pipes are made after the Turkifh fafhion; they are never burnt, but dry naturally, and become as hard as ftone. Here are two mofques, and feveral Greek churches. It is feated between two rivers, 20 miles NW. of Athens, and 280 SW. Conftantinople. Lon. 23. 40. E. Lat. 38. 17. N.

THEFT, or simple larceny, is "the felonious taking and carrying away of the perfonal goods of another." This offence certainly commenced then, whenever it was that the bounds of property, or laws of *meum* and *tuum,* were eftablifhed. How far fuch an offence can exift in a ftate of nature, where all things are held to be common, is a queftion that may be folved with very little difficulty. The difturbance of any individual in the occupation of what he has feized to his prefent ufe, feems to be the only offence of this kind incident to fuch a ftate. But unqueftionably, in focial communities, when property is eftablifhed, any violation of that property is fubject to be punifhed by the laws of fociety; though how far that punifhment fhould extend is matter of confiderable doubt.

By the Jewifh law it was only punifhed with a pecuniary fine, and fatisfaction to the party injured; and in the civil law, till fome very late conftitutions, we never find the punifhment capital. The laws of Draco at Athens punifhed it with death: but his laws were faid to be written with blood; and Solon afterwards changed the penalty to a pecuniary mulct. And fo the Attic laws in general continued; except that once, in a time of dearth, it was made capital to break into a garden and fteal figs: but this law, and the informers againft the offence, grew fo odious, that from them all malicious informers were ftyled *fycophants*; a name which we have much perverted from its original meaning. From thefe examples, as well as the reafon of the thing, many learned and fcrupulous men have queftioned the propriety, if not lawfulnefs, of inflicting capital punifhment for fimple theft. And certainly the natural punifhment for injuries to property feems to be the lofs of the offender's own property; which ought to be univerfally the cafe, were all men's fortunes equal. But as thofe who have no property themfelves are generally the moft ready to attack the property of others, it has been found neceffary, inftead of a pecuniary, to fubftitute a corporal punifhment; yet how far this corporal punifhment ought to extend, is what has occafioned the doubt. Sir Thomas More and the Marquis Beccaria, at the diftance of more than two centuries, have very fen-

ſibly propoſed that kind of corporal puniſhment which approaches the neareſt to a pecuniary ſatisfaction, viz. a temporary impriſonment, with an obligation to labour, firſt for the party robbed, and afterwards for the public, in works of the moſt ſlaviſh kind; in order to oblige the offender to repair, by his induſtry and diligence, the depredations he has committed upon private property and public order. But, notwithſtanding all the remonſtrances of ſpeculative politicians and moraliſts, the puniſhment of theft ſtill continues throughout the greateſt part of Europe to be capital: and Puffendorf, together with Sir Matthew Hale, are of opinion that this muſt always be referred to the prudence of the legiſlature; who are to judge, ſay they, when crimes are become ſo enormous as to require ſuch ſanguinary reſtrictions. Yet both theſe writers agree, that ſuch puniſhment ſhould be cautiouſly inflicted, and never without the utmoſt neceſſity.

The Anglo-Saxon laws nominally puniſhed theft with death, if above the value of twelve pence: but the criminal was permitted to redeem his life by a pecuniary ranſom; as, among their anceſtors the Germans by a ſtated number of cattle. But in the 9th year of Henry I. this power of redemption was taken away; and all perſons guilty of larceny above the value of twelve pence were directed to be hanged; which law continues in force to this day, for though the inferior ſpecies of theft, or petit larceny, is only puniſhed by whipping at common law, or (by ſtat. 4 Geo. I. c. 11.) may be extended to tranſportation for ſeven years, as is alſo expreſsly directed in the caſe of the Plate-glaſs Company; yet the puniſhment of grand larceny, or the ſtealing above the value of twelve pence (which ſum was the ſtandard in the time of king Athelſtan, 800 years ago), is at common law regularly death: which, conſidering the great intermediate alteration in the price or denomination of money, is undoubtedly a very rigorous conſtitution; and made Sir Henry Spelman (above a century ſince, when money was at twice its preſent rate) complain, that while every thing elſe was riſen in its nominal value, and become dearer, the life of man had continually grown cheaper. It is true, that the mercy of juries will often make them ſtrain a point, and bring in larceny to be under the value of twelve pence, when it is really of much greater value: but this, though evidently juſtifiable and proper when it only reduces the preſent nominal value of money to the ancient ſtandard, is otherwiſe a kind of pious perjury; and does not at all excuſe our common law in this reſpect from the imputation of ſeverity, but rather ſtrongly confeſſes the charge. It is likewiſe true, that by the merciful extenſions of the benefit of clergy by our modern ſtatute-law, a perſon who commits a ſimple larceny to the value of thirteen pence or thirteen hundred pounds, though guilty of a capital offence, ſhall be excuſed the pains of death; but this is only for the firſt offence. And in many caſes of ſimple larceny the benefit of clergy is taken away by ſtatute: as from horſe-ſtealing in the principals and acceſſories both *before* and *after* the fact; theft by great and notorious thieves in Northumberland and Cumberland; taking woollen cloth from off the tenters, or linens, fuſtians, calicoes, or cotton goods, from the place of manufacture (which extends, in the laſt caſe, to aiders, aſſiſters, procurers, buyers, and receivers); feloniouſly driving away, or otherwiſe ſtealing one or more ſheep or other cattle ſpecified in the acts, or killing them with intent to ſteal the whole or any part of the carcaſe, or aiding or aſſiſting therein; thefts on navigable rivers above the value of forty ſhillings, or being preſent, aiding and aſſiſting thereat; plundering veſſels in diſtreſs, or that have ſuffered ſhipwreck; ſtealing letters ſent by the poſt; and alſo ſtealing deer, hares, and conies, under the peculiar circumſtances mentioned in the Waltham black act. Which additional ſeverity is owing to the great malice and miſchief of the theft in ſome of theſe inſtances; and, in others, to the difficulties men would otherwiſe lie under to preſerve thoſe goods, which are ſo eaſily carried off. Upon which laſt principle the Roman law puniſhed more ſeverely than other thieves the *Abigei* or ſtealers of cattle, and the *Balnearii* or ſuch as ſtole the clothes of perſons who were waſhing in the public baths; both which conſtitutions ſeem to be borrowed from the laws of Athens. And, ſo too, the ancient Goths puniſhed with unrelenting ſeverity thefts of cattle, or of corn that was reaped and left in the field: ſuch kind of property (which no human induſtry can ſufficiently guard) being eſteemed under the peculiar cuſtody of heaven.

Theft-*Bote* (from the Saxon word *theof*, i. e. *fur*, and *bote*, *compenſatis*), is the receiving of a man's goods again from a thief, after ſtolen, or other amends not to proſecute the felon, and to the intent the thief may eſcape; which is an offence puniſhable with fine and impriſonment, &c.

THELIGONUM, in botany: a genus of plants belonging to the claſs of *monœcia*, and order of *polyandria*; and in the natural ſyſtem ranging under the 53d order, *Scabridæ*. The male calyx is bifid; there is no corolla; the ſtamina are generally 12. The female calyx is alſo bifid; there is no corolla; only one piſtil; the capſule is coriaceous unilocular, and monoſpermous. There is only one ſpecies, the *Cynocrambe*, which is indigenous in the ſouth of Europe.

THEME, denotes the ſubject of an exerciſe for young ſtudents to write or compoſe on.

THEMISON, a phyſician of Laodicea, a diſciple of Aſclepiades. He founded the methodic ſect, with a view to the more eaſily teaching and practiſing the art of medicine. Themiſon gave the firſt account of diacodium, which was prepared of the juice and decoction of poppy-heads and honey. He invented a purging medicine called *beira*.

THEMISTIUS, an ancient Greek orator and philoſopher, a native of Paphlagonia, who flouriſhed in the 4th century. He had great intereſt and favour with the emperors in his time, and, though a heathen, was of a very tolerating ſpirit. He taught for many years at Conſtantinople, of which city he was made præfect by Julian and Theodoſius; and lived to be exceeding old. More than 30 of his orations are ſtill extant, beſide commentaries on ſeveral parts of Ariſtotle's works.

THEMISTOCLES, the renowned Athenian admiral, general, and patriot, who gained the battle of Salamis againſt the Perſians. Being baniſhed his country by his ungrateful fellow-citizens, he fled to Artaxerxes king of Perſia; but in order to avoid taking up arms againſt his country, he ſlew himſelf, 464, B.C.

THEOBALD (Lewis), the ſon of an attorney at Sittinbourn in Kent, was a well-known writer and critic in the early part of the preſent century. He engaged in a paper called the *Cenſor*, publiſhed in Miſt's Journal, wherein, by delivering his opinions with too little reſerve concerning ſome eminent wits, he expoſed himſelf to their reſentment. Upon the publication of Pope's Homer, he praiſed it in terms of extravagant admiration, yet afterwards thought proper to abuſe it as earneſtly; for which Pope at firſt made him the hero of his Dunciad, though he afterward laid him aſide for another. Mr. Theobald not only expoſed himſelf to the laſhes of Pope, but waged war with Mr. Dennis, who treated him more roughly, though with leſs ſatire. He nevertheleſs publiſhed an edition of Shakſpeare, in which he corrected, with great pains and ingenuity, many faults that had crept into that poet's writings. This edition is ſtill

in great esteem; being in general preferred to those published by Pope, Warburton, and Hanmer. He also wrote some plays, and translated others from the ancients.

THEOBROMA, in botany: a genus of plants belonging to the class of *polyadelphia*, and order of *pentandria*; and in the natural system ranging under the 37th order, *Columniferæ*. The calyx is triphyllous; the petals, which are five in number, are vaulted and two-horned; the nectarium is pentaphyllous and regular; the stamina grow from the nectarium, each having five antheræ. There are three species; the *cacao*, *guazuma*, and *angusta*.

The *cacao*, or chocolate tree, we shall describe in the words of Dr. Wright: "In all the French and Spanish islands and settlements in the warmer parts of America, the chocolate tree is carefully cultivated. This was formerly the case also in Jamaica; but at present we have only a few straggling trees left as monuments of our indolence and bad policy. This tree delights in shady places and deep valleys. It is seldom above 20 feet high. The leaves are oblong, large, and pointed. The flowers spring from the trunk and large branches; they are small, and pale red. The pods are oval and pointed. The seeds or nuts are numerous, and curiously stowed in a white pithy substance. The cocoa nuts being gently parched in an iron pot over the fire, the external covering separates easily. The kernel is levigated on a smooth stone; a little arnotto is added, and with a few drops of water is reduced to a mass, and formed into rolls of one pound each. This simple preparation is the most natural, and the best. It is in daily use in most families in Jamaica, and seems well adapted for rearing of children." See CHOCOLATE.

THEOCRACY, in matters of government, a state governed by the immediate direction of God alone: such was the ancient government of the Jews before the time of Saul.

THEOCRITUS, the father of pastoral poetry, was born at Syracuse in Sicily. Two of his poems ascertain his age; one addressed to Hiero king of Syracuse, who began his reign about 275 years before Christ; and the other to Ptolemy Philadelphus king of Egypt. Hiero, though a prince distinguished in arms and political wisdom, does not seem to have been a patron of learning. This is supposed to have given birth to the 10th Idyllium. From Syracuse Theocritus went to Alexandria, where he seems to have found a munificent patron in Ptolemy Philadelphus, if we may judge from the panegyric which he composed on that prince (the 17th Idyllium). It has been said that Theocritus was strangled by Hiero, but we have not found evidence of this.

The compositions of this poet are distinguished, among the ancients, by the name of *Idylliums*, in order to express the smallness and variety of their natures: they would now be called *Miscellanies*, or *Poems on several Occasions*. The first nine and the eleventh are confessed to be true pastorals, and hence Theocritus has usually passed for nothing more than a pastoral poet; yet he is manifestly robbed of a great part of his fame, if his other poems have not their proper laurels. For though the greater part of his Idylliums cannot be called the songs of shepherds, yet they have certainly their respective merits. His pastorals ought to be considered as the foundation of his credit; upon this claim he will be admitted for the finisher as well as the inventor of his art; and will be acknowledged to have excelled all his imitators as much as originals usually do their copies.

The works of this poet were first published in folio by Aldus Manutius at Venice in 1495. A more elegant and correct edition was printed by Henry Stephens at Paris in 1566. An edition was published at Leipsic in 1765, with valuable notes by the learned Reiske. But what will most highly gratify the admirers of pastoral poetry, is an edition published in 1770, 2 vols 4to. by Mr. Thomas Warton. It is accompanied by the scholia of the best editors, and the different readings of 15 MSS.

THEODOLITE, a mathematical instrument for measuring heights and distances. See GEOMETRY.

THEODORE, king of Corsica, baron Nieuhoff in the county of La Marc in Westphalia. He had his education in the French service, and afterwards went to Spain, where he received some marks of regard from the Duke of Riperda and Cardinal Alberoni; but being of an unsettled disposition, he quitted Spain, and travelled into Italy, England, and Holland, in search of some new adventure. He at last fixed his attention on Corsica, and formed the scheme of rendering himself sovereign of that island. He was a man of abilities and address; and having fully informed himself of every thing relating to Corsica went to Tunis, where he fell upon means to procure some money and arms; and then went to Leghorn, from whence he wrote a letter to the Corsican chiefs Giafferi and Paoli, offering considerable assistance to the nation if they would elect him as their sovereign. This letter was consigned to Count Domenico Rivarola, who acted as Corsican plenipotentiary in Tuscany; and he gave for answer, that if Theodore brought the assistance he promised to the Corsicans, they would very willingly make him king.

Upon this he, without loss of time, set sail, and landed at Tavagna in the spring of the year 1736. He was a man of a very stately appearance, and the Turkish dress he wore added to the dignity of his mien. He had a few attendants with him; and his manners were so engaging, and his offers so plausible, that he was proclaimed king of Corsica before Count Rivarola's dispatches arrived to inform the chiefs of the terms upon which he had agreed. He brought with him about 1000 zequins of Tunis, beside some arms and ammunition, and made magnificent promises of foreign assistance; whence the Corsicans, who were glad of any support, willingly gave in to his schemes. Theodore instantly assumed every mark of royal dignity. He had his guards and his officers of state; he conferred titles of honour, and struck money both of silver and copper. The silver pieces were few in number, and can now hardly be met with; the copper coins have on one side T. R. that is, "Theodorus Rex," with a double branch crossed, and round it this inscription, PRO BONO PUBLICO RE. CO. that is, "For the public good of the kingdom of Corsica:" on the other side is the value of the piece; *Cinque solidi*, or five sous.

The Genoese were not a little confounded with this unexpected adventurer. They published a violent manifesto against Theodore, treating him with great contempt; but at the same time showing they were alarmed at his appearance. Theodore replied, in a manifesto, with all the calmness and dignity of a monarch; but after being about eight months in Corsica, perceiving that the people began to cool in their affections towards him, he assembled his chiefs, and declared he would keep them no longer in a state of uncertainty, being determined to seek in person the support he so long expected. He settled an administration during his absence, recommended unity in the strongest terms, and left the island with reciprocal assurances of fidelity and affection. He went to Holland, where he was so succesful as to obtain credit from several rich merchants, particularly Jews, who trusted him with cannon and other warlike stores to a great value, under the charge of a supercargo. With these

he returned to Corſica in 1739; but by this time the French, as auxiliaries to the Genoeſe, had become ſo powerful in the iſland, that though Theodore threw in his ſupply of warlike ſtores, he did not incline to venture his perſon, the Genoeſe having ſet a high price on his head. He therefore again departed; and after many unavailing attempts to recover his crown, at length choſe for retirement a country where he might enjoy the participation of that liberty which he had ſo vainly endeavoured to give his Corſicans; but his ſituation in England by degrees grew wretched, and he was reduced ſo low as to be ſeveral years before his death a priſoner for debt in the King's Bench. At length, to the honour of ſome gentlemen of rank, a charitable contribution was ſet on foot for him in the year 1735. Mr. Boſwell obſerves, that Mr. Horace Walpole generouſly exerted himſelf for the unhappy Theodore, and wrote a paper in *The World* with great elegance and humour, ſoliciting a contribution for the unhappy monarch in diſtreſs, to be paid to Mr. Robert Dodſley bookſeller, as lord high treaſurer. This brought him a very handſome ſum, and he was ſet at liberty. That gentleman adds, that Mr. Walpole has the original deed, by which Theodore made over the kingdom of Corſica in ſecurity to his creditors, and that he has alſo the great ſeal of the kingdom. Theodore died in 1756, and was buried in St. Anne's church-yard, Weſtminſter; where, in 1757, a ſimple unadorned monument of marble was erected to his memory by a gentleman, with an inſcription; which, after mentioning ſome of the above particulars, concludes with the following lines:

> The grave, great teacher, to a level brings
> Heroes and beggars, galley-ſlaves and kings;
> But Theodore this moral learn'd ere dead,
> Fate pour'd its leſſon on his living head,
> Beſtow'd a kingdom and deny'd him bread.

Theodore left a ſon, who was an accompliſhed gentleman.

THEODORET, biſhop of St. Cyricus in Syria, in the 5th century, and one of the moſt learned fathers of the church, was born in the year 386, and was the diſciple of Theodorus Mopſueſta and St. John Chryſoſtom. Having received holy orders, he was with difficulty perſuaded to accept of the biſhopric of St. Cyricus, about the year 420. He diſcovered great frugality in the expences of his table, dreſs, and furniture, but ſpent conſiderable ſums in improving and adorning the city of Cyricus. He erected two large bridges, public baths, fountains, and aqueducts, and laboured with great zeal and ſucceſs in his dioceſe. Yet his zeal was not confined to his own church: he went to preach at Antioch, and the neighbouring towns; where he became admired for his eloquence and learning, and had the happineſs to convert multitudes of people. He wrote in favour of John of Antioch and Neſtorious, againſt Cyril's Twelve Anathemas: he afterwards attacked the opinions of Neſtorius, and was depoſed in the ſynod held by the Eutychians at Epheſus; but was afterwards reſtored by the general council of Chalcedon, in which he was preſent, in 451. It is thought that he died ſoon after; though others ſay that he lived till the year 470. There are ſtill extant Theodoret's excellent Commentary on St. Paul's Epiſtles, and on ſeveral other books of the holy Scriptures. 2. His Eccleſiaſtical Hiſtory from the time of Arius to Theodoſius the Younger. 3. The hiſtory of the famous Anchorites of his time. 4. Epiſtles. 5. Diſcourſes on Providence. And, 6. An excellent treatiſe againſt the Pagans, intitled, *De curandis Græcorum affectibus;* and other works. The beſt edition of all which is that of Father Sirmond in Greek and Latin, in 4 vols. folio.

THEODOSIUS I. called the *Great*, was a native of Spain. The valour he had ſhown, and the great ſervices he had done to the empire, made Gratian, attacked by the Goths and Germans, admit him as a partner in the government. He received the purple in 379, aged 43.

THEOGNIS, an ancient Greek poet of Megara in Achaia; flouriſhed about the 59th Olympiad, 144 B.C. We have a moral work of his extant, containing a uſual ſummary of precepts and reflections, to be found in the collections of the Greek minor poets.

THEOLOGY;

OR,

THE STUDY OF RELIGION.

TO aſcend by a chain of reaſoning from things viſible to things inviſible, from palpable to impalpable, from terreſtrial to celeſtial, from the creature even up to the Creator, is the buſineſs of theology: it is not ſurpriſing, therefore, that the union of many doctrines is neceſſary completely to form ſuch a ſcience. To underſtand, and properly to interpret, the ſcriptures or revelation, demands not leſs ſagacity than aſſiduity. The gift of perſuaſion is alſo eſſential to the miniſters of the goſpel. And laſtly, the civil government has committed to their care certain functions of ſociety, which relate, or ſeem to relate, either to the doctrines or morality of the goſpel. They aſſemble, for example, in bodies to form conſiſtories; they judge in matrimonial caſes; they carry conſolation and hope to the ſouls of the ſick; they prepare for death thoſe criminals which juſtice ſacrifices to public ſafety; they take upon themſelves the charge of Ephori, with the inſpection of ſome pious foundations; they diſtribute alms; they adminiſter the ſacraments, &c.

To diſcharge fully ſo many duties, the theologian has need, 1. Of ſeveral preparatory ſtudies; 2. Of ſome theoretic ſciences; and, 3. Of many doctrines which have for their object his miniſterial office. The firſt are,

1. The languages; and among theſe,
   (*a*) His native language, in which he is to preach and exercise his miniſtry, and with which he ought to be perfectly acquainted.

(*b*) The Latin language, which is the language of the learned world in general.
(*c*) The Greek language, in order to underſtand the new Teſtament.
(*d*) The Hebrew language, of which the Talmudian and Rabbinical idioms are a part.
(*e*) The Arabic language.
(*f*) The Syriac language.
(*g*) The French language. And,
(*h*) The Engliſh language. The two latter of which now appear neceſſary to every man of letters, and particulary to a theologian, on account of the excellent works which are wrote in thoſe languages.

2. The principal parts of philoſophy: as,
(*a*) Logic.
(*b*) Metaphyſics.
(*c*) Moral philoſophy.
3. Rhetoric and eloquence, or the art of ſpeaking correctly, of writing with elegance, and of perſuaſion.

To which may be added,

4. The elements of chronology, and univerſal hiſtory.
5. The ſtudy of the Jewiſh antiquities.

He who would devote himſelf to the important employment of a theologian, and has the noble ambition to excel in it, ſhould early impreſs on his mind theſe truths: that the years which are paſſed at an univerſity are few; that they run rapidly away; that they are entirely engroſſed by the theoretic ſciences; and that he who does not carry with him to the univerſity a fund of knowledge in the preparatory parts of learning, commonly brings very little away, when his age or his parents oblige him to quit it.

The theoretic ſciences of a theologian are,

1. The dogmatic, or the theory of theology; which ſome Latin authors name alſo *thetica*, or *ſyſtematica*.
2. The exegeſis, or the ſcience of attaining the true ſenſe of the holy ſcriptures.
3. The hermeneutic, or the art of interpreting and explaining the ſcriptures to others. This differs in general but little from the exegeſis, and in ſome reſpects is quite the ſame.
4. Polemic theology, or controverſy.
5. Natural theology.
6. Moral theology.
7. The hiſtory of the church under the Old and New Teſtaments.

The practical ſciences are,

1. Homiletic theology.
2. Cathechetic theology.
3. Caſuiſtic theology.

We do not here particularly name the *patriſtic theology* (*theologia patrum ſeu patriſtica*), becauſe all Christian communions are not agreed in their opinions concerning the degree of authenticity and infallibility that is to be attributed to theſe ancient fathers of the church. The Proteſtants believe, that theſe primitive theologians were liable to error in their ſentiments as well as thoſe of our days; and, in all probability, that they were leſs ſkilful, leſs learned, leſs clear, and leſs accuſtomed to cloſe reaſoning, than the latter, as philoſophy was then more imperfect. But as we find in the writings of theſe fathers, many elucidations of the doctrine of the primitive apoſtles, and many irrefragable teſtimonies of the authenticity of divers remarkable events, which ſerve to eſtabliſh the truth of Chriſtianity; and as we there ſee, moreover, the origin of errors, of arbitrary ceremonies, and of many doctrines that have been introduced into the Chriſtian church; the reading and the ſtudy of theſe fathers cannot but be of great utility to the theologian. To a virtuous citizen, who unites ſuch various ſciences, and employs them in pointing out to his fellow-citizens the path that leads to temporal and eternal felicity; in a word, to a wiſe theologian, what veneration is not due?

Sect. I. *Of the* Dogmatic.

Under the general term of dogmatic, we comprehend that part which the different writers on theology have called ſometimes *theoretic*, ſometimes *ſyſtematic*, and ſometimes *thetic theology*, &c. The term *dogmatic* appears to us the moſt general, and the moſt juſt, to expreſs the ſubject that we intend, as it comprehends an entire ſyſtem of all the dogmas or tenets that each religion profeſſes: whether it teach theſe dogmas by the way of theſis, as articles of faith; by public lecture; by catechiſing; or any other manner whatever.

Every poſitive religion muſt naturally have a ſyſtem of certain points of doctrine to propoſe to its followers; otherwiſe each one would form a particular ſyſtem according to his own fancy: there would be as many different religions as there are individuals on the earth, and each ſociety would conſiſt of a confuſed maſs of fantaſtic opinions; as the different modes of thinking, and the different degrees of diſcernment, are varied and compounded by mankind to infinity; but truth, on the contrary, is uniform and invariable.

The Chriſtian religion is as compound in its dogmas as it is ſimple in its moral principle. It includes, 1. The dogmas founded on the lights of reaſon. 2. Thoſe drawn from the Old Teſtament and the law of Moſes. 3. Thoſe taken from the New Teſtament and the doctrine of Jesus Christ. 4. Thoſe that the fathers of the church have drawn from the Holy Scriptures. 5. Thoſe that the church under the New Teſtament has preſcribed to Chriſtians by œcumenical and other councils aſſembled in different ages. 6. The dogmas that the popes, in quality of heads of the church, have eſtabliſhed by their bulls: and to theſe muſt be added, on the part of the Proteſtants, 7. The dogmas that the reformers, eſpecially Luther and Calvin, have taught. 8. The deciſions of ſynods: and laſtly, the tenets that are maintained by the different ſects, as Socinians, Anabaptiſts, Quakers, &c. Each of theſe particular religions or ſects pretend to ſupport their dogmas both by reaſon and revelation: we do not here offer a work of controverſy, and are very far from attempting to determine on which ſide truth and reaſon are to be found.

Our zeal, however, for the Chriſtian religion in general, which we regard as perfectly divine, and as the only religion adapted to promote the happineſs of mankind in this world, and to ſecure it in the next, and the deſire we have that it may endure to the end of time, compels us to make in this place one important reflection; which is, that ſimplicity is ever an eſſential attribute of perfection, as complexity is of imperfection. Now, it cannot be denied, without doing violence to truth, that among the different dogmas of which we have been ſpeaking, there are ſeveral that ſeem to be founded on ſpeculations very abſtruſe, on ſubtleties very intricate, and on interpretations very ambiguous. God certainly never intended that all mankind ſhould be theologians; he has not given them his divine word to be the cauſe of diſcord among men, nor that they ſhould paſs their whole lives in a painful ſearch after objects of belief and articles of faith; and that they ſhould forego, in that purſuit, the neceſſary offices of life, and their duties as citizens. The dogmas, then, eſſentially neceſſary to the welfare of mankind, ought to conſiſt of a ſmall number, and

to bear the marks of ſimplicity and perſpicuity; without which they muſt be imperfect, and conſequently the work of man. Our intention, in making this remark, is, to extend our voice, if it be poſſible, even to poſterity, whom we would conjure not to injure our religion, ſo holy and ſo admirable, by a multiplicity of dogmas. It is neceſſary, however, that the divine, who makes it his ſtudy and his profeſſion, ſhould be thoroughly acquainted with the theory of this ſcience, in order that he may be able to inſtruct the ſincere Chriſtian, and to explain the nature of each particular dogma, as well as the ſolidity of its proofs; and to this it is that the ſtudy of the dogmatic leads; of which we ſhall now continue the analyſis.

The dogmatic is then nothing but *a ſuccinct expoſition of all the dogmas of the Chriſtian religion, in a natural and philoſophical order.* By the word philoſophic, we do not here preciſely mean the method of mathematicians, in the manner the late M. Wolff has applied it to philoſophy; every ſubject is not capable of a demonſtration ſo exact and rigid; but a regular order is required in the arrangement of the general ſyſtem; and a connection is to be preſerved in the ſeveral matters that form it: the definitions ſhould be juſt; the diviſions exact; the arguments ſolid; the proofs clear; the citations concluſive; the examples ſtriking; and, in a word, every thing ſhould be adduced that appertains to ſo important a diſcipline.

It is very eſſential, moreover, in the dogmatic, at the beginning of each theſis, to explain the ſeveral terms that are peculiar to it, and that uſe has eſtabliſhed in treating of theology; to draw from each definition certain axioms, and from thence to form propoſitions, and to illuſtrate them by ſolid reaſoning. Laſtly, we ſhould not neglect, in ſuch a ſyſtem, to make uſe of the expreſſions uſed in the ſymbolic books that have been received by the whole Chriſtian church, and which cannot be rejected or altered, without cauſing a confuſion in our ideas, and in the general ſyſtem of the Chriſtian religion. But before we make the leaſt advance in the ſtudy of Chriſtian theology, it is indiſpenſably neceſſary to examine the proofs by which the truth, the authenticity, and the divinity of the ſacred and canonical books are eſtabliſhed; for this is the foundation of all the dogmas, and the axis on which its whole doctrine turns.

The ſyſtematic part of the Chriſtian religion, among the great number of its dogmas or theſes, has *three principal*, from which all the reſt are derived, and which form the baſis of its whole doctrine:

1. The exiſtence of one God in three perſons.
2. The neceſſity of a Mediator or Redeemer.
3. The real appearance of the Mediator or Meſſiah on the earth.

Whoever writes, profeſſes, or teaches the dogmatic, ſhould be, above all things, careful well to eſtabliſh theſe important truths; to evince them by the ſtrongeſt and moſt evident proofs, drawn partly from the lights of reaſon, and partly from revelation: and he will then ſee with what facility all other theſes flow from, and how eaſy it will be to prove them by, theſe.

The infinite variety that is found among mankind in their manner of thinking, and in their method of treating ſubjects; the frequent changes that have happened in the exterior form of philoſophy, and in the method of treating it; the oppoſitions that have been raiſed at all times againſt divers doctrines of the Chriſtian religion; all theſe have produced among theologians, different ſyſtems of the dogmatic. Sometimes they have combined poſitive theology with morality, and have formed a ſyſtem that they call *theologia theoretico-practica*, or *theologia thetico-moralis*, &c.: ſometimes they have refuted the arguments that others oppoſe to certain theſes; and from thence has aroſe a ſyſtem that they call *theologia thetico*, or *dogmatico*, or *poſitivo-polemica*: ſometimes they have joined to natural theology that of revelation; and have formed a dogmatic, called *philoſophico theologica*: and ſo of the reſt. But, beſides that theſe diſtinctions and denominations are in themſelves pedantic, it is at all times more eligible, in every ſcience, to avoid confounding with each other the ſeveral branches of which it conſiſts. The different dogmas, morality, philoſophy, and controverſy, are ſeparate articles; and when each of theſe parts of theology are ſeparately treated, they are diſpoſed with more order in the mind, and a greater light is diffuſed over their ſeveral ſubjects.

It appears, moreover, from the ſimple enumeration that we have made above, of the different principles on which the dogmas of the Chriſtian religion are founded, that, to be thoroughly acquainted with its whole theory, the theologian ſhould alſo apply himſelf to the ſtudy of the ſymbolic books of its communion, and eſpecially ſhould be well verſed in the Creed of the Apoſtles; that of Nice and St. Athanaſius; the book called *Formula Concordiæ*; the Theſes of the council of Trent; the Catechiſms of Luther; the Confeſſion of Augſburg; the Articles of Smalcalden; the Catechiſm of Heidelberg, &c. That he ſhould be well acquainted with that part of theology that is called *patriſtica*: that is to ſay, that he ſhould be well read in the fathers of the church; that he ſhould not be ignorant even of ſcholaſtic theology; that he ſhould at leaſt know the frivolous ſubtleties and the complicated method of the ancient ſcholaſtic divines, which was derived from the philoſophy of Ariſtotle and the ſchools; that he ſhould make a ſerious ſtudy of the ſacred hiſtory of all ages, the councils and ſynods; that he ſhould, above all, never loſe ſight of natural theology; and laſtly, that it is indiſpenſably neceſſary that he ſhould procure a good bibliotheque, or treatiſe of eccleſiaſtical writers (A), which he may conſult occaſionally, and learn from thence to know the beſt guides. The more a theologian applies himſelf to all theſe ſubjects, the more ability he will acquire in this ſcience, and the more perfect he will be in the theory of that religion which it is his duty to teach to others.

Revealed religion being founded (at leaſt in great part) on natural religion, and philoſophy being the ſource from whence the principles and the knowledge of the latter are derived, it is evident that philoſophy is intimately connected with theology: nevertheleſs, the aid of the former is to be employed with precaution, and is not to be regarded as the foundation of the theological dogmas, but only as a mean by which they may be explained and enforced. The Holy Scriptures conſtitute perpetually the true baſis of revealed theology: philoſophy effectually concurs, however, to prove the exiſtence and the attributes of the Supreme Being; the neceſſity of the creation of the univerſe by Almighty God, in oppoſition to every other poſſible manner of its being produced: it furniſhes, moreover, plauſible conjectures concerning the intention of the Almighty in creating this world; it proves the neceſſity of a perpetual power to

(A) Thoſe of Du Pin and William Cave are moſt celebrated.

preserve it; it supposes, that as God could not produce any thing that was not perfect in its kind, he could not have created man as he now is; it vindicates the conduct of the Supreme Being, in appointing chastisements for transgressions, by showing that moral evil was not introduced into the world by absolute necessity, but by the abuse of liberty, the most noble prerogative of the human soul; it determines the necessity of a Mediator; it furnishes arguments for the belief of the immortality of the soul, and of a future state that has a relation to the moral actions of this life; and lastly, it inspires a love of God as a Being of sovereign perfection, a gratitude towards him as our Creator and Preserver, and a submission to his will as our Supreme Ruler and Director; motives of all others the most powerfully conducive to a virtuous conduct.

It is this use which theology makes of philosophy, that has given occasion to divide the theses of the dogmatic into pure and mixed; that is, into theses that are founded entirely upon revelation; and such as arise from an union of reason with revelation. Of the first sort are, 1. The article of the Holy Scripture itself; which treats of its divine origin, its authority, and its efficacy. 2. The dogma of the Trinity. 3. That of the origin of evil, or of original sin. 4. The whole article of Jesus Christ. 5. The dogma of the efficacy and operations of the Holy Ghost. 6. That of the sacraments. 7. That of repentance. 8. That of the belief in Jesus Christ. 9. That of good and bad angels. 10. That of the end of the world, and the last judgment. 11. That of the church, &c. The mixed dogmas or theses are, 1. The doctrine of a Supreme Being in general; his being, his attributes, and his works. 2. That of the creation. 3. That of providence, or the conservation of the world. 4. Of sin, as a transgression of the laws of God. 5. Of rewards and punishments after death, &c. He that attentively studies, thoroughly comprehends, and well digests, all these theses, will have reason to rest content with his knowledge of the dogmatic.

Sect. II. *Of the* Exegesis *and the* Hermeneutic.

The term *Exegesis* is derived from the Greek verb EXE'GONSTAI, which signifies to *relate* or *explain*; and that of *Hermeneutic* from ERME'NEUEIN, which means to *search into*; and, in a figurative sense, *thoroughly to examine* and *interpret*. The learned, but especially the theologians, make use of these words, sometimes as synonima, to express the same thing, and sometimes (as there are scarce any terms that are perfectly synonymous) to denote a small difference between two parts of learning of the same nature. By the word Exegesis they mean, *that science which teaches clearly to investigate the true sense of the original text of the Holy Scriptures*; and by the Hermeneutic, *the art of interpreting and explaining the Holy Scriptures to others* (B). This distinction is so subtle, that it becomes almost frivolous. They are, in fact, the same science; the one is only an explication of the other, and for that reason we think we are authorised to treat of them together in this place.

In order to the true understanding of the sacred text of all the books contained in the Holy Bible, whether of the Old or New Testament, it is absolutely necessary that the theologian be thoroughly accquainted, not only with the languages in which these books were originally wrote, but likewise with the history and antiquities of those remote times in which their authors lived. With regard to researches into the history of the Jewish nation, their antiquities, their morals, and their customs, it will be found advantageous to pursue it as far as the nature of the subject will admit, without, however, engaging in critical subtleties that lead to a labyrinth to which there is no end, and have spread more clouds over theology than even the scholastic controversies have formerly done.

He who would successfully interpret any work whatever, should first consider the spirit in which it is wrote: he should attentively reflect on the general design of that work, and the particular motives that induced the author to undertake it; his genius, his passions, his taste; the time, the place, and the people for whom it was written. These considerations are, above all, necessary, when we would undertake the explication of the Holy Scriptures. Independent of those reflections which the theologian will of himself naturally make on the subject, the excellent commentaries which we have on the Bible, in which the greatest men of every age have exercised their genius, may serve him as a guide in this course. The critical histories will likewise afford great aid, and throw admirable lights on this matter. Clear ideas, an acute discernment, and a solid judgment, will complete the work.

Furnished with ideas from such sources, the theologian may venture to investigate the true sense of those passages of Holy Scripture that may appear to him obscure, contradictory, or difficult, and to interpret them to others: but he will be more wise and less vain than to attempt to impose his decisions on mankind, at all times, as authentic and infallible. The human discernment is ever confined and imperfect; and God has not granted to any man, to any theologian, or assembly of divines, an exclusive power of interpreting his divine word: he has moreover denounced his anathema against all those who shall add or take away a single word thereof. But to explore the true sense of any passage, and to explain it to others, cannot certainly be deemed either adding or retrenching.

Sect. III. *Of* Moral Theology.

If it were allowable to compare the Saviour of the world to a weak mortal, we would say, that the conduct of Jesus Christ resembled that of Socrates, who has left us no part of his doctrine in writing, but whose whole instructions (as well as the particulars of his life) have been collected, digested, and published, by his disciples. The evangelists are the only historians of the Messiah: it is to their labours that we owe the knowledge of his actions upon earth, and his divine doctrine. The four Evangelists, and the Acts of the Apostles wrote by St. Luke, contain therefore *alone* the history of the life of Jesus Christ, and the doctrine that he taught. His apostles and disciples began by paraphrasing his doctrine, as well by their evangelic sermons as in the epistles they addressed to the faithful of several Christian churches: they have given explications, and have added pastoral instructions, which are in effect admirable; but which, nevertheless, form not the original text of the discourses of our Saviour. The bishops of the apostolic century, the fathers of the church in all succeeding centuries, the other bishops and ecclesiastics, the councils, the synods, the doctors of theology, the popes, the consistories, the reformers likewise, and an infinity of theologians, have drawn from the Gospel, and sometimes also from the letters of the apostles, and from other commentaries on the Gospel, various tenets; which, united, form at this day the general system of the Christian religion. The theologians who devote themselves to the service of the altar, study this

(B) The *Exegesis* is a kind of rational grammar. The *Hermeneutic* is the art of interpreting entire passages.

ſyſtem in the dogmatic: the laity learn it by means of catechiſms; and after they have made confeſſion of their faith, ſolemnly adopt it when they are received into the boſom of the church.

It is not the ſame with regard to the morality of Jeſus Chriſt, which every one may read in the Goſpel; and to know which, it is not neceſſary to become learned, nor to ſtudy a complicated ſyſtem. If the dogmatic were not armed with a thouſand arguments to eſtabliſh the divinity of Jeſus Chriſt, yet would the morality of his goſpel ſufficently prove it; ſeeing that it is perfectly holy, entirely ſimple, ſtrictly juſt, and moſt completely adapted to promote the felicity of the human race in this world, and in that which is to come. The Saviour of the world has not enjoined any part of mankind to engage in diſputes or abſtract refinements: the ſole command that he has given them is, *to believe in his goſpel*; and that is compriſed in one word only, LOVE: the grand and only principle on which the whole of his ſacred doctrine is founded.

To produce the greateſt effects poſſible by the leaſt efforts, is the higheſt perfection in nature, and at the ſame time the true characteriſtic of divinity. God has given to all the beings that compoſe the univerſe, one ſimple principle alone, by which the whole, and every part, is connected and perpetually ſupported; and that is LOVE. The attraction of the celeſtial bodies, as well as of thoſe of which our globe is formed, is a ſpecies of *love*; a mutual tendency toward each other. The uniform generation, by which all beings are perpetuated, is founded in *love*. This is the true *minimum*, the true ſyſtem of *the leaſt action*, which includes ſomething ſo divine. It appears to be the will of God to eſtabliſh by the mouth of the Meſſiah, the ſame ſimple principle in morality, that is, in the rule of human actions, by ſaying *Love*: in a word, it was his will, that in the conduct of mankind, as in every other part of nature, there ſhould be no other principle than that of Love.

That in the different ſyſtems of ethics of the ancient heathen philoſophers many maxims and precepts of admirable morality are to be found, cannot be denied; but, beſide that theſe philoſophers are almoſt continually contradicting each other in their maxims, no one of their ſyſtems is founded on the true principle. In ſearching after it, they have diſcovered ſome excellent truths; but it is has been by chance, and they are at beſt imperfect. - Jeſus Chriſt has alone taught mankind perfect morals, by deducing them from this true principle. Every principle ſhould be ſimple: the idea of a compound principle implies at once an imperfection. Every principle ſhould be comprehenſive, even univerſal, in its effects. Every principle, whoſe effects are limited, is imperfect. God himſelf is uniform in his principle, and infinite in his effects. His doctrine, or his law, ſhould be the ſame. Jeſus Chriſt has made known to mankind this principle, ſimple and univerſal. He has therefore been, in this ſenſe alſo, the true Saviour of the world. He has preached to mankind; and his only doctrine has been that of love.

By the word *Love*, with regard to bodies in general, is meant a tendency, a mutual inclination, that urges them to join and to coaleſce; and with regard to men in particular, a lively affecting pleaſure that poſſeſſes the mind on contemplating the perfections of any object. This pleaſure is always accompanied with a deſire either to poſſeſs that object, or to render it propitious. By adopting therefore this principle, and this laſt definition of *Love*, it follows, that all the duties of man conſiſt, 1. In the love of God in preference to all other objects. 2. In the love of himſelf. 3. In the love of his own ſpecies. 4. In the love of every other creature to a certain degree. The doctrines of Jeſus Chriſt are, in theſe reſpects, the moſt explicit.

From this principle flows our duty towards God, towards ourſelves, our neighbour, and to thoſe beings that are ſubject to our power. The firſt rule is, to communicate to all thoſe, whom it is our duty to love, all the good, and to preſerve them from all the evil in our power. The ſecond, to do to no one what we would not have done to ourſelves in ſimilar circumſtances. The third, which is the ſimple effect of love, is to endeavour to pleaſe the object that we ought to love. The fourth, to endeavour to render the pleaſures that we communicate to others, as lively as poſſible, and thoſe inevitable evils, which we are ſometimes conſtrained to do to them, as ſupportable as we can; and ſo of the reſt. The whole evangelic doctrine of our Saviour is replete, from beginning to end, with admirable precepts for theſe purpoſes; and theſe precepts, with their applications, general and particular, we learn from that ſcience which we call *moral theology*.

This doctrine we diſtinguiſh from moral philoſophy, or the ſimple doctrine of Ethics; becauſe Jeſus Chriſt has made known, in his divine morality, a far greater degree of perfection than is diſcoverable by the mere light of human reaſon. For the renouncing of ſelf-intereſt, and private pleaſure; the forgiveneſs of offences; the love of his enemies; the triumph over deſtructive paſſions; and many other like virtues, the Chriſtian is alone indebted to the doctrine of Jeſus Chriſt.

A ſecond difference between Chriſtianity and philoſophy conſiſts in this, that the firſt adds to the ſecond ſtill new motives to the practice of virtue. That of redemption and pardon, obtained by Jeſus Chriſt, is not one of the leaſt. Its argument is this: if God has ſo loved mankind, as to afford them the means by which the evil, cauſed by their own fault, may be aboliſhed, it would be the greateſt of all ingratitude and malice towards himſelf, if man ſhould not endeavour to acknowledge this love, to merit it, and to embrace the means of pleaſing God. A third motive, taken alſo from the merit of Jeſus Chriſt, here offers itſelf as an auxiliary to the two former. According to the Chriſtian doctrine, man has not by nature the power to practiſe all thoſe virtues which are agreeable to God: but the ſame doctrine teaches, on the other hand, the conditions by which it is poſſible to pleaſe that moſt holy and perfect Being; and gives the Chriſtian hope alſo that he ſhall never labour in vain.

Laſtly, the Chriſtian morality is of far greater efficacy in adverſity than philoſophy: it carries with it a wonderful conſolation in misfortune, and even in the hour of death; for the Chriſtian may ſay, with the Apoſtle, *that godlineſs* (or the practice of evangelic morals) *is in all things profitable, having the promiſe of the preſent life, and that which is to come.*

SECT. IV. *Of* POLEMIC THEOLOGY, *or* CONTROVERSY.

WE cannot ſufficiently lament, that the church of the God of peace ſhould be a church-militant; and that a doctrine ſo ſimple and clear as that of the Goſpel ſhould be the cauſe of diſcord even among Chriſtians themſelves. Nevertheleſs, as the truth is ſo difficult to diſcover in all things, and eſpecially in matters of religion; as it is ſo frequently covered with the clouds of intereſt and ambition; as the ſame object appears ſo different to different men; and as error in the face of the world conſtantly aſſumes the maſk of truth; it is but juſt that the true religion be furniſhed with arms to combat error, and to pluck off that deceitful maſk by which ſo many poor mortals are ſeduced.

The theologian, who has made the proper preparatory ſtudies, who is thoroughly inſtructed in natural religion, in

the dogmatic and the hermeneutic, and who joins to these found logic, is already well prepared for this spiritual combat: he is armed, but he is still to learn how to use these arms: he must also be made acquainted with the enemies he is to encounter, to know their force, and the arts they will use against him. It is plain enough, we suppose, that we here speak of spiritual arms; of those with which we are furnished by reason and the Holy Scripture: evil be to him that employs any other: force is ever an infallible proof of the want of argument. The propagation of a religion by the sword, after the manner of Mahomet; persecutions either secret or open; constraint, violence, every sort of religious war, is so atrocious, so contrary to the spirit of the Gospel, in a word, so detestable, that every true Christian must avert his sight from such infamous horrors.

Controversy is conducted either from the pulpit or chair, by way of harangue, by conversation, or by writing. The first quality that is necessary to a disputant is reason, and the next moderation; in what manner soever the contest is conducted, these two qualities should constantly be manifest, during the whole course of altercation.

There are some errors that attack the system of religion, and there are others that attack even its morality. In order properly to oppose an error, we must begin by finding out its real meaning: we must therefore study the different systems of other religions, and the principal heresies, if we would successfully refute them. We do not mean by this, that the theologian should know all the errors that spring up in the brain of each individual; we speak only of those that are professed by whole sects.

They who attack our religion, found their opinions either on the interpretation of the sacred text, or on philosophy or history; and we should always oppose them with the same arms with which they pretend to defeat us. It is necessary to begin by divesting ourselves of all prejudice, in order the better to show others those prejudices by which they are deluded. We should never make use, but especially when we oppose weak minds, of opprobrious terms in the course of the debate, nor contend about words or expressions, nor attack incidental circumstances that may attend erroneous principles; but bend our whole force against the root of the tree, the principal error; to uncover it, to dig it up, to destroy it.

Polemic theology is taught in universities by two methods, according to the views of the student. If he learn it merely in order hereafter to defend his parishioners against the most prevalent errors, he is only to examine the principal controversies according to the systematic order of theology; and may content himself with knowing their true meaning, together with the arguments of those that oppose them. But if it be his intention to teach this science to others, or to engage in controversy, either by conversation or writing; in short, if he aspire to renown in it, he should study the origin and history of each controversy, he should make himself a complete master of the arguments for and against it, the exceptions that it makes, its interests, its different revolutions and actual state, &c. These follow, in this study, either the order established in the dogmatic, or that which is used in symbolic books, that is, such as treat on articles of faith.

In order the better to elucidate the method to be observed in this sort of study, we shall say, that to acquire a complete knowledge of theological disputes, the student should, 1. Make the examen of each religion, and even of each controversy. 2. He should thoroughly examine his system in the symbolic books, and likewise the sources of his religion. 3. He should precisely determine the principal and capital error of each religion, sect, or individual; that which is the source from whence all the other errors flow. 4. Search into the political causes of each error, and each controversy, from history. 5. Examine the natural order according to which all the errors have taken their rise, the one from the other: and lastly, 6. Confront the respective arguments, the answers, and exceptions, that each party has made to defend its cause. To all this is to be added, 7. What they call *collegium disputatorium*; an exercise by which all that is learned in the closet and in the schools is called forth and animated, under the inspection of a professor; and the mind is accustomed to think, and the tongue to speak, with facility and efficacy.

The principal contests in which the theologian may be engaged, are, 1. Against those who admit of no revealed religion; as the atheist and deist. 2. Against those who admit of a revealed religion, but adopt not the true Revelation; as the Heathens, the Mahometans, &c. 3. Against those who believe only a part of the true Revelation; as the Jews. 4. Against those who add to the true Revelation matter foreign to it; as traditions, &c. 5. Against those who make a false interpretation of the sacred text, and draw from it erroneous systems; as the heretics and the schismatics, &c. And lastly, 6. Against those who make a wrong use of certain expressions of Revelation, and build on whimsical notions, ridiculous systems; the Fanatics, &c.

According to this division, the theologian will have to combat principally with,

1. The Atheists, with Spinosa at their head. 2. The Deists. 3. The Heathens and Idolaters. 4. The Mahometans. 5. The modern Jews. 6. The Arians and the Manicheans, or rather those who in these days follow their ancient errors. 7. The Socinians. 8. The Catholics, opposed to the Protestants. 9. The Protestants, opposed to the Catholics. 10. The Molinists, opposed to the Jansenists. 11. The Jansenists, opposed to the Molinists. 12. The Reformed, opposed to the Lutherans. 13. The Lutherans, opposed to the Reformed. 14. The Arminians. 15. The Anabaptists. 16. The Quakers. 17. The Fanatics, at the head of whom is Jacob Bohm. 18. The Pietists. 19. The Moravian Brethren, or the Herenhuters, &c.

Now, as each of the religions, communions, or heresies, above mentioned, have not scrupled to publish to the world their dogmas and creeds, the theologian ought carefully to instruct himself in those symbolic books, in which each of them have comprised its system; to study and to make a good analysis of them; and to prepare such arguments as are the most just, the most weighty, and proper to confute them.

Before we quit this subject, there is one remark to be made, or rather one caution that is very essential, which we would offer to the young theologian; which is, that the polemic is useful, and even necessary, in the study of theology in general; but that it is a discipline which ought to be treated with great prudence and moderation. Disputation in general is a dangerous art; and religious disputation is a deceitful art, and of infinite peril. The student will do right well to remember, that there is no sect, no communion on earth, that is perfectly true in all its dogmas without exception; that there are some small errors in all religions; that infallibility never was, nor ever will be, the portion of humanity. He should likewise remember, that the masters who teach him, or the books that he reads, are constantly partial to the religion they profess: and that when he has supported a thesis, and confuted his adversaries in a collegial dispute (where his adversaries, as well as his preceptors, are of the same side of the question, and will not fail to adjudge him the victory), he should be persuaded, that the victory would not have been so easily obtained had he contended with able adversaries of the opposite religion: he should remember, that we triumph without glory when we combat without danger; and let him not be vain of

his laurels, nor imagine himſelf ſome wonderful ſcholar; ſeeing that it is very poſſible that he may go off victorious from ſuch a diſpute, that he may receive vaſt applauſe from his profeſſors and his colleagues, and at the ſame time have reaſoned like a dolt.

On the other hand, the moſt able theologians, and the moſt conſummate profeſſors in this ſcience, ought to be conſtantly on their guard againſt the abuſe of polemic theology; which frequently ſerves leſs to clear and confirm the truth of the dogmas of a communion, than to eſtabliſh perpetual diſcord and hatred among Chriſtians. Every theologian ſhould alſo remember, that, by the nature of the ſubject, it is not poſſible to produce demonſtration in ſupport of his theſes and opinions; but that his arguments will be only valid, and preponderate in proportion to their degree of evidence; and laſtly, that it is a ridiculous and inſufferable vanity to imagine, that every man, who does not think preciſely as we do, is guilty of palpable error.

Sect. V. Pastoral Theology.

Having deſcribed the theoretic ſciences of theology, we now come to thoſe which regard the practice. It would be to bury the talents that God has given him, and the ſtudies that he has made, if the theologian did not employ them to the edification of his neighbour and the proſperity of the church. His office in ſociety is attended with conſtant and anxious labours. He is charged with the cure of ſouls, with the inſtruction of youth, with preaching of the Goſpel, the conduct of his flock, and the adminiſtration of the ſacraments, with viſitations to the ſick and the dying, with calming the terrors of weak minds, with adminiſtering comforts to afflicted ſouls, and many other functions equally difficult and important.

As the homily makes a part of eloquence, it is unneceſſary to ſay any thing of it in this place, but treat the others in their order.

It is in vain that a ſon of the church poſſeſſes all the ſciences that belong to his profeſſion, that he is an agreeable and even a renowned preacher, if he do not give a life, an efficacious ſpirit, to his miniſtry, by a good example; for that is the firſt precept in paſtoral theology. He is at the head of a flock, and ought to be their guide: but how abſurd, if his words and his actions be at continual variance with each other! How ſcandalous, if he be not the firſt to practiſe theſe leſſons of wiſdom that he preaches! How indecent, if, while he edifies by his diſcourſes, he diſguſts by his morals! What baſeneſs, if he ſhould even glory in his irregularities! It is leſs ſhameful for a ſoldier to relate that he has tamely ſuffered an affront, than for an eccleſiaſtic to boaſt of his debaucheries! Both the one and the other is a diſgrace to his profeſſion.

But this exemplary conduct ſhould be free from all affectation in the external behaviour. A ſingularity of dreſs, and an air of auſterity; the head declined, the eyes turned up to heaven, the hands conſtantly claſped, a plaintive tone of voice, and a ſolemn gait; a ſcrupuloſity in things indifferent, and a dogmatic and clerical manner of deciding in the common affairs of life; a ridiculous inclination to diſcover iniquity in innocent actions; to confound pleaſure with vice, and to be an enemy to joy, the greateſt boon that God has beſtowed on man; and a hundred other like fopperies there are, with which the religious make a parade, that is ſhocking both to good ſenſe and the evangelic morality, and which render their miniſtry, in the eyes of ſenſible people, more contemptible than reſpectable. Theſe are rocks on which the young theologian is much too liable to run, and of which he cannot be ſufficiently cautioned.

After this candid caution and brief introduction, we paſs to the examen of the different parts, the union of which compoſes the ſyſtem of the paſtoral, the moſt important article perhaps in all theology. The deſign of Revelation was, without doubt, to conduct man by faith to a virtuous life. It is not the opinions or the learning of weak mortals that can determine their intrinſic merit: it is their wiſdom, their regularity of conduct, that muſt ſtamp their value. Experience ſhows, that a man of great genius and learning may be alſo a great villain; one who is unable to pleaſe God or his neighbour: the virtuous Chriſtian, on the contrary, muſt be agreeable to both: it follows therefore, that the practical part of theology, which leads mankind to a virtuous conduct, is of all its parts the moſt important.

Sect. VI. Catechetic Theology.

By Catechetic Theology is meant, *The art of teaching youth and ignorant perſons, the principal points of the Evangelical Doctrine, as well with regard to belief as practice.* This application of the theoretic ſciences of theology ought to be conducted in the moſt ſimple manner poſſible. It is not every one who is poſſeſſed of the talent of properly compoſing and delivering catechetic inſtructions: and it is an art that is very neceſſary in the Chriſtian church.

The greateſt difficulty conſiſts in ſeparating the articles of faith that are abſolutely eſſential and indiſpenſable to the ſalvation of mankind, from thoſe that are ſubtle and ſpeculative, more liable to contradiction, and leſs neceſſary to ſuch as do not make theology their profeſſion. However, as children do not always remain children, and as the church is compoſed of perſons of both ſexes and of all ages, it is neceſſary that, in the explanations of the catechiſm, there ſhould be employed different degrees of ſimplicity, proportioned to the age and capacity of thoſe that are to be inſtructed. It is expedient for young people to retain in their minds the firſt principles of religion, ſuch as are contained in good catechiſms; and that they be explained to them in particular lectures; which is the moſt uſual and moſt natural method of enabling youth to give an account of their faith. The ſermons that are given in the Catholic churches on controverſy, and in Proteſtant churches on the catechiſm, ſerve to inſtruct thoſe who are of riper years and have their judgment more formed. Theſe ſermons compoſe, at the ſame time, a ſort of courſe of the dogmatic and the polemic theology.

Both in private catechiſing, and in ſermons that are purpoſely intended to explain the catechiſm, the theologian ſhould avoid, as much as poſſible, the uſe of technical terms; or (which is ſtill better) he ought to begin by explaining thoſe terms, of which he ſhould give ſuch clear and determinate definitions, that no perſon of a moderate capacity can poſſibly miſtake them. In a word, he ſhould endeavour more to prove than to perſuade; and as eloquence ſometimes perſuades at the expence of truth, he ſhould cautiouſly avoid that ſort of deluſive perſuaſion, and in its room ſubſtitute clear and ſolid argument.

Sect. VII. *Of* Casuistic Theology.

By caſuiſtic theology is meant, the ſcience that decides in doubtful caſes of moral theology, and that calms the ſcruples of conſcience which ariſe in the Chriſtian's ſoul during his ſojourn in this world.

The ſtudies relative to theſe objects, which the theologian

is ſuppoſed to have made, and the confidence that the common rank of Chriſtians place in their paſtors, afford them the means and the opportunities of rendering ſignal ſervice to thoſe of their fellow-citizens who have need of their counſel and conſolation: for where there is one man of a philoſophic ſpirit, one Chriſtian of a well-grounded knowledge in theology, there are in a ſociety a thouſand that are not, and who are yet deſirous of being inſtructed, guided, comforted, eſtabliſhed. It is therefore both juſt and important that he who devotes himſelf to the ſervice of the altar, ſhould early ſtudy all thoſe ſciences that will enable him worthily to perform this important part of his miniſtry.

God forbid, however, that we ſhould countenance the abuſe that is made, in ſome Chriſtian countries, of the duties that we have here explained. To reduce theſe matters into a political ſyſtem; to make the direction of conſciences a profeſſion, a regular trade; to provide each houſe with a ſpiritual director, as with a butcher or baker, a ſteward or porter, who by that means may inſinuate himſelf into the confidence of families, and become the depoſitory of all their ſecrets; may ſometimes ſow diſcord between huſband and wife, or the neareſt relations; who may avail himſelf of the confidence of his devotees, to direct them conſtantly in matters of a worldly, and ſometimes even of a criminal, nature; to efface the legitimate and ſacred authority of the father of a family, and in its place to ſubſtitute a foreign power; to undermine the confidence, the union and concord of families, in order to confirm and render neceſſary this ſecondary authority; to captivate the ſpirit, and oft-times the heart, of a wife or daughter, and in general of weak minds; to enjoin them ridiculous mummeries that lead to fanaticiſm, and a thouſand dangerous ſuperſtitions, or to religious exerciſes that divert them from their domeſtic duties; in a word, to aſſume an abſolute authority over the conſciences of mankind, is a pernicious invention, contrary to the evangelic moral, to the welfare of ſociety, to the intereſt of the ſtate, and to the ſovereign authority; and well deſerves an exemplary puniſhment.

But the cure of ſouls, faithfully intended, and properly limited, differs totally from this deſpotic power. He who is charged with it by a lawful vocation, ſhould remember that there are four claſſes of men with whom he will be engaged: 1. With thoſe of weak minds; of little knowledge and little ability. 2. With thoſe whoſe ſpirits are afflicted by ſome great reverſe of fortune. 3. With thoſe of nice and timorous conſciences, who ſuffer by their ſcruples, whether they be vain or rational. 4. And laſtly, the wicked, the hardened and incorrigible ſinner. The grand art here conſiſts in repreſenting to each of theſe claſſes of men, the truth, in a manner ſo clear, ſo ſtrong and full, that they can no longer retain any doubts that conviction muſt take place, and conſolation or converſion be the conſequence.

Truth is in its nature highly problematic: each one, however, is perſuaded that he knows it, that he poſſeſſes it; and is guided by it; every man thinks himſelf in the right. We ſhould therefore begin by diſcovering the truth in the ſubject before us, and in placing it upon a ſolid foundation. This buſineſs of demonſtrating the truth to others, is attended in the mean time with infinite difficulty. Every mind is not capable of diſcovering it at the firſt glance; nor can all diſcern it from the ſame point of view. Sometimes men require conviction by abſtract or philoſophical arguments, and ſometimes by the expreſs deciſions of the Holy Scripture. Sometimes by authority, ſometimes by gentle remonſtrance, and ſometimes by dreadful menaces. Sometimes they are to be reclaimed by properly expoſing the neceſſary and fatal conſequences that reſult from their conduct; and at others, by the alluring promiſes of the goſpel. Now vice is to be boldly confronted; and now the tranſgreſſor is to be conducted into the right path by artful turnings: now the ſinner's crimes are to be painted in the ſtrongeſt colours; and now a veil is to be lightly caſt over them; and ſometimes we ſhould even indulge a favourite inclination, in order to induce them to abandon a more pernicious paſſion: and ſo of the reſt.

As it is impoſſible that the books which have been wrote on this ſubject, though of an immenſe quantity, can contain every caſe that daily occurs in the miniſtry of the goſpel; and as theſe caſes are not always juſtly decided by theſe authors; and, if they were, the conſulting of ſuch enormous works would take up too much of a theologian's time, and divert him from his other ſtudies; and as theſe caſuiſtic writers contain, moreover, a number of puerile ſubtleties and wretched chimeras; it is highly proper that the miniſter of the altar, whom we ſuppoſe to have a maſterly knowledge of the principles, the dogmas, and moral of the Chriſtian religion, ſhould endeavour to draw from the true ſource the means that he is to employ on each occurrence, and not have recourſe to books for their deciſions. For which purpoſe it is neceſſary, 1. That he accuſtom himſelf to reaſon according to the rules of ſound logic. 2. That he learn to know the human heart, under its different diſguiſes; the characters of men, their arts, and ruling paſſions. 3. That he do not attempt to gain or convince by little pious frauds, or by lucky ſophiſms artfully repreſented. 4. That he do not inflict what are called *penances*, which are the height of abſurdity. 5. That he do not enjoin mummeries, pilgrimages, auſterities, and a thouſand like matters, which can never carry with them a real conviction, and only ſerve to divert men from their labours and the duties of ſociety. But, 6. That he conſtantly preſent, as we have before ſaid, and cannot too often repeat, the truth, in all its native force and purity.

This truth, however, is no enemy to ſacred eloquence; on the contrary, the latter ſerves to introduce the former into the mind of the auditor, and there to give it ſuch ſtrong impreſſions, as neither time, the diſſipations of the world, nor the diſtractions of fortune, are able eaſily to efface. The whole miniſterial function conſiſts in teaching, preaching, adminiſtering the ſacraments of the church, viſiting the ſick and the dying, comforting the afflicted, and affording the ſpiritual aids to all thoſe who have need of them. Eloquence is of the greateſt efficacy in all theſe functions; and, without affecting it, the miniſter of the goſpel ſhould never neglect it. There are ſome profeſſors in univerſities who give their auditors a complete ſyſtematic courſe on paſtoral theology, which may be attended with many advantages.

THEOPHILUS, the ſixth biſhop of Antioch; was raiſed to that ſee in 169, and inſtructed his church till about the year 182. There are ſtill extant his three books, written in Greek, againſt the calumniators of the Chriſtian religion, addreſſed to Autolycus. They were printed at Oxford in 1684, in duodecimo, under the inſpection of Dr. Fell. There are alſo other works attributed to him; but theſe are written by later authors.

THEOPHRASTUS, a celebrated Greek philoſopher, was the ſon of Melanthus, and was born at Ereſus in Bœotia. He was at firſt the diſciple of Lucippus, then of Plato, and at laſt of Ariſtotle. He ſucceeded the latter in the 322d year before the Chriſtian æra, and taught philoſophy at Athens with extraordinary applauſe. He ſaid of an orator without judgment, "that he was a horſe without a bridle." He was accuſtomed to ſay, "There is nothing ſo valuable as time, and thoſe who loſe it are the moſt inexcuſable of all prodigals." He died at above 100 years of age. Theophraſtus wrote many works; of which the following are the principal of thoſe that are ſtill extant: 1. An excellent moral treatiſe, intitled *Characters*, which he ſays in his preface he compoſed at ninty-nine years of age. Iſaac Caſaubon has written learned Commentaries on this ſmall treatiſe: it has been tranſlated from the Greek into French; by M. de la Bruyere; it has alſo been tranſlated into Engliſh. 2. A curious treatiſe on Plants. 3. A hiſtory of Stones; of which Dr. Hill has given a good edition, with an Engliſh tranſlation, and learned notes, in 8vo.

THEOPHYLACT, archbiſhop of Achrida, the metropolis of Bulgaria, and one of the moſt learned men of the 11th century, was born at Conſtantinople, where he was inſtructed in eccleſiaſtical learning. He laboured with great zeal to eſtabliſh the Chriſtian religion in Achrida, where there were ſtill many pagans, and died after the year 1071. He wrote Commentaries upon the Goſpels, the Acts of the Apoſtles, St. Paul's Epiſtles, and upon Habakkuk, Jonah, Nahum, and Hoſea, and alſo ſeveral Epiſtles, and other works in Greek.

THEOPOMPUS, a celebrated Greek orator and hiſtorian, was born in the iſland of Chios, and flouriſhed in the reign of Alexander the Great. He was one of the moſt famous of all the diſciples of Iſocrates, and won the prize from all the panegyriſts whom Artemiſa invited to praiſe Mauſolus. He wrote ſeveral works, which are loſt.

THEOREM, a ſpeculative propoſition, demonſtrating the properties of any ſubject.

THEORY, in general, denotes any doctrine which terminates in ſpeculation, without conſidering the practical uſes or application thereof.

THEOSOPHISTS, a ſect of men who pretend to derive all their knowledge from divine illumination. They boaſt that, by means of this celeſtial light, they are not only admitted to the intimate knowledge of God, and of all divine truth, but have acceſs to the moſt ſublime ſecrets of nature. They aſcribe it to the ſingular manifeſtation of divine benevolence, that they are able to make ſuch a uſe of the element of fire, in the chemical art, as enables them to diſcover the eſſential principles of bodies, and to diſcloſe ſtupendous myſteries in the phyſical world. They even pretend to an acquaintance with thoſe celeſtial beings which form the medium of intercourſe between God and man, and to a power of obtaining from them, by the aid of magic, aſtrology. and other ſimilar arts, various kinds of information and aſſiſtance.

To this claſs belonged Paracelſus, Robert Fludd, Jacob Boehmen, Van Helmont, Peter Poiret, and the Roſicrucians. They are alſo called FIRE-*Philoſophers*, which ſee.

THERAPEUTÆ, a term applied to thoſe that are wholly in the ſervice of religion. This general term has been applied to particular ſects of men, concerning whom there have been great diſputes among the learned.

THERAPEUTICS, that part of medicine which acquaints us with the rules that are to be obſerved, and the medicines to be employed, in the cure of diſeaſes.

THERIACA ANDROMACHI, a compound medicine made in the form of an electuary, now little uſed.

THERMÆ, hot baths or bagnios. Luxury and extravagance were in nothing carried to ſuch heights as in the thermæ of the Roman emperors. Ammian complains, that they were built to ſuch an extent as to equal whole provinces; from which Valeſius would abate, by reading *piſcinæ* inſtead of *provinciæ*. And yet after all, the remains of ſome ſtill ſtanding are ſufficient teſtimonies for Ammian's cenſure; and the accounts tranſmitted of their ornaments and furniture, ſuch as being laid with precious ſtones (Seneca), ſet round with ſeats of ſolid ſilver (Pliny), with pipes and ciſterns of the ſame metal (Statius), add to, rather than take from, the cenſure. The moſt remarkable bagnios were thoſe of Diocleſian and Caracalla at Rome, great part of which remains at this day; the lofty arches, ſtately pillars, variety of foreign marble, curious vaulting of the roofs, great number of ſpacious apartments, all attract the curioſity of the traveller. They had alſo their ſummer and winter baths.

THERMOMETER, an inſtrument for meaſuring the degree of heat or cold in any body. The thermometer was invented about the beginning of the 17th century; but, like many other uſeful inventions, it has been found impoſſible to aſcertain to whom the honour of it belongs. Boerhaave aſcribes it to Cornelius Drebbel of Alcmar, his own countryman. Fulgenzio attributes it to his maſter Paul Sarpi, the great oracle of the Venetion republic; and Viviani gives the honour of it to Galilæo. But all theſe are poſthumous claims. Sanctorio claims this honour to himſelf; and his aſſertion is corroborated by Borelli and Malpighi of the Florentine academy, whoſe partiality is not to be ſuſpected in favour of a member of the Patavinian ſchool.

Perhaps the beſt way to reconcile theſe different claims would be, to ſuppoſe that the thermometer was really invented by different perſons about the ſame time. We know that there are certain periods in the progreſs of the arts when the ſtream of human genius runs in the ſame direction, and moves towards the ſame object. That part of the current which reaches the object firſt may poſſeſs the title; but the other parts follow ſo rapidly and arrive ſo ſoon after, that it is impoſſible for a ſpectator to decide which is firſt in point of time.

The firſt form of this inſtrument for meaſuring the degrees of heat and cold, was the air-thermometer. It is a well known fact that air expands with heat ſo as to occupy more ſpace than it does when cold, and that it is condenſed by cold ſo as to occupy leſs ſpace than when warmed, and that this expanſion and condenſation is greater or leſs according to the degree of heat or cold applied. The principle then on which the air-thermometer was conſtructed is very ſimple. The air was confined in a tube by means of ſome coloured liquor; the liquor roſe or fell according as the air become expanded or condenſed. What the firſt form of the tube was, cannot now perhaps be well known; but the following deſcription of the air-thermometer will fully explain its nature.

The air-thermometer conſiſts of a glaſs tube BE, Pl. 34. fig. 1. connected at one end with a large glaſs ball A, and at the other end immerſed in an open veſſel, or terminating in a ball DE, with a narrow orifice at D; which veſſel, or ball, contains any coloured liquor that will not eaſily freeze. Aquafortis tinged of a fine blue colour with a ſolution of vitriol or copper, or ſpirit of wine tinged with cochineal, will anſwer

this purpoſe. But the ball A muſt be firſt moderately warmed ſo that a part of the air contained in it may be expelled through the orifice D; and then the liquor preſſed by the weight of the atmoſphere will enter the ball DE, and riſe, for example, to the middle of the tube at C, at a mean temperature of the weather; and in this ſtate the liquor by its weight, and the air included in the ball A, &c. by its elaſticity, will counterbalance the weight of the atmoſphere. As the ſurrounding air becomes warmer, the air in the ball and upper part of the tube, expanding by heat, will drive the liquor into the lower ball, and conſequently its ſurface will deſcend; on the contrary, as the ambient air becomes colder, that in the ball is condenſed, and the liquor preſſed by the weight of the atmoſphere will aſcend: ſo that the liquor in the tube will aſcend or deſcend more or leſs according to the ſtate of the air contiguous to the inſtrument. To the tube is affixed a ſcale of the ſame length, divided upwards and downwards from the middle C into 100 equal parts, by means of which the aſcent and deſcent of the liquor in the tube, and conſequently the variations in the cold or heat of the atmoſphere, may be obſerved.

This inſtrument was extremely defective; for the air in the tube was not only affected by the heat and cold of the atmoſphere, but alſo by its weight.

The air being found improper for meaſuring with accuracy the variations of heat and cold according to the form of the thermometer which was firſt adopted, another fluid was propoſed about the middle of the 17th century by the Florentine academy. This fluid was ſpirit of wine, or alcohol, as it is now generally named. The alcohol being coloured, was incloſed in a very fine cylindrical glaſs tube previouſly exhauſted of its air, having a hollow ball at one end A, and hermetically ſealed at the other end D. The ball and tube are filled with rectified ſpirit of wine to a convenient height, as to C, when the weather is of a mean temperature, which may be done by inverting the tube into a veſſel of ſtagnant coloured ſpirit, under a receiver of the air-pump, or in any other way. When the thermometer is properly filled, the end D is heated red hot by a lamp, and then hermetically ſealed, leaving the included air of about $\frac{1}{3}$ of its natural denſity, to prevent the air which is in the ſpirit from dividing it in its expanſion. To the tube is applied a ſcale, divided from the middle, into 100 equal parts, upwards and downwards.

As ſpirit of wine is capable of a very conſiderable degree of rarefaction and condenſation by heat and cold, when the heat of the atmoſphere increaſes the ſpirit dilates, and conſequently riſes in the tube; and when the heat decreaſes, the ſpirit deſcends, and the degree or quantity of the motion is ſhown by a ſcale.

The ſpirit of wine thermometer was not ſubject to ſome of the inconveniences which attended the air-thermometer. In particular, it was not affected by variations in the weight of the atmoſphere: accordingly it ſoon came into general uſe among philoſophers. It was, at an early period, introduced into Britain by Mr. Boyle. To this inſtrument, as then uſed, there are, however, many objections. The liquor was of different degrees of ſtrength, and therefore different tubes filled with it, when expoſed to the ſame degree of heat, would not correſpond. There was alſo another defect: the ſcale which was adjuſted to the thermometer did not commence at any fixed point. The higheſt term was adjuſted to the great ſunſhine heats of Florence, which are too variable and undetermined; and frequently the workman formed the ſcale according to his own fancy. While the thermometer laboured under ſuch diſadvantages it could not be of general uſe.

To obtain ſome fixed unalterable point by which a determined ſcale might be diſcovered, to which all thermometers might be accurately adjuſted, was the ſubject which next drew the attention of philoſophers. Mr. Boyle, who ſeems at an early period to have ſtudied this ſubject with much anxiety, propoſed the freezing of the eſſential oil of anniſeeds as a convenient point for graduating thermometers; but this opinion he ſoon laid aſide. Dr. Halley next propoſed that thermometers ſhould be graduated in a deep pit under ground, where the temperature both in winter and ſummer is pretty uniform; and that the point to which the ſpirit of wine ſhould riſe in ſuch a ſubterraneous place ſhould be the point from which the ſcale ſhould commence. But this propoſal was evidently attended with ſuch inconveniences that it was ſoon abandoned. He made experiments on the boiling point of water, of mercury, and of ſpirit of wine; and he ſeems rather to give a preference to the ſpirit of wine. He objected to the freezing of water as a fixed point, becauſe he thought that it admitted conſiderable latitude.

It ſeems to have been reſerved to the all-conquering genius of Sir Iſaac Newton to determine this important point, on which the accuracy and value of the thermometer depends. He choſe, as fixed, thoſe points at which water freezes and boils; the very points which the experiments of ſucceeding philoſophers have determined to be the moſt fixed and convenient. Senſible of the diſadvantages of ſpirit of wine, he tried another liquor which was homogenous enough, capable of a conſiderable rarefaction, about 15 times greater than ſpirit of wine. This was linſeed oil. It has not been obſerved to freeze even in very great colds, and it bears a heat about four times that of water before it boils. With theſe advantages it was made uſe of by Sir Iſaac Newton, who diſcovered by it the comparative degree of heat for boiling water, melting wax, boiling ſpirit of wine, and melting tin; beyond which it does not appear that this thermometer was applied. The method he uſed for adjuſting the ſcale of this oil thermometer was as follows: ſuppoſing the bulb, when immerged in thawing ſnow, to contain 10,000 parts, he found the oil expand by the heat of the human body ſo as to take up $\frac{1}{39}$th more ſpace, or 10,256 ſuch parts; and by the heat of water boiling ſtrongly 10,725; and by the heat of melting tin 11,516. So that reckoning the freezing point as a common limit between heat and cold, he began his ſcale there, marking it 0, and the heat of the human body he made 12°; and conſequently, the degrees of heat being proportional to the degrees of rarefaction, or 256 : 725 : : 12 : 34, this number 34 will expreſs the heat of boiling water; and by the ſame rule, 72 that of melting tin. This thermometer was conſtructed in 1701.

To the application of oil as a meaſure of heat and cold, there are inſuperable objections. It is ſo viſcid, that it adheres too ſtrongly to the ſides of the tube. On this account it aſcends and deſcends too ſlowly in caſe of a ſudden heat or cold. In a ſudden cold, ſo great a proportion remains adhering to the ſides of the tube after the reſt has ſubſided, that the ſurface appears lower than the correſponding temperature of the air requires. An oil thermometer is therefore not a proper meaſure of heat and cold.

All the thermometers hitherto propoſed were liable to many inconveniences, and could not be conſidered as exact ſtandards for pointing out the various degrees of temperature. This led Reaumur to attempt a new one, an account of which was publiſhed in the year 1730, in the Memoirs of the Academy of Sciences. This thermometer was made with ſpirit of wine. He took a large ball and tube, the dimenſions and capacities of which were known; he then graduated the tube, ſo that the ſpace from one diviſion to another might contain 1000th part of the liquor; the liquor containing 1000 parts when it ſtood at the freezing point. He adjuſted the thermometer to

the freezing point by an artificial congelation of water: then putting the ball of his thermometer and part of the tube into boiling water, he obferved whether it rofe 80 divifions: if it exceeded thefe, he changed his liquor, and by adding water lowered it, till upon trial it fhould juft rife 80 divifions; or if the liquor, being too low, fell fhort of 80 divifions, he raifed it by adding rectified fpirit to it. The liquor thus prepared fuited his purpofe, and ferved for making a thermometer of any fize, whofe fcale would agree with his ftandard.

This thermometer was far from being perfect. As the bulbs were three or four inches in diameter, the furrounding ice would be melted before its temperature could be propagated to the whole fpirits in the bulb, and confequently the freezing point would be marked higher than it fhould be. Dr. Martine accordingly found, that inftead of coinciding with the 32d degree of Fahrenheit, it correfponded with the 34th, or a point a little above it. Reaumur committed a miftake alfo refpecting the boiling point; for he thought that the fpirit of wine, whether weak or ftrong, when immerged in boiling water, received the fame degree of heat with the boiling water. But it is well known that highly rectified fpirit of wine cannot be heated much beyond the 175th degree of Fahrenheit, while boiling water raifes the quickfilver 37 degrees higher. There is another thermometer that goes by the name of *Reaumur's*, which fhall be afterwards defcribed.

At length a different fluid was propofed, by which thermometers could be made free from moft of the defects hitherto mentioned. This fluid was mercury, and feems firft to have occurred to Dr. Halley in the laft century; but was not adopted by him on account of its having a fmaller degree of expanfibility than the other fluids ufed at that time. Boerhaave fays that the mercurial thermometer was firft conftructed by Olaus Roemer; but the honour of this invention is generally given to Fahrenheit of Amfterdam, who prefented an account of it to the Royal Society of London in 1724.

That we may judge the more accurately of the propriety of employing mercury, we will compare its qualities with thofe of the fluids already mentioned, air, alcohol, and oil.

Air is the moft expanfible fluid, but it does not receive nor part with its heat fo quickly as mercury. Alcohol does not expand much by heat. In its ordinary ftate it does not bear a much greater heat than 175° of Fahrenheit; but when highly rectified it can bear a greater degree of cold than any other liquor hitherto employed as a meafure of temperature. At Hudfon's Bay, Mr. Macnab, by a mixture of vitriolic acid and fnow, made it to defcend to 69 below 0 of Fahrenheit. There is an inconvenience, however, attending the ufe of this liquor; it is not poffible to get it always of the fame degree of ftrength. As to oil, its expanfion is about 15 times greater than that of alcohol; it fuftains a heat of 600°, and its freezing point is fo low that it has not been determined; but its vifcofity renders it ufelefs.

Mercury is far fuperior to alcohol and oil, and is much more manageable than air. 1. As far as the experiments already made can determine, it is of all the fluids hitherto employed in the conftruction of thermometers, that which meafures moft exactly equal differences of heat by equal differences of its bulk: its dilatations are in fact very nearly proportional to the augmentations of heat applied to it. 2. Of all liquids it is the moft eafily freed from air. 3. It is fitted to meafure high degrees of heat and cold. It fuftains a heat of 600° of Fahrenheit's fcale, and does not congeal till it falls 39 or 40 degrees below 0. 4. It is the moft fenfible of any fluid to heat and cold, even air not excepted. Count Rumford found that mercury was heated from the freezing to the boiling point in 58 feconds, while water took two minutes 13 feconds, and common air 10 minutes and 17 feconds. 5. Mercury is a homogeneous fluid, and every portion of it is equally dilated or contracted by equal variations of heat. Any one thermometer made of pure mercury is *cæteris paribus*, poffeffed of the fame properties with every other thermometer made of pure mercury. Its power of expanfion is indeed about fix times lefs than that of fpirit of wine, but it is great enough to anfwer moft of the purpofes for which a thermometer is wanted.

The fixed points which are now univerfally chofen for adjufting thermometers to a fcale, and to one another, are the boiling and freezing water points. The boiling water point, it is well known, is not an invariable point, but varies fome degrees according to the weight and temperature of the atmofphere. In an exhaufted receiver, water will boil with a heat of 98° or 100°; whereas in Papin's digefter it will acquire a heat of 412. Hence it appears that water will boil at a lower point, according to its height in the atmofphere, or to the weight of the column of air which preffes upon it. In order to enfure uniformity therefore in the conftruction of thermometers, it is now agreed that the bulb of the tube be plunged in the water when it boils violently, the barometer ftanding at 30 Englifh inches (which is its mean height round London), and the temperature of the atmofphere 55°. A thermometer made in this way, with its boiling point at 212°, is called by Dr. Horfley *Bird's Fahrenheit*, becaufe Mr. Bird was the firft perfon who attended to the ftate of the barometer in conftructing thermometers.

As artifts may be often obliged to adjuft thermometers under very different preffures of the atmofphere, philofophers have been at pains to difcover a general rule which might be applied on all occafions. M. de Luc, in his *Recherches fur les Mod. de l'Atmofphere* from a feries of experiments, has given an equation for the allowance on account of this difference, in Paris meafure, which has been verified by Sir George Schuckburgh; alfo Dr. Horfley, Dr. Mafkelyne, and Sir George Schuckburgh, have adapted the equation and rules to Englifh meafures, and have reduced the allowances into tables for the ufe of the artift. Dr. Horfley's rule, deduced from De Luc's, is this:

$$\frac{99}{8990000}\log. z - 92{\cdot}804 = h.$$

where h denotes the height of a thermometer plunged in boiling water, above the point of melting ice, in degrees of Bird's Fahrenheit, and z the height of the barometer in 10ths of an inch. From this rule he has computed the following table, for finding the heights, to which a good Bird's Fahrenheit will rife when plunged in boiling water, in all ftates of the barometer, from 27 to 31 Englifh inches; which will ferve, among other ufes, to direct inftrument-makers in making a true allowance for the effect of the variation of the barometer, if they fhould be obliged to finifh a thermometer at a time when the barometer is above or below 30 inches; though it is beft to fix the boiling point when the barometer is at that height.

Equation of the Boiling Point.

Barometer.	Equation.	Difference.
31·0	+ 1·57	
		0·78
30·5	+ 0·79	
		0·79
30·0	0·00	
		0·80
29·5	— 0·80	
		0·82
29·0	— 1·62	
		0·83
28·5	— 2·45	
		0·85
28·0	— 3·31	
		0·86
27·5	— 4·16	
		0·88
27·0	— 5·04	

The numbers in the firſt column of this table expreſs heights of the quickſilver in the barometer in Engliſh inches and decimal parts: the ſecond column ſhows the equation to be applied, according to the ſign prefixed, to 212° of Bird's Fahrenheit, to find the true boiling point for every ſuch ſtate of the barometer. The boiling point for all intermediate ſtates of the barometer may be had with ſufficient accuracy, by taking proportional parts, by means of the third column of differences of the equation. See *Phil. Tranſ.* lxiv. art. 30.; alſo Dr. Maſkelyne's *Paper*, vol. lxiv. art. 20.

In the following table we have the reſult of 15 different obſervations made by Sir George Schuckburgh, compared with the reſult of M. de Luc's rules.

Height of the Barometer reduced to the ſame temperature of 50°	Mean boiling Point by Obſervation.	BoilingPoint by De Luc's Rules.	Height of Barometer.	Boiling Point by Obſervation.	Boiling Point by De Luc's Rules.
Inch.	°	°	Inch.	°	°
26,498	207,07	208,54	30,008	213,22	213,47
27,241	208,64	208,84	30,207	213,58	213,79
27,954	209,87	210,03	30,489	214,15	214,23
28,377	210,50	210,81	30,763	214,37	214,66
28,699	211,27	211,34	30,847	214,83	214,79
28,898	211,50	211,67	30,957	214,96	214,96
28,999	211,60	211,85			
29,447	212,55	212,74			
29,805	212,95	213,15			

Sir George Schuckburgh has alſo ſubjoined the following general table for the uſe of artiſts in conſtructing the thermometer, both according to his own obſervations and thoſe of M. de Luc.

Height of the Barometer.	Correct. of the boiling point.	Difference.	Correct. accord. to M. de Luc.	Difference.
	°		°	
26,0	− 7,09	,91	− 6,83	,90
26,5	− 6,18	,91	− 5,93	,89
27,0	− 5,27	,90	− 5,04	,88
27,5	− 4,37	,89	− 4,16	,87
28,0	− 3,48	,89	− 3,31	,86
28,5	− 2,59	,87	− 2,45	,83
29,0	− 1,72	,87	− 1,62	,82
29,5	− 0,85	,85	− 0,80	,80
30,0	0,00	,85	0,00	,79
30,5	+ 0,85	,84	+ 0,79	,78
31,0	+ 1,69		+ 1,57	

The Royal Society, fully apprized of the importance of adjuſting the fixed points of thermometers, appointed a committee of ſeven gentlemen to conſider of the beſt method for this purpoſe; and their report is publiſhed in the Phil. Tranſ. vol. lxvii. part ii. art. 37.

They obſerved, that though the boiling point be placed ſo much higher on ſome of the thermometers now made than on others, yet this does not produce any conſiderable error in the obſervations of the weather, at leaſt in this climate; for an error of $1\frac{1}{2}$° in the poſition of the boiling point, will make an error only of half a degree in the poſition of 92°, and of not more than a quarter of a degree in the point of 62°. It is only in nice experiments, or in trying the heat of hot liquors, that this error in the boiling point can be of much importance.

In adjuſting the freezing as well as the boiling point, the quickſilver in the tube ought to be kept of the ſame heat as that in the ball. When the freezing point is placed at a conſiderable diſtance from the ball, the pounded ice ſhould be piled to ſuch a height above the ball, that the error which can ariſe from the quickſilver in the remaining part of the tube not being heated equally with that in the ball, ſhall be very ſmall, or the obſerved point muſt be corrected on that account according to the following table:

Heat of the Air.	Correction.
42°	,00087
52	,00174
62	,00261
72	,00348
82	,00435

The correction in this table is expreſſed in 1000th parts of the diſtance between the freezing point and the ſurface of the ice: *e. g.* if the freezing point ſtands ſeven inches above the ſurface of the ice, and the heat of the room is 62, the point of 32° ſhould be placed 7 × 00261, or ,018 of an inch lower than the obſerved point. A diagonal ſcale will facilitate this correction.

The committee obſerve, that in trying the heat of liquors, care ſhould be taken that the quickſilver in the tube of the thermometer be heated to the ſame degree as that in the ball; or if this cannot be done conveniently, the obſerved heat ſhould be corrected on that account; for the manner of doing which, and a table calculated for this purpoſe, we muſt refer to their excellent report in the Phil. Tranſ. vol. lxvii. part ii. art. 37.

With regard to the choice of tubes, they ought to be exactly cylindrical. But though the diameter ſhould vary a little, it is eaſy to manage that matter in the manner propoſed by the Abbé Nollet, by making a ſmall portion of the quickſilver, *e. g.* as much as fills up an inch or half an inch, ſlide backward and forward in the tube; and thus to find the proportions of all its inequalities, and from thence to adjuſt the diviſions to a ſcale of the moſt perfect equality. The capillary tubes are preferable to others, becauſe they require ſmaller bulbs, and they are alſo more ſenſible, and leſs brittle. The moſt convenient ſize for common experiments has the internal diameter about the 40th or 50th of an inch, about 9 inches long, and made of thin glaſs, that the riſe and fall of the mercury may be better ſeen.

The next thing to be conſidered, is of what number of degrees or diviſions the ſcale ought to conſiſt, and from what point it ought to commence. As the number of the diviſions of the ſcale is an arbitrary matter, the ſcales which have been employed differ much from one another in this circumſtance. Fahrenheit has made 180 degrees between the freezing and boiling water point. Amonton's made 73, and Sir Iſaac Newton only 34. There is, however, one general maxim, which ought to be obſerved: *That ſuch an arithmetical number ſhould be choſen as can eaſily be divided and ſubdivided, and that the number of diviſions ſhould be ſo great that there ſhall ſeldom be occaſion for fractions.* The number 80 choſen by Reaumur anſwers extremely well in this reſpect, becauſe it can be divided by ſeveral figures without leaving a remainder; but it is too ſmall a number: the conſequence of which is, that the degrees are placed at too great a diſtance from one another, and fractions muſt therefore be often employed. We think, therefore, that 160 would have been a more convenient num-

ber. Fahrenheit's number 180 is large enough, but when divided its quotient ſoon becomes an odd number.

As to the point at which the ſcale ought to commence, various opinions have been entertained. If we knew the beginning or loweſt degree of heat, all philoſophers would agree, that the loweſt point of the thermometer ought to be fixed there; but we know neither the loweſt nor the higheſt degrees of heat; we obſerve only the intermediate parts. All that we can do, then, is to begin it at ſome invariable point, to which thermometers made in different places may eaſily be adjuſted. If poſſible too, it ought to be a point at which a natural well-known body receives ſome remarkable change from the effects of heat or cold. Fahrenheit began his ſcale at the point at which ſnow and ſalt congeal. Kirwan propoſes the freezing point of mercury. Sir Iſaac Newton, Hales, and Reaumur adopted the freezing point of water. The objection to Fahrenheit's loweſt point is, that it commences at an artificial cold never known in nature, and to which we cannot refer our feelings, for it is what few can ever experience. There would be ſeveral great advantages gained, we allow, by adopting the freezing point of mercury. It is the loweſt degree of cold to which mercury can be applied as a meaſure; and it would render unneceſſary the uſe of the ſigns plus and minus, and the extenſion of the ſcale below 0. But we object to it, that it is not a point well known; for few, comparatively ſpeaking, who uſe thermometers, can have an opportunity of ſeeing mercury congealed. As to the other advantage to be gained by adopting the freezing point of mercury, namely, the abolition of negative numbers, we do not think it would counterbalance the advantage to be enjoyed by uſing a well-known point. Beſides, it may be aſked, Is there not a propriety in uſing negative numbers to expreſs the degree of cold, which is a negative thing? Heat and cold we can only judge of by our feelings: the point then at which the ſcale ſhould commence, ought to be a point which can form to us a ſtandard of heat and cold; a point familiar to us from being one of the moſt remarkable that occurs in nature, and therefore a point to which we can with moſt clearneſs and preciſion refer to in our minds on all occaſions. This is the freezing point of water choſen by Sir Iſaac Newton, which of all the general changes produced in nature by cold is the moſt remarkable. It is therefore the moſt convenient point for the thermometers to be uſed in the temperate and frigid zones; we may ſay over the globe, for even in the hotteſt countries of the torrid zone many of the mountains are perpetually covered with ſnow.

Having now explained the principles of the thermometer as fully as appears neceſſary, in order to make it properly underſtood, we will now ſubjoin an account of thoſe thermometers which are at preſent in moſt general uſe. Theſe are Fahrenheit's, De l'Iſle's, Reaumur's, and Celſius's. Farenheit's is uſed in Britain, De l'Iſle's in Ruſſia, Reaumur's in France, and Celſius's in Sweden. They are all mercurial thermometers.

Fahrenheit's thermometer conſiſts of a ſlender cylindrical tube and a ſmall longitudinal bulb. To the ſide of the tube is annexed a ſcale which Fahrenheit divided into 600 parts, beginning with that of the ſevere cold which he had obſerved in Iceland in 1709, or that produced by ſurrounding the bulb of the thermometer with a mixture of ſnow or beaten ice and ſal ammoniac or ſea ſalt. This he apprehended to be the greateſt degree of cold, and accordingly he marked it, as the beginning of his ſcale, with 0; the point at which mercury begins to boil, he conceived to ſhow the greateſt degree of heat, and this he made the limit of his ſcale. The diſtance between theſe two points he divided into 600 equal parts or degrees; and by trials, he found that the mercury ſtood at 32 of theſe diviſions, when water juſt begins to freeze, or ſnow or ice juſt begins to thaw; it was therefore called the degree of the freezing point. When the tube was immerſed in boiling water, the mercury roſe to 212, which therefore is the boiling point, and is juſt 180 degrees above the former or freezing point. But the preſent method of making the ſcale of theſe thermometers, which is the ſort in moſt common uſe, is firſt to immerge the bulb of the thermometer in ice or ſnow juſt beginning to thaw, and mark the place where the mercury ſtands with a 32; then immerge it in boiling water, and again mark the place where the mercury ſtands in the tube, which mark with the num. 212, exceeding the former by 180; dividing therefore the intermediate ſpace into 180 equal parts, will give the ſcale of the thermometer, and which may afterwards be continued upwards and downwards at pleaſure.

Other thermometers of a ſimilar conſtruction have been accommodated to common uſe, having but a portion of the above ſcale. They have been made of a ſmall ſize and portable form, and adapted with appendages to particular purpoſes; and the tube with its annexed ſcale has often been encloſed in another thicker glaſs tube, alſo hermetically ſealed, to preſerve the thermometer from injury. And all theſe are called *Fahrenheit's thermometers*.

In 1733, M. De l'Iſle of Peterſburgh conſtructed a mercurial thermometer on the principles of Reaumur's ſpirit thermometer. (See Plate 35.) In his thermometer, the whole bulk of quickſilver, when immerged in boiling water, is conceived to be divided into 100,000 parts; and from this one fixed point the various degrees of heat, either above or below it, are marked in theſe parts on the tube or ſcale, by the various expanſion or contraction of the quickſilver, in all imaginable varieties of heat.—Dr. Martine apprehends it would have been better if De l'Iſle had made the integer 100,000 parts, or fixed point, at freezing water, and from thence computed the dilatations or condenſations of the quickſilver in thoſe parts; as all the common obſervations of the weather, &c. would have been expreſſed by numbers increaſing as the heat increaſed, inſtead of decreaſing, or counting the contrary way. However, in practice it will not be very eaſy to determine exactly all the diviſions from the alteration of the bulk of the contained fluid. And beſides, as glaſs itſelf is dilated by heat, though in a leſs proportion than quickſilver, it is only the exceſs of the dilatation of the contained fluid above that of the glaſs that is obſerved; and therefore if different kinds of glaſs be differently affected by a given degree of heat, this will make a ſeeming difference in the dilatations of the quickſilver in the thermometers conſtructed in the Newtonian method, either by Reaumur's rules or De l'Iſle's. Accordingly it has been found, that the quickſilver in De l'Iſle's thermometers has ſtood at different degrees of the ſcale when immerged in thawing ſnow: having ſtood in ſome at 154°, while in others it has been at 156° or even 158°.

The thermometer at preſent uſed in France is called *Reaumur's*; but it is very different from the one originally invented by Reaumur in 1730, and deſcribed in the Memoirs of the Academy of Sciences. The one invented by Reaumur was filled with ſpirit of wine; and though its ſcale was divided by the author into 80 parts, of which 0 was the freezing point, and 80 the boiling water point, yet in fact 80 was only the boiling point of the ſpirit of wine that he employed, which, as Dr. Martine computes, correſponded with 180 of Fahrenheit. But the thermometer now in uſe in France is filled with mercury; and the boiling water point, which is at 80, correſponds with the 212th degree of Fahrenheit. The ſcale indeed commences at the freezing point, as the old one did. The new thermometer ought more properly to be called *De Luc's thermometer*, for it was firſt made by De Luc; and is in fact as different from Reaumur's as it is from

Sir Isaac Newton's. When De Luc had fixed the scale, and finished an account of it, he showed the manuscript to M. De la Condamine. Condamine advised him to change the number 80; remarking, that such was the inattention of physicians, that they would probably confound it with Reaumur's. De Luc's modesty, as well as a predilection for the number 80, founded, as he thought, on philosophical reasons, made him decline following this advice. But he found by experience that the prediction of Condamine was too well founded.

The thermometer of Celsius, which is used in Sweden, has a scale of 100 degrees from the freezing to the boiling water point.

These are the principal thermometers now used in Europe; and the temperatures indicated by any of them may be reduced into the corresponding degrees on any of the others by means of the following simple canons; in which R signifies the degrees on the scale of Reaumur, F those of Fahrenheit, and S those of the Swedish thermometer.

1. To convert the degrees of Reaumur into those of Fahrenheit; $\frac{R \times 9}{4} + 32 = F$.

2. To convert the degrees of Fahrenheit into those of Reaumur; $\frac{F - 32 \times 4}{9} = R$.

3. To convert the Swedish degrees into those of Fahrenheit; $\frac{S \times 9}{5} + 32 = F$.

4. To convert Fahrenheit's into Swedish; $\frac{F - 32 \times 5}{9} = S$.

5. To convert Swedish degrees into those of Reaumur; $\frac{S \times 4}{5} = R$.

6. To convert Reaumur's degrees into Swedish; $\frac{R \times 5}{4} = S$.

To such readers as are unacquainted with the algebraic expression of arithmetical formulæ, it will be sufficient to express one or two of these in words to explain their use.—1. Multiply the degree of Reaumur by 9, divide the product by 4, and to the quotient add 32, the sum expresses the degree on the scale of Fahrenheit.—2. From the degree of Fahrenheit subtract 32, multiply the remainder by 4, and divide the product by 9, the quotient is the degree according to the scale of Reaumur, &c.

As many other thermometers have been used besides these, and consequently observations taken by them, it is of importance to have them placed in such a point of view that they may be easily compared with any of these four now in general use. We therefore give them in Plate 35. in the same order as they were arranged by Dr. Martine in his valuable Essay on the Construction and Graduation of Thermometers, and at the same time adding those of Celsius and De Luc. We call it by the name of De Luc for the sake of distinguishing it from Reaumur's spirit of wine thermometer, which may be seen in the same Plate.

It is unnecessary to describe any of these more minutely, as they are no longer used. Those who wish to read a more particular account of them may consult Dr. Martine's Essays.

As in meteorological observations it is necessary to attend to the greatest rise and fall of the thermometer, attempts have been made to construct a thermometer which might register the greatest degree of heat, or greatest degree of cold, which took place during the absence of the observer. In 1757 Lord Charles Cavendish presented to the Royal Society of London a thermometer in two different forms; the one contrived to mark the greatest degree of heat, and the other the greatest degree of cold.

The first consists of a glass tube A B, Plate 34, Fig. 3. with a cylindrical bulb B at the lower end, and capillary at the top, over which there is fixed a glass ball C. The bulb and part of the tube are filled with mercury, the top of which shows the degrees of heat as usual. The upper part of the tube above the mercury is filled with spirit of wine; the ball C is also filled with the same liquor almost to the top of the capillary tube. When the mercury rises the spirit of wine is also raised, and falls into the ball C, which is so made that the liquor cannot return into the tube when the mercury sinks; consequently the height of the spirit of wine in the ball, added to that in the tube, will give the greatest degree of heat to which the thermometer has pointed since last observation. When a new observation is to be made, the instrument must be inclined till the liquor in the ball cover the end of the capillary tube.

In this thermometer it is evident that the mercury must be affected by the weight and elasticity of the spirit of wine, and therefore it will not correspond to any of the common mercurial thermometers.

The thermometer for showing the greatest degree of cold is represented in fig. 4. by the crooked tube ABCD This instrument is filled with spirit of wine, with the addition of as much mercury as is sufficient to fill both legs of the syphon, and about a fourth or fifth part of the hollow ball C. We are not told what the proportion of mercury was to that of spirit of wine. The degrees of heat are shown by the rise or fall of the mercury in the leg AB. The thermometer marks the greatest fall by means of the hollow ball C. When the mercury in the longer leg sinks by cold, that in the shorter will rise and run over into the ball C, from which it cannot return when the mercury subsides in the shorter and rises in the longer leg. The upper part of the shorter leg will therefore be filled with a column of spirits of a length proportional to the increase of heat; the bottom or lower surface of which, by means of a proper scale, will show how much the mercury has been lower than it is; which being subtracted from the present height will give the lowest point to which the mercury has fallen. That the thermometer may be fitted for a new observation, the mercury must be made to run back from the ball into the shorter leg, by inclining the tube and heating the ball.

In 1782 Mr. Six proposed another self-registering thermometer. It is properly a spirit of wine thermometer, though mercury is also employed for supporting an index. *a b* is a thin tube of glass 16 inches long, and 5-16ths of an inch caliber: *c d e* and *f g b* are smaller tubes about 1-20th of an inch caliber. These three tubes are filled with highly rectified spirit of wine, except the space between *d* and *g*, which is filled with mercury. As the spirit of wine contracts or expands in the middle tube, the mercury falls or rises in the outside tubes. An index, such as that represented in fig. 6. is placed on the surface, within each of these tubes, so light as to float upon it. *k* is a small glass tube 3-4ths of an inch long, hermetically sealed at each end, and inclosing a piece of steel wire nearly of its own length. At each end *l*, *m*, of this small tube, a short tube of black glass is fixed, of such a diameter as to pass freely up and down within either of the outside tubes of the thermometer *c e* or *f b*. From the upper end of the index is drawn a spring of glass to the fineness of a hair, and about 5-7ths of an inch long; which being placed a little oblique, presses lightly against the inner surface of the tube, and prevents

the index from defcending when the mercury defcends. Thefe indexes being inferted one into each of the outfide tubes, it is eafy to underftand how they point out the greateft heat or cold that has happened in the obferver's abfence. When the fpirit of wine in the middle tube expands, it preffes down the mercury in the tube *bf*, and confequently raifes it in the tube *e c*; confequently the index on the left hand tube is left behind and marks the greateft cold, and the index in the right hand tube rifes and marks the greateft heat.

In 1790 a paper was given into the Royal Society of Edinburgh, defcribing two thermometers, newly invented, by Dr. John Rutherford of Middle Bailifh; the one for regiftering the higheft and the other for regiftering the loweft degree of heat to which the thermometer has rifen or fallen during the abfence of the obferver. An account of them may be found in the third volume of the Tranfactions of the Society.

A new felf-regiftering thermometer has more lately been invented by Mr. Keith of Ravelftone, which we confider as the moft ingenious, fimple, and perfect, of any which has hitherto appeared. Its fimplicity is fo great, that it requires only a very fhort defcription to make it intelligible.

AB is a thin glafs tube about fourteen inches long, and 3-4ths of an inch caliber, clofe or hermetically fealed at top. To the lower end, which is open, there is joined the crooked glafs tube BE, feven inches long, and 4-10ths of an inch caliber, and open at top. The tube AB is filled with the ftrongeft fpirit of wine, and the tube BE with mercury. This is properly a fpirit of wine thermometer, and the mercury is ufed merely to fupport a piece of ivory or glafs, to which is affixed a wire for raifing one index or depreffing another, according as the mercury rifes or falls. E is a fmall conical piece of ivory or glafs, of fuch a weight as to float on the furface of the mercury. To the float is joined a wire called the *float-wire*, which reaches upwards to H, where it terminates in a knee bent at right angles. The float-wire, by means of an eye at *a*, moves eafily along the fmall harpfichord wire GK. LL are two indexes made of thin black oiled filk, which flide upwards or downwards with a force not more than two grains. The one placed above the knee points out the greateft rife, and the one placed below it points out the greateft fall, of the thermometer.

When the inftrument is to be prepared for an obfervation, both indexes are to be brought clofe to the knee H. It is evident, that when the mercury rifes, the float and float-wire, which can be moved with the fmalleft force, will be pufhed upwards till the mercury becomes ftationary. As the knee of the float-wire moves upwards it will carry along with it the upper index L. When the mercury again fubfides, it leaves the index at the higheft point to which it was raifed, for it will not defcend by its own weight: As the mercury falls the float-wire does the fame; it therefore brings along with it the lower index L, and continues to deprefs it till it again becomes ftationary or afcends in the tube; in which cafe it leaves the lower index behind it as it had formerly left the upper. The fcale to which the indexes point is placed parallel to the flender harpfichord wire. It may be feen more diftinctly in fig. 8. That the fcale and indexes may not be injured by the wind and rain, a cylindrical glafs cover, clofe at top, and made fo as to exactly fit the part FG, is placed over it.

The ingenious inventor has another improvement in contemplation, which, if upon trial it be found to anfwer, will make this thermometer as perfect as can be defired, provided there do not arife fome errors from the variable preffure of the atmofphere. He propofes to adopt clock-work to this thermometer, in fuch a way as to regifter with the utmoft precifion the degrees of heat and cold for every month, day, and minute, in the year.

M. De Luc has defcribed the beft method of conftructing a thermometer, fit for determining the temperature of the air, in the menfuration of heights by the barometer. He has alfo fhown how to divide the fcale of a thermometer, fo as to adapt it for aftronomical purpofes in the obfervation of refractions.

Mr. Cavallo, in 1781, propofed the conftruction of a thermometrical barometer, which, by means of boiling water, might indicate the various gravity of the atmofphere, or the height of the barometer. But as he does not fay that the inftrument has been tried with the defired fuccefs, we forbear to defcribe it. Thofe who wifh to know his ideas refpecting it may confult the Philofophical Tranfactions, vol. lxxi. p. 524.

The thermometers hitherto defcribed are very limited in their extent; they indeed point out to us the loweft degrees of heat which are commonly obferved even in cold climates, but they by no means reach to thofe degrees of heat which are very familiar to us. The mercurial thermometer extends no farther than to 600 of Fahrenheit's fcale, the heat of boiling mercury; but we are fure that the heat of folid bodies, when heated to ignition, or till they emit light, far exceeds the heat of boiling mercury.

In order to remedy this defect, Sir Ifaac Newton, whofe genius overcame thofe obftacles which ordinary minds could not approach, attempted by an ingenious experiment to extend the fcale to any degree required. Having heated a mafs of iron red-hot, and expofed it to the cold air, he obferved the time which elapfed till it became cold, or of the fame temperature with the air; and when the heat fo far decreafed that he could apply fome known meafure (as a thermometer) to it, he obferved the degrees of heat loft in given times; and thence drew the general conclufion, that the quantities of heat loft in given fmall fpaces are always proportional to the heat remaining in the body, reckoning the heat to be the excefs by which it is warmer than the ambient air. So that taking the number of minutes which it took to cool after it came to a determined point in an arithmetical progreffion, the decrements of the heat of the iron would be continually proportional. Having by this proportion found out the decrements of heat in a given time after it came to a known point, it was eafy, by carrying upwards the fame proportion to the beginning of its cooling, to determine the greateft heat which the body had acquired. This proportion of Sir Ifaac's was found by Dr. Martine to be fomewhat inaccurate. The heat of a cooling body does not decreafe exactly in proportion to that which the body retains. As the refult of many obfervations, he found that two kinds of proportion took place, an arithmetical as well as the geometrical proportion which Sir Ifaac Newton had adopted; namely, that the decrements of heat were partly proportional to the times (that is, that quantities of heat are loft in equal times), as well as partly in proportion to the remaining heat; and that if thefe two are added together the rule will be fufficiently accurate. By the geometrical proportion which Sir Ifaac Newton adopted he difcovered the heat of metals red-hot or in fufion.

This method, fo fuccefsfully purfued by Sir Ifaac, was fufficient to form a fcale of high degrees of heat, but was not convenient for practical purpofes. Accordingly the ingenious Mr. Jofiah Wedgwood, who is well known for his great improvement in the art of pottery, applied himfelf in order to difcover a thermometer which might be eafily managed. After many experiments recorded in the Philofophical Tranfactions, but which it is unneffary to detail in this place, he has in-

vented a thermometer which marks with much preciſion the different degrees of ignition from a dull red heat viſible in the dark to the heat of an air-furnace. This thermometer is extremely ſimple. It conſiſts of two rulers fixed upon a ſmooth flat plate, a little farther aſunder at the one end than at the other, leaving an open longitudinal ſpace between them. Small pieces of alum and clay mixed together are made of ſuch a ſize as juſt to enter at the wide end; they are then heated in the fire along with the body whoſe heat we wiſh to determine. The fire, according to the degree of heat it contains, diminiſhes or contracts the earthy body, ſo that when applied to the wide end of the guage, it will ſlide on towards the narrow end, leſs or more according to the degree of heat to which it has been expoſed.

That this inſtrument may be perfectly underſtood, we have given a repreſentation of it in Plate 34. fig. 9. ABCD is a ſmooth flat plate; and EF and GH two rulers or flat pieces, a quarter of an inch thick, fixed flat upon the plate, with the ſides that are towards one another made perfectly true, a little farther aſunder at one end EG than at the other end FH: thus they include between them a long converging canal, which is divided on one ſide into a number of ſmall equal parts, and which may be conſidered as performing the offices both of the tube and ſcale of the common thermometer. It is obvious, that if a body, ſo adjuſted as to fit exactly at the wider end of this canal, be afterwards diminiſhed in its bulk by fire, as the thermometer pieces are, it will then paſs further in the canal, and more and more ſo according as the diminution is greater; and converſely, that if a body, ſo adjuſted as to paſs on to the narrow end, be afterwards expanded by fire, as is the caſe with metals, and applied in that expanded ſtate to the ſcale, it will not paſs ſo far; and that the diviſions on the ſide will be the meaſures of the expanſions of the one, as of the contractions of the other, reckoning in both caſes from that point to which the body was adjuſted at firſt.

I is the body whoſe alteration of bulk is thus to be meaſured. This is to be gently puſhed or ſlid along towards the end FH, till it is ſtopped by the converging ſides of the canal.

Mr. Wedgwood at firſt uſed clay for his thermometer pieces; but he ſoon found it impoſſible to procure freſh ſupplies of the ſame quality. He therefore had recourſe to an artificial preparation. As the earth of alum is the pure argillaceous earth to which all clays owe their property of diminiſhing in the fire, he mixed ſome of this earth with the clay, and found it to anſwer his wiſhes completely, both in procuring the neceſſary degree of diminution and of increaſing its unvitreſcibility. The only way of aſcertaining the proportion of alum earth to be added is by repeated trials. Mr. Wedgwood found that ten hundred weight of the poreclain clay of Cornwall required all the earth that was afforded by five hundred weight of alum. But as the clay or alum differs in quality, the proportion will alſo differ. There can now, however, be no difficulty in making thermometers of this kind, as common clay anſwers the purpoſe very well, and alum-earth can eaſily be procured. Thoſe who wiſh to ſee a more particular account of this ſubject may peruſe Mr. Wedgwood's papers in the Philoſophical Tranſactions for 1782, 1784, and 1786.

As Mr. Wedgwood's thermometer begins at the loweſt degree of ignition, and Fahrenheit's goes no higher than the boiling point of mercury, Mr. Wedgwood continued to fill up the interval of the ſcale by uſing a piece of ſilver inſtead of his common thermometer pieces; and in this way he has found out that 130 degrees of Fahrenheit are equal to one of his. He has accordingly, by obſerving this proportion, continued Fahrenheit's ſcale to the top of his own. We are now therefore enabled to give a ſcale of heat from the higheſt degree of heat produced by an air-furnace to the greateſt degree of cold hitherto known, which was produced at Hudſon's Bay in December, 1784, by a mixture of vitriolic acid and ſnow. Of the remarkable degrees between theſe extreme points we ſhall now lay before our readers a ſcale.

	Fahrenheit's ſcale.	Wedgwood's ſcale.
Extremity of Wedgwood's ſcale	32277°	240°
Greateſt heat of his ſmall air-furnace	21877	160
Caſt-iron melts - -	17977	130
Greateſt heat of a common ſmith's forge	17327	125
Welding heat of iron, greateſt	13427	95
——————— leaſt - -	12777	90
Fine gold melts - -	5237	32
Fine ſilver melts - -	4717	28
Swediſh copper melts -	4587	27
Braſs melts - - -	3807	21
Heat by which his enamel colours are burnt on - -	1857	6
Red-heat fully viſible in day-light	1077	0
Red-heat fully viſible in the dark	947	1
MERCURY BOILS, alſo lintſeed and other expreſſed oils - -	600	
Oil of turpentine boils -	560	
Sulphuric acid boils - -	546	
Lead melts - - -	540	
Biſmuth melts - - -	460	
Tin melts - -	408	
Sulphur melts - -	244	
Nitrous acid boils - -	242	
Cows milk boils - -	213	
WATER BOILS - -	212	
Human urine boils - -	206	
Brandy boils - -	190	
Alcohol boils - -	174	
Serum of blood and white of eggs harden	156	
Bees wax melts - -	142	
Heat of the air near Senegal ſometimes	111	
Hens hatch eggs about -	108	
Heat of birds from - -	103 to 111	
Heat of domeſtic quadrupeds from	100 to 103	
Heat of the human body -	92 to 99	
Heat of a ſwarm of bees -	97	
Heat of the ocean under the equator	80	
Butter melts - -	74	
Vitriolic acid of the ſpecific gravity of 1780 freezes at - -	45	
Oil of olives begins to congeal -	43	
Heat of hedgehogs and marmots in a torpid ſtate - - - -	$39\frac{1}{2}$	
WATER FREEZES and ſnow melts	32	
Milk freezes - - -	30	
Urine and common vinegar freezes	28	
Human blood freezes - -	25	
Strong wines freeze - -	20	
A mixture of one part of alcohol and three parts of water freezes -	7	
A mixture of ſnow and ſalt freezes	0 to 4	
Brandy, or a mixture of equal parts of alcohol and water, freezes - -	— 7	
Spirit of wine in Reaumur's thermometer froze at Torneo - -	— 34	
MERCURY FREEZES - -	— 39 or 40	
Cold produced by Mr. Macnab at Hudſon's Bay by a mixture of vitriolic acid and ſnow - - -	— 69	

THERMOPYLÆ (anc. geog.); a narrow pass or defile, between the wash of the Sinus Maliacus; on the east and steep mountains, reaching to Oeta, made dreadful by impassable woods; on the west, leading from Thessaly to Locris and Bœotia. These mountains divide Greece in the middle, in the same manner as the Apennine does Italy; forming one continued ridge from Leucate on the west to the sea on the east, with thickets and rocks interspersed; that persons even prepared for travelling, much less an army encumbered with baggage, cannot easily find a commodious passage. In the valley verging towards the Sinus Maliacus, the road is only sixty paces broad; the only military way for an army to pass, if not obstructed by an enemy; and therefore the place is called *Pylæ*, and by others, on account of its hot water, *Thermopylæ*. Ennobled by the brave stand made by Leonidas and three hundred Spartans against the whole army of Persia; and by the bold resolution of blind Euthycus, choosing rather to fall there in fight, than return to Sparta, and escape the common danger. Famous also for the Amphyctiones, the common council or states general of Greece, assembling there twice a year, spring and autumn.

THESEA, in antiquity, feasts celebrated by the Athenians in honour of Theseus, consisting of sports and games, with mirth and banquets; such as were poor and unable to contribute to them were entertained at the public expence.

THESEUS, a famous hero of antiquity ranked among the demi-gods, whose history is fabulous. He was the reputed son of Ægeus king of Athens. He threw Sciron, a cruel robber, down a precipice; fastened Procrustes, tyrant of Attica, to a bending pine, which being let loose tore him asunder; killed the Minotaur kept in the labyrinth by king Minos, in Crete; and by the assistance of that prince's daughter, Ariadne, who gave him a clue, escaped out of that labyrinth, and sailed with his deliverer to the isle of Naxos, where he had the ingratitude to leave her.

Theseus afterwards overcame the Centaurs, subdued the Thebans, and defeated the Amazons. He assisted his friend Pirithous in his expedition to the infernal regions to carry off Proserpine; but was imprisoned by Pluto, till he was released by Hercules. He is also said to have established the Istmean games, in honour of Neptune; to have united the twelve cities of Attica; and to have founded a republic there, 1236 B.C. Some time after, taking a voyage into Epirus, he was seized by Aidonius, king of the Molossians; meanwhile Menestheus rendered himself master of Athens. But at length Theseus being released from prison, retired to Scyros, where King Lycomedes caused him to be thrown from the top of a rock. Theseus had several wives; the first of whom was Helena the daughter of Tyndarus; the second, Hypolita queen of the Amazons; and the last, Phedra sister to Ariadne, who punished him for his infidelity to her sister, by her incestuous passion for his son Hippolitus.

THESIS, a general position which a person advances, and offers to maintain. In taking degrees in universities, the candidates are generally obliged to write a thesis, which they must afterwards defend.

THESIUM, BASE FLUELLIN, in botany: a genus of plants belonging to the class of *pentandria*, and order of *monogynia*. The calyx is monophyllous, with the stamina inserted into it: there is only one seed, which is inferior. There are seventeen species; one of which is a British plant, the *linophyllum* or bastard toad-flax. It has a foliaceous panicle with linear leaves, and flowers in June and July.

THESPIS, a famous Greek tragic poet, and the first representer of tragedy at Athens. He carried his troop from village to village in a waggon, from which they performed their pieces. Alcestis was the first tragedy they performed at Athens, 536 B.C. See THEATRE.

THESSALIAN *Chair*, so called from Thessaly, where chairs of this figure were most in use; it is recommended by Hippocrates in place of a machine for reducing a recent luxation of the shoulder bone. The back of this chair is perpendicular to the seat, as Galen tells us; by which construction it is distinguished and accommodated to the operation.

THESSALY, a country of Greece, whose boundaries have been different at different periods. Properly speaking, Thessaly was bounded on the south by the southern parts of Greece, or Græcia Propria; east, by the Ægean; north, by Macedonia and Mygdonia; and west, by Illyricum and Epirus. It was generally divided into four separate provinces, Thessaliotis, Pelalgiotis, Istiæotis, and Phthiotis, to which some add Magnesia. It has been severally called *Æmonia*, *Pelasgicum*, *Argos*, *Hellas*, *Argeia*, *Dryopis*, *Pelasgia*, *Pyrrhæa*, &c. The name of Thessaly is derived from Thessalus, one of its monarchs. Thessaly is famous for a deluge which happened there in the age of Deucalion. Its mountains and cities are also celebrated, such as Olympus, Pelion, Ossa, Larissa, &c. The Argonauts were partly natives of Thessaly. The inhabitants of the country passed for a treacherous nation, so that false money was called *Thessalian coin*, and a perfidious action a *Thessalian deceit*. Thessaly was originally governed by kings, till it became subject to the Macedonian monarchs. The cavalry was universally esteemed, and the poeple were superstitious and addicted to the study of magic and incantations. See *Lucan*. 6. v. 438, &c.; *Dionys*. 249; *Curt*. 3. c. 2; *Ælian*, *V. H.* 3. c. 1; *Paus*. 4. c. 36. l. 10. c. 1; *Mela*. 2. c. 3; *Justin* 7. c. 6; *Diod*. 4. Thessaly is now called *Janna*, a province of European Turkey, bounded by Macedonia on the north, by the Archipelago on the east, by Achaia or Livadia on the south, and by Epirus on the west.

THETIS, in Pagan mythology, the wife of Oceanus, and the mother of Nereus and Doris, who were married to each other; and from this marriage sprung the nymphs of the earth and sea. Among the sea nymphs there was one named *Thetis the Younger*, who excelled all the rest in beauty, and for whom Jupiter conceived such a passion, that he resolved to espouse her; but being informed by the Destinies that she would bring forth a son who would rise above his father, he married her to Peleus. To their nuptials all the gods and goddesses were invited except Discord, who, to be revenged for this contempt, threw a golden apple into the assembly, on which was engraven, *For the fairest*. Juno, Pallas, and Venus, disputed for this apple; but Paris being chosen to decide the difference, adjudged it to Venus. From this marriage of Thetis and Peleus sprung Achillis.

THEURGY, Θεουργια, a name which the ancients gave to that sacred part of magic which we sometimes call *white magic*, or the *white art*. The word is formed from Θεος, "God," and εργον "work;" *q. d.* the art of doing divine things, or things which God alone can do: or the power of working extraordinary and supernatural things, by invoking the names of God, saints, angels, &c. Accordingly, those who have written of magic in general, divide it into three parts: the first whereof is called *theurgy*, as operating by divine or celestial means; the second, *natural magic*, performed by the powers of nature; and the third, comprehending *necromancy*, *sorcery*, and *witchcraft* or *magic*, performed by the assistance of demons or departed men. See MAGIC.

THIBET. See TIBET.

THIGH, in anatomy. See ANATOMY.

THINKING, a general name for any act or operation of the mind. See METAPHYSICS.

THIRST, an uneaſy ſenſation ariſing from a deficiency of the ſaliva to moiſten the inward parts of the mouth. Hence ariſes a ſtrong deſire for drink; and thirſt is a ſymptom generally attending fevers of all kinds.—Thirſt is beſt allayed by acids; water kept a while in the mouth, then ſpit out, and repeated as required; a bit of bread chewed with a little water, which latter may be gradually ſwallowed; if the perſon is very hot, brandy is the beſt for holding in the mouth, but ſhould be ſpit out again: except in fevers, large draughts of cold water are hurtful. For the means of *preſervation againſt Hunger and* THIRST, ſee HUNGER.

THISTLE, a well known weed in corn-fields. In Britain there are eight ſpecies of thiſtles according to the vulgar arrangement; the carduus lanceolatus or ſpear-thiſtle, the nutans or muſk-thiſtle, the paluſtris or marſh-thiſtle, the marianus or milk-thiſtle, acanthoides or welted-thiſtle, criſpus or curled-thiſtle, onopordum acanthium or cotton-thiſtle, ſerratula arvenſis or corn-thiſtle. All theſe, except the laſt, are annual or biennial, and therefore may be eaſily deſtroyed by cutting them down before their ſeed ripens; but the ſerratula arvenſis is perennial, continues in the earth increaſing and throwing up new ſhoots every year. Mr. Curtis aſcertained the annual increaſe of its root, by planting in a garden a piece of the root two inches long, and about the thickneſs of a gooſe's quill, and a ſmall head of leaves. By the 2d of November the root had extended itſelf eight feet, and when dug and waſhed it weighed four pounds. As to the uſes of the thiſtle, they are not well known. The corn-thiſtle is eaten by the aſs, and formerly was pulled with great care by the farmers in ſome parts of Scotland as food for their horſes. For a botanical deſcription of the different kinds of thiſtle, ſee CARDUUS, CACTUS, DIPSAUS, ONOPORDUM, SERRATULA, SONCHUS.

Order of the THISTLE, or *of St. Andrew*, a military order of knighthood in Scotland, the riſe and inſtitution of which is variouſly related by different authors. Leſley biſhop of Roſs reports, that the night before the battle between Athelſtan king of Northumberland and Hungus king of the Picts, a bright croſs, in form of that whereon St. Andrew (the tutelar ſaint of Scotland) ſuffered martyrdom, appeared to Hungus; who having gained the victory, ever after bore the figure of that croſs on his banners. Others aſſert, that Achaius king of Scotland firſt inſtituted this order, after having made the famous league offenſive and defenſive with Charlemagne king of France. But although the thiſtle had been acknowledged as the ſymbol of the kingdom of Scotland from the reign of Achaius, yet ſome refer the beginning of this order to Charles VII. of France. Others place the foundation of it as low as the year 1500.

The chief and principal enſign is a gold collar compoſed of thiſtles and ſprigs of rue interlinked with amulets of gold, having pendent thereto the image of St. Andrew with his croſs, and the motto, NEMO ME IMPUNE LACESSIT. "No body ſhall provoke me with impunity." The ordinary or common enſign worn by the knights is a ſtar of four ſilver points, and over them a green circle, bordered and lettered with gold, containing the ſaid motto, and in the centre is a thiſtle; all which is embroidered on their left breaſt, and worn with the collar, with a green riband over the left ſhoulder, and brought under the right arm; pendent thereto is the image of St. Andrew, with his croſs, in a purple robe, within an oval of gold enamelled vert, with the former motto; but ſometimes they wear, encircled in the ſame manner, a thiſtle crowned.

About the time of the Reformation, this order was dropped, till James II. of Great Britain reſumed it, by creating eight knights. The Revolution unſettled it again; and it lay neglected, till queen Anne, in 1703, reſtored it to the primitive deſign, of twelve knights of St. Andrew.

THLAPSI, BASTARD-CRESS, or *mithridate-muſtard*, in botany: a genus of plants belonging to the claſs of *tetradynamia*, and order of *ſiliculoſa*; and in the natural ſyſtem ranging under the 39th order, *Siliquoſa*. The pod is emarginated, obcordate, and polyſpermous; the valves are boat-ſhaped and marginato-carinated. There are twelve ſpecies; of which ſix only are natives of Britain, the *arvenſe, hirtum, campeſtre, montanum, perfoliatum*, and *burſa paſtoris*. 1. The *arvenſe*, treacle-muſtard or penny-creſs, has orbiculate pods, and leaves oblong, ſmooth, and ſcalloped. It ſmells like garlic, and has a white flower. 2. The *hirtum*, or perennial mithridate-muſtard, has roundiſh hairy pods; the cauline leaves are ſagittate and villous. 3. The *campeſtre*, or mithridate-muſtard, has roundiſh pods, ſagittate leaves, dentated and hairy. 4. *Montanum*, or mountain mithridate-muſtard, has obcordate pods, ſmooth leaves; the radical leaves ſomewhat fleſhy, obovate and entire; the cauline embracing the ſtalk, and the corolla being larger than the calyx. 5. The *perfoliatum*, or perfoliate treacle-muſtard, has obcordate pods; the cauline leaves are ſmooth and ſubdentate; the petals of the length of the calyx, and the ſtalk branchy. 6. The *burſa paſtoris*, or ſhepherd's purſe, has obcordate pods; the radical leaves are pinnatifid. The ſeeds of ſome theſe ſpecies have an acrid biting taſte, approaching to that of the common muſtard; with which they agree nearly in their pharmaceutic properties.

THOLOUSE. See TOULOUSE.

THOMÆANS, THOMISTS. See CHRISTIANS *of St. Thomas*.

THOMAS AQUINAS. See AQUINAS.

St. Thomas's Day, a feſtival of the Chriſtian church, obſerved on December 21, in commemoration of St. Thomas the apoſtle.

St. Thomas of Canterbury's Day, a feſtival of the Romiſh church, obſerved on December 29, in memory of Thomas Becket archbiſhop of Canterbury, who was murdered, or, as the Romaniſts ſay, martyred, in the reign of King Henry II.

Thomas the Reymour, called alſo *Thomas Lermont*, and *Thomas of Erceldon*, was born at Erceldon, a village near Melroſe in Tweedale, in what year is uncertain; but he was an old man when Edward I. was carrying on war in Scotland.

The character of Lermont as a prophet, and which was common to him with Linus, Orpheus, and other early poets in many countries, aroſe, if we may believe Mackenyie in his Lives of Scottiſh writers, from his having conferences with Eliza, a nun and propheteſs at Haddington. Lermont put her predictions into verſe, and thus came in for his ſhare of the prophetic ſpirit. None of theſe ancient prophecies now remain; except a pretended one, of which mention is made in Pinkerton's Scottiſh Poets. It is contained in a manuſcript of the time of Edward I. or II. The Counteſs of Dunbar is the lady famous for the defence of her caſtle againſt the Engliſh. Her proper title was *Counteſs of March*; but it was common in theſe times to ſtyle a nobleman from his chief reſidence. Thus Gilbert Strongbow, earl of Pembroke, is called *Earl of Striguil*, from his reſidence at Striguil caſtle, near Chepſtow, Monmouthſhire, &c.

The prophecies of Lermont appear to have been merely traditional; nay, it ſeems doubtful if he ever pretended to ſuch folly, notwithſtanding Mackenyie's ſtory of Eliza. The reverence of the people for a learned and reſpectable character ſeems to have been the ſole foundation of Thomas's claim to

prophecy. But, in the 16th century, prophecies were made, and afcribed to him, as well as others given to Bede, Merlin, &c. They were printed at Edinburgh, 1615, reprinted 1680, and 1742.

THOMISM. See AQUINAS.

THOMSON (JAMES), an excellent Britifh poet, was the fon of a minifter in Scotland, and born at Ednam, in the fhire of Roxburgh, Sept. the 11th, 1700. He gave early marks of genius, which was difcoverable through the rudenefs of his puerile effays; and, after the ufual courfe of fchool-education at Jedburgh, was fent to the univerfity of Edinburgh. In the fecond year of his admiffion, his ftudies were for fome time interrupted by the death of his father; but his mother foon after repaired with her family, which was very numerous, to Edinburgh, where fhe lived in a decent frugal manner, till her favourite fon had not only finifhed his academical courfe, but was even diftinguifhed and patronifed as a man of genius.

The divinity-chair at Edinburgh was then filled by Mr. Hamilton, whofe lectures our author attending about a year, there was prefcribed to him, for the fubject of an exercife, a pfalm, in which the power and majefty of God are celebrated. Of this pfalm he gave a paraphrafe and illuftration, as the nature of the exercife required, but in a ftyle fo highly poetical, that it furprifed the whole audience. Mr. Hamilton complimented him upon the performance; but at the fame time told him, fmiling, that if he thought of being ufeful in the miniftry, he muft keep a ftricter reign upon his imagination, and exprefs himfelf in language more intelligible to an ordinary congregation. Thomfon concluded from this, that his expectations from the ftudy of theology might be very precarious, even though the church had been more his free choice than it probably was: fo that, having foon after received fome encouragement from a lady of quality, a friend of his mother, then in London, he quickly prepared himfelf for a journey there: and although this encouragement ended in nothing beneficial, it ferved then for a good pretext, to cover the imprudence of committing himfelf to the wide world, unfriended and unpatronifed, and with the flender ftock of money he was then poffeffed of. But his merit did not lie long concealed. Mr. Forbes, afterwards lord prefident of the feffion, received him very kindly, and recommended him to fome of his friends. The good reception he met with wherever he was introduced emboldened him to rifque the publication of his "Winter," in March 1726, which was no fooner read than univerfally admired; and from that time his acquaintance was courted by all men of tafte. Dr. Rundle, afterwards bifhop of Derry, received him into his intimate confidence and friendfhip; promoted his character every-where; introduced him to his great friend the lord chancellor Talbot; and fome years after, when the eldeft fon of that nobleman was to make his tour of travelling, recommended Mr. Thomfon as a proper companion for him. Mean while, our poet's chief care had been, in return for the public favour, to finifh the plan which their wifhes laid out for him; and the expectations which his "Winter" had raifed were fully fatisfied by the fucceffive publication of the other feafons; of "Summer," in 1727; of "Spring," in 1728; and of "Autumn," in a 4to. edition of his works, in 1730.

Befides thefe, and his tragedy of "Sophonifba," written and acted with applaufe in 1729, Thomfon had in 1727 publifhed his "Poem to the Memory of Sir Ifaac Newton," then lately deceafed. The fame year, the refentment of our merchants, for the interruption of their trade by the Spaniards in America, running very high, Thomfon zealoufly took part in it, and wrote his poem, "Britannia," to roufe the nation to revenge. His poetical purfuits were now to be interrupted by his attendance on the honourable Mr. Charles Talbot in his travels, with whom he vifited moft of the courts and capital cities of Europe. How particular and judicious his obfervations abroad were, appears from his poem on "Liberty," in five parts, thus entitled, "Ancient and Modern Italy compared;" "Greece;" "Rome;" "Britain;" "The Profpect." While he was writing the firft part of "Liberty," he received a fevere fhock by the death of his noble friend and fellow-traveller; and this was foon followed by another feverer ftill, and of more general concern, the death of lord Talbot himfelf, which Thomfon fo pathetically laments, in the poem dedicated to his memory. At the fame time, he found himfelf from an eafy competency reduced to a ftate of precarious dependence, in which he paffed the remainder of his life, excepting only the two laft years of it, during which he enjoyed the place of furveyor-general of the Leward-Iflands, procured for him by the generous friendfhip of Lord Lyttelton. Immediately upon his return to England with Mr. Talbot, the chancellor had made him his fecretary of briefs, a place of little attendance, fuiting his retired indolent way of life, and equal to all his wants. This place fell with his patron; yet could not his genius be depreffed, or his temper hurt, by this reverfe of fortune. The profits arifing from his works were not inconfiderable; his "Tragedy of Agamemnon," acted in 1738, yielded a good fum. But his chief dependence, during this long interval, was on the protection and bounty of his royal highnefs Frederic prince of Wales, who, upon the recommendation of Lord Lyttelton, then his chief favourite, fettled on him an handfome allowance, and always received him very gracioufly. It happened, however, that the favour of his royal highnefs was, in one inftance, of fome prejudice to Mr. Thomfon, in the refufal of a licence for his "Tragedy of Edward and Eleanora," which he had prepared for the ftage in 1739. This proceeded from the mifunderftandings which then fubfifted between the court of the prince of Wales and that of the king his father. His next dramatic performance was the "Mafque of Alfred," written jointly with Mr. Mallet, who was his good friend on many occafions, by command of the Prince of Wales, for the entertainment of his royal highnefs's court at his fummer refidence. In 1745, his "Tancred and Sigifmunda," taken from the novel in Gil Blas, was performed with applaufe. He had, in the mean time, been finifhing his "Caftle of Indolence," an allegorical poem, in two cantos. This was the laft piece Thomfon himfelf publifhed, his tragedy of "Coriolanus" being only prepared for the theatre, when a fever feized him, and deprived the world of a very good man, as well as of a very good poet. His death happened Aug. the 27th, 1748. His executors were the Lord Lyttelton and Mr. Mitchel; and by their intereft, the orphan play, "Coriolanus," was brought on the ftage to the beft advantage: from the profits of which, and from the fale of his manufcripts and other effects, all demands were duly fatisfied, and a handfome fum remitted to his fifters. His remains were depofited in the church of Richmond, under a plain ftone, without any infcription.

THOR, the eldeft and braveft of the fons of Odin and Frea, was, after his parents, the greateft god of the Saxons and Danes while they continued heathens. They believed, that Thor reigned over all the aerial regions, which compofed his immenfe palace, confifting of 540 halls; that he launched the thunder, pointed the lightening, and directed the meteors, winds, and ftorms. To him they addreffed their prayers for favourable winds, refrefhing rains, and fruitful feafons; and to him the fifth day of the week, which ftill bears his name, was confecrated.

THORAX. See ANATOMY.

WHITE or HAW THORN. See CRATÆGUS.

THORN, a town of Poland, in Regal Pruffia, and in the palatinate of Culm. It was formerly a Hanfeatic town, and

ſtill enjoys great privileges; is large and well fortified; but part of the fortifications, and a great number of houſes, were ruined by the Swedes in 1703. It is ſeated on the Viſtula, and contains 10,000 inhabitants. E. Long. 18. 42. N. Lat. 53. 6.

THORNBACK, in ichthyology. See Raia.

THORNHILL (Sir James), an eminent Engliſh painter, was born in Dorſetſhire in 1676, of an ancient family; but was conſtrained to apply to ſome profeſſion by the diſtreſſes of his father, who had been reduced to the neceſſity of ſelling his family-eſtate. His inclination directed him to the art of painting; and on his arrival at London he applied to his uncle, the famous Dr. Sydenham, who enabled him to proceed in the ſtudy of the art under the direction of a painter who was not very eminent. However, the genius of Thornhill made ample amends for the inſufficiency of his inſtructor, and by an happy application of his talents he made ſo great a progreſs, that he gradually roſe to the higheſt reputation.

His genius was well adapted to hiſtorical and allegorical compoſitions; he poſſeſſed a fertile and fine invention; and he ſketched his thoughts with great eaſe, freedom, and ſpirit. He excelled alſo equally in portrait, perſpective, and architecture; ſhewed an excellent taſte for deſign, and had a free and firm pencil. Had he been ſo fortunate as to have ſtudied at Rome and Venice, to acquire greater correctneſs at the one, and a more exact knowledge of the perfection of colouring at the other, no artiſt among the moderns might perhaps have been his ſuperior. Nevertheleſs, he was ſo eminent in many parts of his profeſſion, that he muſt for ever be ranked among the beſt painters of his time; and his performances in the dome of St. Paul's church at London, in the hoſpital at Greenwich, and at Hampton-court, are ſuch public proofs of his merit as will convey his name to poſterity with great honour.

This painter lived in general eſteem; he enriched himſelf by the excellence of his works: was appointed ſtate-painter to Queen Anne, from whom he received the honour of knighthood; had the ſingular ſatisfaction to repurchaſe his family eſtate; and was ſo much diſtinguiſhed as to be elected one of the members of parliament. He died in 1732.

THOROUGH-wax, in botany. See Bupleurum.

THOTH, or Theut (called by the Phœnicians *Taaut*, by the Greeks *Hermes*, and by the Romans *Mercury)*, was a Phœnician of very ſuperior talents, and one of the civilizers of mankind. He was prime miniſter to Oſiris, whom, after his death, he deified; and he was himſelf deified by his countrymen the Egyptians, for the benefits that he had rendered to the human race. See Mercury, Mythology, and Polytheism.

THOUGHT, a general name for all the ideas conſequent on the operations of the mind, and even on the operations themſelves. See Metaphysics.

Thought, in compoſition. See Oratory, Part I. and II.

THOUINIA, in botany: a genus of plants belonging to the claſs of *diandria*, and order of *monogynia*. The corolla is quadripetalous; the calyx quadripartite, and the antheræ ſeſſile. There is only one ſpecies diſcovered, the *nutans*.

THRACE, a country very frequently mentioned by the Greek and Latin writers, deriving its name, according to Joſephus, from Tiras one of the ſons of Japhet. It was bounded on the north by mount Hæmus; on the ſouth, by the Ægean Sea; on the weſt, by Macedon and the river Strymon; and on the eaſt, by the Euxine Sea, the Helleſpont, and the Propontis.—The Thracian Cherſoneſus is a peninſula incloſed on the ſouth by the Ægean Sea, on the weſt by the gulf of Melas, and on the eaſt by the Helleſpont; being joined on the north to the continent by a neck of land about thirty-ſeven furlongs broad. The inland parts of Thrace are very cold and barren, the ſnow lying on the mountains the greateſt part of the year; but the maritime provinces are productive of all ſorts of grain and neceſſaries for life; and withal ſo pleaſant, that Mela compares them to the moſt fruitful and agreeable countries of Aſia.

The ancient Thracians were deemed a brave and warlike nation, but of a cruel and ſavage temper; being, according to the Greek writers, ſtrangers to all humanity and good-nature. It was to the Thracians, however, that the Greeks were chiefly indebted for the polite arts that flouriſhed among them; for Orphæus, Linus, Muſæus, Thamyris, and Eumolpus, all Thracians, were the firſt, as Euſtathius informs us, who charmed the inhabitants of Greece with their eloquence and melody, and perſuaded them to exchange their fierceneſs for a ſociable life and peaceful manners; nay, great part of Greece was anciently peopled by Thracians. Tereus, a Thracian, governed at Daulis in Phocis, where the tragical ſtory of Philomela and Progna was acted. From thence a body of Thracians paſſed over to Eubœa, and poſſeſſed themſelves of that iſland. Of the ſame nation were the Aones Tembices, and Hyanthians, who made themſelves maſters of Bœotia; and great part of Attica itſelf was inhabited by Thracians, under the command of the celebrated Eumolpus. It is not therefore without the utmoſt ingratitude and injuſtice that the Greeks ſtyle them *Barbarians*, ſince to them chiefly they were indebted both for the peopling and poliſhing of their country.

Thrace was anciently divided into a number of petty ſtates, which were firſt ſubdued by Philip of Macedon. On the decline of the Macedonian empire, the country fell under the power of the Romans. It continued under ſubjection to them till the irruption of the Turks, in whoſe hands it ſtill remains.

THRASHING, in agriculture, the operation by which corn is ſeparated from the ſtraw. This operation is performed in a variety of ways, ſometimes by the feet of animals, ſometimes by a flail, and ſometimes by a machine.

The moſt ancient method of ſeparating the corn from the ſtraw was by the hoofs of cattle or horſes. This was practiſed by the Iſraelites, as we find from the books of Moſes; it was alſo common among the Greeks and Romans. Flails and thraſhing machines were alſo not uncommon among theſe nations. The flail which was uſed by the Romans, called *baculus*, *fuſtis*, or *pertica*, was probably nothing more than a cudgel or pole. The thraſhing machine, which was called *tribula* or *tribulum*, and ſometimes *traha*, was a kind of ſledge made of boards joined together, and loaded with ſtone or iron. Horſes were yoked to this machine, and a man was ſeated upon it to drive them over the ſheaves of corn.

Different methods are employed in different countries for ſeparating the corn from the ſtalk. In the greateſt part of France the flail is uſed; but in the ſouthern diſtricts it is generally performed by the feet of animals: animals are alſo uſed for the ſame purpoſe in Spain, in Italy, in the Morea, in the Canaries, in China, and in the vicinity of Canton, where the flail is alſo ſometimes uſed. It appears that in hot climates the grains do not adhere ſo firmly to the ſtalk as in cold countries, and therefore may be more eaſily ſeparated. This will explain the reaſon why animals are ſo frequently employed in hot countries for treading out the corn; whereas in cold climates we know they are ſeldom tried, and have no reaſon to ſuppoſe that they would anſwer the purpoſe. In the Iſle of France in Africa, rice and wheat are thraſhed with poles, and maize with ſticks; for it has not been poſſible to teach the negroes the uſe of the flail.

The animals uſed for treading out corn are, oxen, cows, horſes, mules, and even aſſes when the quantity is not great. The operation is performed in this manner: the ſheaves, after

being opened, are ſpread in ſuch a manner that the ears of the corn are laid as much uppermoſt as poſſible, and a man, ſtanding in the centre, holds the halters of the cattle, which are made to trot round as in a manege; whilſt other men with forks ſhake the ſtraw up from time to time, and the cattle are trotted over it again and again till they have beaten out all the grain. This method is expeditious enough; but beſides bruiſing a conſiderable quantity of corn, it requires a great many cattle, and injures the legs of the horſes and mules, which are preferred before cows and oxen for this work.

The flail is undoubtedly a much better inſtrument for thraſhing corn than the feet of animals, for it ſeparates the grain from the ſtraw and huſks both more effectually and more expeditiouſly; yet it is liable to many objections. It is a very laborious employment, too ſevere indeed even for a ſtrong man; and as it is uſually the intereſt of the thraſher rather to thraſh much than to thraſh clean, a good deal of corn will generally be left upon the ſtraw. It is therefore an object of great importance in huſbandry to procure a proper machine for ſeparating the corn from the ſtraw.

The firſt thraſhing machine attempted in modern times, of which we have received any account, was invented in Edinburgh by Mr. Michael Menzies about the year 1732. It conſiſted of a number of inſtruments like flails, fixed in a moveable beam, and inclined to it at an angle of ten degrees. On each ſide of the beam in which the flails were fixed, floors or benches were placed for ſpreading the ſheaves on. The flails were moved backwards and forwards upon the benches by means of a crank fixed on the end of an axle, which made about thirty revolutions in a minute.

In 1776 an attempt was made by Mr. Andrew Meikle, an ingenious millwright in the pariſh of Tyningham, Eaſt Lothian, to conſtruct a new machine upon the principles which had been adopted by Mr. Menzies already mentioned. This conſiſted in making joints in the flails, which Mr. Menzies had formed without any. But this machine, after much labour and expence was ſoon laid aſide, on account of the difficulty of keeping it in repair, and the ſmall quantity of work performed, which did not exceed one boll or ſix Wincheſter buſhels of barley *per* hour. At length, however, Mr. Meikle invented one different in principle from the machines which had before been conſtructed. This was made in the year 1785; and in the following year the firſt thraſhing machine on the ſame principles was erected in the neighbourhood of Alloa, in the county of Stirling. The machine anſwered completely, and the fame of it ſoon ſpread over the whole country. At length Mr. Meikle, having got a patent for conſtructing them, theſe machines are now become very common.

The thraſhing machine, in its moſt improved ſtate, is ſo ſimple, that with the aſſiſtance of Plate 36, exhibiting the plan of elevation, fig. 1, the ground plan, fig. 2, and the 3d ſhowing its eſſential parts in a diſtinct manner, it will be eaſily underſtood. The power employed for turning that part of the machine which ſeparates the corn from the ſtraw is produced by four wheels (when moved by horſes), the teeth of which move in one another and turn the drum, on which four ſcutchers are fixed. The ſheaves are introduced between two fluted rollers, which hold them firm, and draw them in gradually, while the ſcutchers ſtrike off the grain from the ſtraw as it paſſes through. This will ſuffice for a general idea of this machine. We will now be more particular.

The large ſpur-wheel A, n° 1 and 2, which has 276 cogs, is horizontal, and moves the pinion B, which has 14 teeth. The pinion B moves the crown wheel C, which has 84 teeth; the wheel C moves a ſecond pinion D, which has 16 teeth; and the pinion D moves the drum HIKL. The drum is a hollow cylinder three feet and an half diameter, and placed horizontally; on the outſide of which the ſcutchers are fixed by ſtrong ſcrew bolts. The ſcutchers conſiſt of four pieces of wood, faced on one ſide with a thin plate of iron, placed at an equal diſtance from each other, and at right angles to the axis of the drum.

The ſheaves are ſpread on an inclined board F, n° 3, from which they are introduced between two fluted rollers GG made of caſt-iron, about three inches and an half in diameter, and making about 35 revolutions in a minute. As theſe rollers are only about three quarters of an inch diſtant from the ſcutchers or leaves of the drum HIKL, they ſerve to hold the ſheaves faſt, while the ſcutchers *a*, *b*, *c*, *d*, moving with prodigious velocity, ſeparate the grain completely from the ſtraw, and at the ſame time throw out both grain and ſtraw upon the concave rack M, lying horizontally with ſlender parallel ribs, ſo that the corn paſſes through them into a hopper N, placed below. From the hopper it paſſes through a harp or riddle O into a pair of fanners P, from which, in the moſt improved machines, it comes out clean and fit for the market. The ſtraw, after being thrown by the ſcutchers *a*, *b*, *c*, *d*, into the rack, is removed from it by a rake QRST into a place contiguous, V. The rake conſiſts of four thin pieces of wood or leaves; on the end of each of theſe leaves is ranged a row of teeth, *e*, *f*, *g*, *h*, five inches long. The rake moves in a circular manner in the concave rack, while the teeth catch hold of the ſtraw, and throw it out of the rack. Theſe are all the eſſential parts of the machine; the reſt may be eaſily underſtood by the references to the Plate. W is the horſe-courſe, n° 1, which is 27 feet diameter. X is the pillar for ſupporting the beams on which the axle of the ſpur-wheel is fixed. YYY are three ſpindles for moving the two fluted rollers, the rake, and fanners. To the deſcription now given we have only to add, that the drum has a covering of wood Z at a ſmall diſtance above it, for the purpoſe of keeping the ſheaves cloſe to the ſcutchers.

The advantages of this machine are many. As the drum makes 300 revolutions in a minute, the four ſcutchers together make 1200 ſtrokes in the ſame ſpace of time. From ſuch power and velocity, it is evident that much work muſt be performed. When the horſes go at the rate of two and one-third miles *per* hour, from three to ſix bolls will be thraſhed; but as the quantity thraſhed will be leſs when the ſtraw is long than when it is ſhort, we ſhall take the average at four bolls. One gentleman, whoſe veracity and accuracy we can depend on, aſſures us, that his mill thraſhed 63 bolls in a day; by which, we ſuppoſe, he meant ten hours. To prove the ſuperior advantage of this machine to the common method of thraſhing with flails, a gentleman ordered two equal quantities of oats to be thraſhed by the mill and by flails. When the corn was cleaned and meaſured, he obtained one-ſixteenth more from the ſheaves thraſhed by the mill than from thoſe thraſhed by the flail. We were alſo informed by another gentleman who has ſtudied this machine with much attention, and calculated its advantages with care, that, independently of having the corn much cleaner ſeparated from the ſtraw than is uſually done by flails, there is a ſaving of 30 or 40 *per cent.* in the expence of thraſhing.

The number of perſons requiſite for attending the mill when working is ſix: one perſon drives the horſes; a ſecond hands the ſheaves to a third, who unties them, while a fourth ſpreads them on the inclined boards and preſſes them gently between the rollers; a fifth perſon is neceſſary to riddle the corn as it falls from the fanners, and a ſixth to remove the ſtraw.

This machine can be moved equally well by water, wind, or horſes. Mr. Meikle has made ſuch improvements on the wind-will as to render it much more manageable and convenient than formerly; and we are informed many wind-mills

are now erecting in different parts of the country. As to the comparative expence of theſe different machines, the erection of the horſe machine is leaſt; but then the expence of employing horſes muſt be taken into conſideration. One of this kind may be erected for 70l. A water-mill will coſt 10l. more, on account of the expence of the water-wheel. A wind-mill will coſt from 200l. to 300l. ſterling.

THRAVE *of Corn*, an expreſſion denoting twenty-four ſheaves, or four ſhocks of ſix ſheaves to the ſhock; though in ſome countries they only reckon twelve ſheaves to the thrave.

THRASYBULUS, a renowned Athenian general and patriot, the deliverer of his country from the yoke of the thirty tyrants, lived about 294 B.C.

THRASYMENUS LACUS (anc. geog.), a lake of Etruria, near Peruſia, and not far from the Tiber, fatal to the Romans in the Punic war. Now *Il Lago de Perugia* on the Eccleſiaſtical State.

THREAD, a ſmall line made up of a number of fine fibres of any vegetable or animal ſubſtance, ſuch as flax, cotton, or ſilk; from which it takes its name of linen, cotton, or ſilk thread.

Dying THREAD *Black*. Linen and cotton thread may be dyed of a durable and deep black by ſolution of iron in ſour beer, in which the linen is to be ſteeped for ſome time, and afterwards boiled in madder. See the article DYING. Thread may be eaſily bleached by the oxygenated muriatic acid diſcovered by Mr. Scheele. This acid whitens cloth remarkably well, but it is ſtill more advantageous for bleaching thread. M. Welter has formed at Liſle, with two partners, an eſtabliſhment for bleaching thread with great ſucceſs, and he has already begun ſome others. He has found that ten or twelve leys and as many immerſions are required for ſome ſorts of thread; and that the thread may be ſurrounded with the liquor, it is neceſſary to place it, quite looſely, in a baſket, which permits the liquor to penetrate to all its ſurfaces; when the liquor is much weakened, it is ſtill fit to be uſed for the bleaching of cotton. Thoſe who wiſh more information upon the powerful effects of the oxygenated muriatic acid in bleaching, as well as on the cheapeſt method of preparing it, may conſult a Paper written by M. Berthollet, and publiſhed in the *Annales de Chimie*, a tranſlation of which is given in the *Repert. of Arts*, vol. i.

THREATENING LETTERS. Knowingly to ſend any letter without a name, or with a fictitious name, demanding money, or any other valuable thing, or threatening (without any demand) to kill or fire the houſe of any perſon, is made felony without benefit of clergy. And ſending letters, threatening to accuſe any perſon of a crime puniſhable with death, tranſportation, pillory, or other infamous puniſhment, with a view to extort from him any money or other valuable chattels, is puniſhable by ſtatute 30 Geo. II. c. 24. at the diſcretion of the court, with fine, impriſonment, pillory, whipping, or tranſportation for ſeven years.

THRESHING. See THRASHING.

THRIFT, in botany. See STATICE.

THRINAX, SMALL JAMAICA FAN-PALM, in botany: a genus of plants belonging to the natural claſs of *palmæ* and order of *flabellifoliæ*. The calyx is ſexdentate; there is no corolla; there are ſix ſtamina; the ſtigma is emarginate, and the berry monoſpermous. This plant was brought from Jamaica to Kew garden by Dr. William Wright.

THRIPS, a genus of inſects belonging to the order of *hemipteræ*. The roſtrum is obſcure, or ſo ſmall as to be ſcarce perceptible. The antennæ are filiform, and as long as the thorax. The body is ſlender, and of equal thickneſs in its whole length. The abdomen is reflexible, or bent upwards. The four wings are extended, incumbent upon the back of the inſect, narrow in proportion to their length, and croſs one another at ſome diſtance from their baſe. The tarſi of the feet are compoſed of only two articulations. There are *eleven ſpecies* mentioned by Gmelin; of which three are natives of Britain; the phyſapus, juneperina, and faſciata.

THROAT, the anterior part of an animal, between the head and the ſhoulders.

THROAT-WORT. See CAMPANULA.

THRONE, a royal ſeat or chair of ſtate, enriched with ornaments of architecture and ſculpture, raiſed on one or more ſteps, and covered with a kind of canopy. Such are the thrones in the rooms of audience of kings and other ſovereigns.

THROSTLE, in ornithology. See TURDUS.

THRUSH, in ornithology. See TURDUS.

THRUSH, or *Aphtha*. See MEDICINE.

THRYALLIS, in botany: a genus of plants belonging to the claſs of *decandria*, and order of *monogynia*; and in the natural ſyſtem ranging under the 38th order, *Tricoccæ*. The calyx is quinquepartite; there are five petals, and the capſule is tricoccous. There is only one ſpecies known, the *braſilienſis*.

THUANUS (Jacobus Auguſtus), youngeſt ſon of the preſident de Thou, was famous for the depth and erudition of his works. He was born in 1553; and having finiſhed his ſtudies and travels, was made preſident a-Mortier, and took poſſeſſion thereof in 1595. He was employed in ſeveral important offices of ſtate, and in reforming the univerſity of Paris; which he diſcharged with ſo much prudence, that he was eſteemed the Cato of his age, and the ornament of France. He wrote the hiſtory of his own time in Latin, from the year 1543 to 1608, in 138 books; a work, both for ſubject and ſtyle, worthy of the ancients. He alſo left memoirs of his own life, beſides poems; and died at Paris, 1617.

THUCYDIDES, a celebrated Greek hiſtorian, was born at Athens 471 B.C. He was the ſon of Olorus, and grandſon of Miltiades, who is thought to have deſcended from Miltiades the famous Athenian general, and to have married the king of Thrace's daughter. He was educated in a manner ſuitable to his quality, that is, in the ſtudy of philoſophy and eloquence. His maſter in the former was Anaxagoras, in the latter Antiphon; one, by his deſcription in the eighth book of his Hiſtory, for power of ſpeech almoſt a miracle, and feared by the people on that account. Suidas and Photius relate, that when Herodotus recited his hiſtory in public, a faſhion in uſe then and many ages after, Thucydides felt ſo great a ſting of emulation, that it drew tears from him; inſomuch that Herodotus himſelf took notice of it, and congratulated his father on having a ſon who ſhowed ſo wonderful an affection to the muſes. Herodotus was then twenty-nine years of age, Thucydides about ſixteen.

When the Peloponeſian war began to break out, Thucydides conjectured truly, that it would prove a ſubject worthy of his labour; and it no ſooner commenced than he began to keep a journal. This explains the reaſon why he has attended more to chronological order than to unity of deſign. During the ſame war he was commiſſioned by his countrymen to relieve Amphipolis; but the quick march of Braſidas the Lacedæmonian general defeated his operations; and Thucydides, unſucceſsful in his expedition, was baniſhed from Athens. This happened in the eighth year of this celebrated war; and in the place of his baniſhment the general began to write an impartial hiſtory of the important events which had happened during his adminiſtration, and which ſtill continued to agitate the ſeveral ſtates of Greece. This famous hiſtory is continued only to the twenty-firſt year of the war, and the remaining part of the time till the demolition of the

walls of Athens was defcribed by the pen of Theopompus and Xenophon. Thucydides wrote in the Attic dialect, as being poffeffed of moft vigour, purity, elegance, and energy. He fpared neither time nor money to procure authentic materials; and the Athenians, as well as their enemies, furnifhed him with many valuable communications, which contributed to throw great light on the different tranfactions of the war. His hiftory has been divided into eight books; the laft of which is imperfect, and fuppofed to have been written by his daughter.

The hiftorian of Helicarnaffus has often been compared with the fon of Olorus, but each has his peculiar excellence. Sweetnefs of ftyle, grace, and elegance of expreffion, may be called the characteriftics of the former; while Thucydides ftands unequalled for the fire of his defcriptions, the concifenefs, and at the fame time the ftrong and energetic manner of his narratives. His relations are authentic, as he himfelf was interefted in the events he mentions; his impartiality is indubitable, as he no-where betrays the leaft refentment againft his countrymen, and the factious partizans of Cleon, who had banifhed him from Athens. The hiftory of Thucydides was fo admired by Demofthenes, that he tranfcribed it eight different times, and read it with fuch attention, that he could almoft repeat it by heart. Thucydides died at Athens, where he had been recalled from his exile, about 411 years before Chrift.

The beft edition of Thucydides is that of Oxford, publifhed in 1696, folio, and that of Duker, publifhed at Amfterdam in 1731, folio.

THUJA, the ARBOR VITÆ, in botany: a genus of plants belonging to the clafs of *monodelphia*, and order of *monœcia*; and in the natural fyftem ranging under the 51ft order, *Coniferæ*. There are four fpecies known; the orientalis, occidentalis, apylla, and dolabrata; of which the two firft are moft remarkable. 1. The *occidentalis*, or common arbor vitæ, grows naturally in Canada, Siberia, and other northern countries. In fome of the Englifh gardens a few of thefe trees are to be met with of a large fize: it has a ftrong woody trunk, which rifes to the height of forty feet or more. The bark, while young, is fmooth, and of a dark-brown colour; but as the trees advance, the bark becomes cracked, and lefs fmooth. The branches are produced irregularly on every fide, ftanding almoft horizontal, and the young flender fhoots frequently hang downward, thinly garnifhed with leaves; fo that when the trees are grown large they make but an indifferent appearance. The young branches are flat, and their fmall leaves lie imbricated over each other like the fcales of a fifh; the flowers are produced from the fide of the young branches pretty near to the footftalk; the male flowers grow in oblong catkins, and between thefe the female flowers are collected in form of cones. When the former have fhed their farina, they foon after drop off; but the female flowers are fucceeded by oblong cones, having obtufe fmooth fcales, containing one or two oblong feeds. The leaves of this tree have a rank oily fcent when bruifed 2. The *orientalis*, or China arbor vitæ, grows naturally in the northern parts of China, where it rifes to a confiderable height; but this has not been long enough in Europe to have any trees of large fize. The feeds of this fort were firft fent to Paris by fome of the miffionaries; and there are fome of the trees growing in the gardens of the curious there, which are more than twenty feet high. The branches of this fort grow clofer together, and are much better adorned with leaves, which are of a brighter green colour, fo make a much better appearance than the other, and being very hardy, it is efteemed preferable to moft of the evergreen trees with fmall leaves, for ornament in gardens. The branches of this tree crofs each other at right angles: the leaves are flat; but the fingle divifions of the leaves are flender, and the fcales are fmaller and lie clofer over each other than thofe of the firft fort. The cones are alfo much larger, and of a beautiful grey colour; their fcales end in acute reflexed points. Thefe trees are propagated by feeds, layers, or cuttings.

THUDE, or THYLÆ (anc. geog.), an ifland in the moft northern parts of the German Ocean. Its fituation was never accurately afcertained by the ancients, hence its prefent name is unknown by modern hiftorians. Some fuppofe that it is the ifland now called Iceland, or part of Greenland, and others that it was *Foula*. See FOULA.

THUMB, in anatomy, one of the extremities of the hand.

THUMB-*Cap*, an ifland in the South Sea, lies about feven leagues north-weft of Lagoon-ifland; it is a low, woody ifland, of a circular form, and not much above a mile in compafs. There was no appearance of inhabitants; the land was covered with verdure of many hues.

THUMMIM. See URIM.

THUNBERGIA, in botany: a genus of plants belonging to the clafs of *didynamia*, and order of *angiofpermia*. The calyx is double; the exterior one is diphyllous, and the interior one multipartite. The capfule is globofe, beaked, and bilocular. There is only one fpecies known, the *capenfis*.

THUNDER, the noife occafioned by the explofion of a flafh of lightning echoed back from the inequalities on the furface of the earth, in like manner as the noife of a cannon is echoed, and in particular circumftances forms a rolling lengthened found.

Although *thunder*, properly fpeaking, is only a mere found, capable of producing very little effect, yet the word is generally fuppofed to include the phenomena of lightning alfo; and electrified clouds are by univerfal confent called *thunder-clouds*, and the explofions of many flafhes of lightning proceeding from them are generally called *thunder-ftorms*. Though the phenomena of lightning, therefore, have been at a great length explained and accounted for under the articles ELECTRICITY and LIGHTNING, and though the immediate caufe of electrical explofions from clouds is explained under the article RAIN; yet the ultimate caufe remains ftill to be fhown, and properly belongs to the prefent article.

It is univerfally allowed, that the variation of the electricity in different parts of the atmofphere is the caufe of thunder. Under the article ELECTRICITY, it has been fhown why lightning explodes after the thunder-clouds are charged. Under the article LIGHTNING, it is fhown why that meteor puts on the various forms in which we fee it, why it fometimes ftrikes houfes or animals, and fometimes not, &c.; and under the article RAIN, why the atmofphere in fome cafes parts with the vapours which at other times it fo obftinately retains. It remains therefore only to mention the theory by which fome philofophers explain the reafon why rains are fometimes attended with thunder, and fometimes not; which, to thofe who attentively perufe the articles above mentioned, may be done in few words.

In this part of Great Britain, and for a confiderable way along the eaftern coaft, although thunder may happen at any time of the year, yet the month of July is that in which it may almoft certainly be expected. Its duration is of very uncertain continuance; fometimes only a few peals will be heard at any particular place during the whole feafon; at other times the ftorm will return at the interval of three or four days for a month, fix weeks, or even longer; not that we have violent thunder in this country directly vertical in any one place fo frequently in any year, but in many feafons it will be percep-

tible that thunder-clouds are formed in the neighbourhood even at thefe fhort intervals. Hence it appears, that during this particular period there muft be fome natural caufe operating for the production of this phenomenon, which does not take place at other times. This cannot be the mere heat of the weather, for we have often a long tract of hot weather without any thunder; and befides, though not common, thunder is fometimes heard in the winter alfo. As therefore the heat of the weather is common to the whole fummer, whether there be thunder or not, we muft look for the caufes of it in thofe phenomena, whatever they are, which are peculiar to the months of July, Auguft, and the beginning of September. Now it is generally obferved, in the tract of country of which we now fpeak, that from the month of April an eaft or fouth-eaft wind generally takes place, and continues with little interruption till towards the end of June. At that time, fometimes fooner and fometimes later, a wefterly wind takes place; but as the caufes producing the eaft wind are not removed, the latter oppofes the weft wind with its whole force. At the place of meeting, there is naturally a moft vehement preffure of the atmofphere, and friction of its parts againft one another; a calm enfues, and the vapours brought by both winds begin to collect and form dark clouds, which can have little motion either way, becaufe they are preffed almoft equally on all fides. For the moft part, however, the weft wind prevails, and what little motion the clouds have is towards the eaft: whence the common remark in this country, that "thunder-clouds move againft the wind." But this is by no means univerfally true: for if the weft wind happens to be excited by any temporary caufe before its natural period when it fhould take place, the eaft wind will very frequently get the better of it; and the clouds, even although thunder is produced, will move weftward. Yet in either cafe the motion is fo flow, that the moft fuperficial obfervers cannot help taking notice of a confiderable refiftance in the atmofphere.

That when two ftreams of air are thus driven againft each other, the fpace where they meet muft become highly electrified, is as plain as that an electric globe muft be excited when friction is applied. It is true, as the fubftances here to be excited are both electrics *per fe*, it may be objected, that no electricity could be produced; for we cannot excite one electric by rubbing it with another. Yet it is obferved, that glafs may be electrified by blowing ftrongly upon it, or by the explofion of cannon; and even when glafs is ftrongly preffed upon glafs, both pieces become electrified as foon as they are feparated. When glafs is rubbed upon glafs, no attraction nor repulfion can be perceived, nor is any fign of electricity obferved on bodies brought near to it; yet a very bright electric light always appears on the glaffes, and a phofphoreal fmell is felt; which fhows, that though the electricity does not fly out through the air in the ufual way, yet the fluid within the glafs is agitated; and there is little reafon to doubt that any conducting body inclofed within the fubftance of the glafs would be electrified alfo. The vapours therefore, which are the conducting fubftances in the atmofphere, become immediately electrified in confequence of the preffure above mentioned, and all the phenomena defcribed under the various articles already referred to take place.

In like manner, by the ftruggle of two other winds as well as thofe of the eaft and weft, may a thunder-ftorm be produced: but it is always neceffary that the refiftance of the air to the motion of the clouds fhould be very great, and nearly equal all round. For if the vapour fhould get off to a fide, no thunder would take place; the electricity would then be carried off as faft as it was collected, and rain would only be the confequence, by reafon of the electrified vapours parting with their latent heat, as is explained under the article RAIN. In fact, we very often obferve, that in the time of rain the clouds evidently move acrofs the wind, and the nearer their motion is to a direct oppofition, the heavier will the rain be; while, on the other hand, if they move brifkly before the wind, let the direction be what it will, the atmofphere foon clears up.

That rattling in the noife of thunder which makes it feem as if it paffed through arches, or were varioufly broken, is probably owing to the found being excited among clouds hanging over one another, and the agitated air paffing irregularly between them. The explofion, if high in the air, and remote from us, will do no mifchief; but when near, it may deftroy trees, animals, &c. This proximity or fmall diftance may be eftimated nearly by the interval of time between feeing the flafh of lightning and hearing the report of the thunder, eftimating the diftance after the rate of 1142 feet *per* fecond of time, or three two-third feconds to the mile. Dr. Wallis obferves, that commonly the difference between the two is about feven feconds, which, at the rate above mentioned, gives the diftance almoft two miles. But fometimes it comes in a fecond or two, which argues the explofion very near us, and even among us. And in fuch cafes, the doctor affures us, he has fometimes foretold the mifchiefs that happened.

The noife of thunder and the flame of lightning are eafily made by art. If a mixture of oil or fpirit of vitriol be made with water, and fome filings of fteel added to it, there will immediately arife a thick fmoke or vapour out of the mouth of the veffel; and if a lighted candle be applied to this, it will take fire, and the flame will immediately defcend into the veffel, which will be burft to pieces with a noife like that of a cannon.

This is fo far analogous to thunder and lightning, that a great explofion and fire are occafioned by it; but in this they differ, that this matter when once fired is deftroyed, and can give no more explofions; whereas, in the heavens, one clap of thunder ufually follows another, and there is a continued fucceffion of them for a long time. Mr. Homberg explained this by the lightnefs of the air above us in comparifon of that near, which therefore would not fuffer all the matter fo kindled to be diffipated at once, but keeps it for feveral returns.

Refpecting the phenomena of thunder, we have many obfervations to communicate; fome of which, we flatter ourfelves, are new, and all of them valuable; but our bounds obliges us, though with great reluctance, to pafs them over.

THUNDERBOLT. When lightning acts with extraordinary violence, and breaks or fhatters any thing, it is called a *thunderbolt*, which the vulgar, to fit it for fuch effects, fuppofe to be a hard body, and even a ftone. But that we need not have recourfe to a hard folid body to account for the effects commonly attributed to the thunderbolt, will be evident to any one who confiders thofe of the pulvis fulminans, and of gunpowder; but more efpecially the aftonifhing powers of electricity, when only collected and employed by human art, and much more when directed and exercifed in the courfe of nature. When we confider the known effects of electrical explofions, and thofe produced by lightning, we fhall be at no lofs to account for the extraordinary operations vulgarly afcribed to thunderbolts. As ftones and bricks ftruck by lightning are often found in a vitrified ftate, we may reafonably fuppofe, with Beccaria, that fome ftones in the earth having been ftruck in this manner, gave occafion to the vulgar opinion of the thunderbolt.

THUNDER-*Houfe*. See ELECTRICITY.

THURINGIA, a circle of Germany, included in the circle of Upper Saxony. This circle forms the north part of the

landgraviate of that name. This country is well watered, yields good paſturage, and abundance of corn, particularly wheat, which is excellent, as alſo fine timber-wood, ſallor, aniſe, fennel, and wine; and has alſo a conſiderable breed of horſes, horned-cattle, and ſheep. Of theſe natural productions of the country, a great part is exported. Thuringia contains in it ſixty towns, 674 villages, and 300 noble eſtates. The modern Thuringia, which lies nearly between the Saale and the Werra, is but a part of the ancient Thuringia, a country formerly comprized under that name, extending itſelf much farther every way. In the ſixth century, the Franks and Saxons ſubjected the Thuringians to their dominions, whoſe country from that time forwards became divided into the North and South. North Thuringia, towards the north, extended itſelf beyond Harzwalde, quite to the river Elbe, and belonged to the Saxons. It was united with the duchy of Saxony, loſt its name, and was at length annexed to Eaſtphalia, or to the eaſtern part of the county of Saxony. South Thuringia belonged to the Franks, and comprized in it the modern Thuringia, together with a large ſhare of the modern Franconia, Heſſe, &c. Till the 11th century, it ſtood under the emperors and kings, and beſides the counts, we find alſo ſome dukes mentioned, to whom the German kings entruſted the government of this country. Ever ſince the 13th century, the marggraves of Meiſſen, who afterwards became electors of Saxony, have been in poſſeſſion of the landgraviate of Thuringia, which was at one time divided among ſeparate lines, but returned again by the extinction of the latter to that of Meiſſen.

THURLOE (John), an Engliſh ſtateſman under Oliver Cromwell, was born at Abots Roding in Eſſex in 1616, of which pariſh his father was rector, and was educated to the ſtudy of the law. In 1648 he was made receiver or clerk of the curſitor fines; and though his attachments were entirely on the ſide of the parliament, he declares himſelf totally unconcerned in all councils relative to the death of the king: however, on that event, and on the eſtabliſhment of the commonwealth, he was diverted from proſecuting his employments in the law by engaging in public buſineſs. When Cromwell aſſumed the protectorſhip, he became ſecretary of ſtate; in 1655 he had the care and charge both of foreign and inland poſtage committed to him by the Protector; and was afterward ſworn one of his privy council, according to "The humble petition and advice." He was continued in the ſame capacities under Richard Cromwell, and until meaſures were taken for the Reſtoration; when he made an offer of his ſervices to that end, which, however, were not accepted. May 15th, 1660, he was committed to the cuſtody of the ſerjeant at arms on a charge of high-treaſon; but being ſoon releaſed, he retired to Great Milton in Oxfordſhire: and though he was afterward often ſolicited by Charles II. to engage in the adminiſtration of public buſineſs, he thought proper to decline the offers. He died in 1668: and was a man of an amiable private character, who in the higheſt of his power exerciſed all poſſible moderation towards perſons of every party. The moſt authentic teſtimony of his abilities is that vaſt collection of ſtate-papers, ſeven volumes folio, now in the hands of the public; which place the affairs of Great Britain, and of Europe in general, during that remarkable period, in the cleareſt light.

THURSDAY, the fifth day of the Chriſtian week, but the ſixth of that of the Jews.

THUS, Frankincense, a ſolid brittle reſin, brought to us in little globes or maſſes, of a browniſh or yellowiſh colour on the outſide, internally whitiſh or variegated with whitiſh ſpecks. It is ſuppoſed to be the produce of the pine that yields the common turpentine, and to concrete upon the ſurface of the terebinthinate juice ſoon after it has iſſued from the tree. See Incense.

THUYA. See Thuja.

THYMUS, Thyme, in botany: a genus of plants belonging to the claſs of *didynamia*, and order of *gymnoſpermia*; and in the natural ſyſtem ranging under the 42d order, *Verticillatæ*. The calyx is bilabiate, and its throat cloſed with ſoft hairs. There are eleven ſpecies; of which two only are natives of Britain, the *ſerpyllum* and *acinas*. 1. The *ſerpyllum*, or mother of thyme, has pale red flowers growing on round heads, terminal; the ſtalks are procumbent, and the leaves plane, obtuſe, and ciliated at the baſe. 2. The *acinas*, or wild baſil, has flowers growing in whirls on ſingle footſtalks; the ſtalks are erect and branched; the leaves acute and ſerrated. The *thymus vulgaris*, or garden thyme, is a native of France, Spain, and Italy.—The attachment of bees to this and other aromatic plants is well known. In the experiments made at Upſal, ſheep and goats were obſerved to eat it, and ſwine to refuſe it.

Thymus, in anatomy. See Anatomy.

THYRSUS, in antiquity, the ſceptre which the poets put into the hand of Bacchus, and wherewith they furniſhed the ménades in their Bacchanalia.

Thyrsus, in botany, a mode of flowering reſembling the cone of a pine. It is, ſays Linnæus, a panicle contracted into an oval or egg-ſhaped form. The lower footſtalks, which are longer, extend horizontally, whilſt the upper ones are ſhorter and mount vertically. Lilac and butter-bur furniſh examples.

TIARA, an ornament or habit wherewith the ancient Perſians covered their head; and with which the Armenians and kings of Pontus are repreſented on medals; theſe laſt, becauſe they were deſcended from the Perſians. Latin authors call it indifferently *tiara* and *cidaris*. Strabo ſays, the tiara was in form of a tower; and the ſcholiaſt on Ariſtophanes's comedy, Αχαρνης, act 1. ſcene 2. affirms, that it was adorned with peacock's feathers.

Tiara is alſo the name of the pope's triple crown. The tiara and keys are the badges of the papal dignity; the tiara of his civil rank, and the keys of his juriſdiction: for as ſoon as the pope is dead, his arms are repreſented with the tiara alone, without the keys. The ancient tiara was a round high cap. John XXIII. firſt encompaſſed it with a crown. Boniface VIII. added a ſecond crown; and Benedict XII. a third.

TIARELLA, in botany: a genus of plants belonging to the claſs of *decandria*, and order of *digynia*; and in the natural ſyſtem ranging under the 13th order, *Succulentæ*. The calyx is quinquepartite; the corolla pentapetalous, and inſerted into the calyx; the petals are entire; the capſule is unilocular and bivalve, the one valve being leſs than the other. There are two ſpecies, the *cordifolia* and *trifoliata*.

TIBER, a great river of Italy, which runs through the pope's territories, paſſing by Perugia and Orvietto; and having viſited Rome, falls into the Tuſcan ſea at Oſtia, fifteen miles below that city.

TIBULLUS (Aulus Albius), a Roman knight, and a celebrated Latin poet, was born at Rome 43 B.C. He was the friend of Horace, Ovid, Macer, and other great men in the reign of Auguſtus. He accompanied Meſſala Corvinus in his expedition againſt the iſland of Corcyra: but falling ſick, and being unable to ſupport the fatigues of war on account of the weakneſs of his conſtitution, he quitted the profeſſion of arms, and returned to Rome, where he died before the year 17; when Ovid ſhowed his grief for his death by writing a fine elegy upon him. Tibullus wrote four books of elegies, which are ſtill extant: they are written in a tender and agreeable

style, and in very elegant Latin. Muret and Joseph Scaliger have written learned and curious commentaries on the works of this poet. The best edition of Tibullus is that of Janus Bronckhusius, published at Amsterdam in 1708, in one volume quarto. We have an English poetical version by Mr. Grainger.

TIBUR (anc. Geog.), a town of Latium, pleasantly situated on the Anio. Here Horace had his villa and house; and here he wished to end his days. Here Adrian built an extraordinary villa called *Tiburtina*, inscribed with the names of the provinces and of the most considerable places (Spartian); near which Zenobia had a house called *Zenobia* (Trebellius, Pollio). Hither Augustus often retreated on account of its salubrity (Suetonius): for which it is greatly commended (Martial). Anciently, when the Romans had far extended their territory, it was the utmost place of banishment (Ovid). It had a temple of Hercules; and therefore called *Herculeum*. In the temple was a library (A. Gellius). Now *Tivoli* in the Campagna di Roma, on the Teverone.

TICINUS (anc. geog.), a river in Insubria, rising in mount Adula, traversing the Lacus Verbanus southwards, and falling into the Po near Ticinum. Between this river and the Po Hannibal gained his first victory over the Romans under P. Scipio. The general himself escaped with the utmost difficulty, and that by the bravery of his son the first Scipio Africanus. Now the *Tesino*, rising in mount Godard, running south through the Lago Maggiore and Milan, by Pavia, into the Po.

TICK, in zoology. See Acarus.

TICKELL (Thomas), an excellent English poet, was the son of the Reverend Richard Tickell, and was born in 1686, at Bridekirk in Cumberland. He was educated at Queen's College, Oxford, of which he was made fellow; and while he continued at that university, he addressed to Mr. Addison a complimentary copy of verses on his Opera of Rosamond, which introduced him to an acquaintance with that gentleman, who discovering his merit, became his sincere friend. On Mr. Addison's being made secretary of state, he appointed Mr. Tickell his under secretary; and on his being obliged to resign that office on account of his ill health, he recommended him so effectually to Mr. Craggs, his successor, that he was continued in his post till that gentleman's death. In 1724 Mr. Tickell was appointed secretary to the lords justices in Ireland, and enjoyed that place as long as he lived. He wrote some poems, which, when separately published, met with a favourable reception, and passed through several editions: they are now printed in the second volume of The Minor Poets. After Mr. Addison's death Mr. Tickell had the care of the edition of his works printed in 4 vols. 4to; to which he prefixed an account of Mr. Addison's life, and a poem on his death. Mr. Tickell died in the year 1740.

TICKERA, a considerable article of merchandise in Fezzan in Africa; it is valued by travellers as a portable and highly salubrious food. It is a preparation of pounded dates, and the meal of Indian corn, formed into a paste, and highly dried in an oven.

TICKSEED, Sun-flower. See Coreopsis.

TICUNAS. See Poison.

TIDE, is a word which expresses that rising and falling of the waters which are observed on all maritime coasts. There is a certain depth of the waters of the ocean which would obtain if all were at rest: but observation shows that they are continually varying from this level, and that some of these variations are regular and periodical.

1st, It is observed, that on the shores of the ocean, and in bays, creeks, and harbours, which communicate freely with the ocean, the waters rise up above this mean height twice a-day, and as often sink below it, forming what is called a flood, and an ebb, a high and a low water. The whole interval between high and low water is called a tide; the water is said to flow and to ebb; and the rising is called the flood-tide, and the falling is called the ebb-tide.

2d, It is observed, that this rise and fall of the waters is variable in quantity. At Plymouth, for instance, it is sometimes twenty-one feet between the greatest and least depth of the water in one day, and sometimes only twelve feet.

These different heights of tide are observed to succeed each other in a regular series, diminishing from the greatest to the least, and then increasing from the least to the greatest. The greatest is called a spring-tide, and the least is called a neap-tide.

3d, This series is completed in about fifteen days. More careful observation shows that two serieses are completed in the exact time of a lunation. For the spring-tide in any place is observed to happen precisely at a certain interval of time (generally between two and three days) after new or full moon, and the neap-tide at a certain interval after half moon; or, more accurately speaking, it is observed that the spring-tide always happens when the moon has got a certain number of degrees eastward of the line of conjunction and opposition, and the neap-tide happens when she is a certain number of degrees from her first or last quadrature. Thus the whole series of tides appears to be regulated by the moon.

4th, It is observed that high water happens at new and full moon when the moon has a certain determined position with respect to the meridian of the place of observation, preceding or following the moon's southing a certain interval of time; which is constant with respect to that place, but very different in different places.

5th, The time of high water in any place appears to be regulated by the moon; for the interval between the time of high water and the moon's southing never changes above three quarters of an hour, whereas the interval between the time of high water and noon changes six hours in the course of a fortnight.

6th, The interval between two succeeding high waters is variable. It is least of all about new and full moon, and greatest when the moon is in her quadratures. As two high waters happen every day, we may call the double of their interval a tide day, as we call the diurnal revolution of the moon a *lunar day*. The tide day is shortest about new and full moon, being then about $24^h\ 37^m$; about the time of the moon's quadratures it is $25^h\ 27^m$. These values are taken from a mean of many observations made at Barbadoes by Dr. Maskelyne.

7th, The tides in similar circumstances are greatest when the moon is at her smallest distance from the earth, or in her perigee, and, gradually diminishing, are smallest when she is in her apogee.

8th, The same remark is made with respect to the sun's distance, and the greatest tides are observed during the winter months of Europe.

9th, The tides in any part of the ocean increase as the moon, by changing her declination, approaches the zenith of that place.

10th, The tides which happen while the moon is above the horizon are greater than the tides of the same day when the moon is below the horizon.

The honour of a complete explanation of the tides was reserved for Sir Isaac Newton. See Astronomy, p. 394. He laid hold of this class of phenomena as the most incontestable proof of universal gravitation, and has given a most beautiful

and ſynoptical view of the whole ſubject; contenting himſelf, however, with merely exhibiting the chief conſequences of the general principle, and applying it to the phenomena with ſingular addreſs. But the wide ſteps taken by this great philoſopher in his inveſtigation leave ordinary readers frequently at fault: many of his aſſumptions require the greateſt mathematical knowledge to ſatisfy us of their truth. The academy of Paris therefore propoſed to illuſtrate this among other parts of the principles of natural philoſophy, and publiſhed the theory of the tides as a prize problem. This produced three excellent diſſertations, by M'Laurin, Dan. Bernoulli, and Euler, all which are worthy the reader's attention.

TIDE-*Waiters*, or *Tideſmen*, are inferior officers belonging to the cuſtom-houſe, whoſe employment is to watch or attend upon ſhips until the cuſtoms be paid: they get this name from their going on board ſhips on their arrival in the mouth of the Thames or other ports, and ſo come up with the tide.

TIERCE, or TEIRCE, a meaſure of liquid things, as wine, oil, &c. containing the third part of a pipe, or forty-two gallons.

TIERCED, in heraldry, denotes the ſhield to be divided by any part of the partition-lines, as party, coupy, tranchy, or tailly, into three equal parts of different colours or metals.

TIGER, in zoology. See FELIS.

TIGER-*Wolf*, the name by which the hyæna is called at the Cape of Good Hope. See HYÆNA.

TIGRIS, a river of Aſia, which has its ſource near that of the Euphrates in the mountain Tchilder in Turkomania: afterwards it ſeparates Diarbeck from Erzerum, and Khuſiſtan from Irac-Arabia; and uniting with the Euphrates at Gorno, it falls into the gulph of Baſſorah, under the name of *Schat el-Arab*. This river paſſes by Diarbekar, Gezira, Mouſul, Bagdad, Gorno, and Baſſorah.

TILIA, LIME or LINDEN-TREE, in botany: a genus of plants belonging to the claſs of *polyandria*, and order of *monogynia*; and in the natural ſyſtem ranging under the *Columniferæ*. The calyx is quinquepartite; the corolla pentapetalous; the berry is dry, globoſe, quinquelocular, quinquevalve, and opening at the baſe. There are four ſpecies; the europæ and americana, pubeſcens and alba. The *europæa*, or common lime tree, is generally ſuppoſed to be a native of Britain; but we are informed by Mr. Coxe, that Mr. Pennant told him (on what authority is not mentioned), that it was imported into England before the year 1652. The leaves are heart-ſhaped, with the apex produced, and ſerrated on the edges; the flowers grow in a thin umbel, from three to nine together, of a whitiſh colour and a fragrant ſmell; very grateful to bees. The wood is light, ſmooth, and of a ſpongy texture, uſed for making laſts and tables for ſhoemakers, &c. Ropes and bandages are made of the bark, and mats and ruſtic garments of the inner rind, in Carniola and ſome other countries.—The lime-tree contains a gummy juice, which being repeatedly boiled and clarified produces a ſubſtance like ſugar.

TILLEMONT (Sebaſtian le Nain de). See NAIN.

TILLER *of a Ship*, a ſtrong piece of wood faſtened in the head of the rudder, and in ſmall ſhips and boats called the *helm*.

TILLŒA, in botany: a genus of plants belonging to ...ral claſs of *tetrandria*, the order of *tetragynia*, and in the ... he calyx ſyſtem ranging under the 13th order, *Succulentæ*. ... four, and has three or four diviſions; the petals ...ſpermeus. There equal; the capſules three or four, ... muſcoſa, is a native of are four ſpecies; of which one ... g the Scotch plants. The England, and is not mentio...

muſcoſa, or procumbent tillœa, has proſtrate ſtems, almoſt erect, generally red, and grow longer after flowering. The parts of fructification are always three. The leaves grow in pairs, and are fleſhy. It is found on dry heaths in Norfolk and Suffolk, and flowers in May and June.

TILLOTSON (John), a celebrated archbiſhop of Canterbury, was the ſon of Robert Tillotſon of Sowerby, in the pariſh of Halifax in Yorkſhire, clothier; and was born there in the year 1630. He ſtudied in Clare Hall, Cambridge; and in 1656 left this college, in order to become tutor to the ſon of Edmund Prideaux, Eſq. of Ford-abbey in Devonſhire. He was afterwards curate to Dr. Hacket, vicar of Cheſhunt, in Hertfordſhire. In 1663 he was preſented by Sir Thomas Barnardiſton to the rectory of Ketton or Keddington in the county of Suffolk; but was the next year choſen preacher to Lincoln's Inn, when he procured Ketton to be beſtowed on his curate. He was greatly admired in London for his ſermons; and in the ſame year was choſen Tueſday-lecturer at St. Lawrence's church, London, where his lectures were frequented by all the divines of the city, and by many perſons of quality and diſtinction. In 1666 he took the degree of doctor of divinity at Cambridge; in 1669 was made prebendary of Canterbury; in 1672 was admitted dean of that cathedral; and three years after, was made a prebendary of St. Paul's cathedral, London. In 1679 he became acquainted with Charles earl of Shrewſbury, whom he converted from Popery; and the next year refuſed to ſign the clergy of London's addreſs of thanks to King Charles II. for not agreeing to the bill of excluſion of the Duke of York. In 1683 he viſited the unhappy Lord Ruſſel when under condemnation; and attended him in his laſt moments on the ſcaffold. In 1689 he was inſtalled dean of St. Paul's; made clerk of the cloſet to King William and Queen Mary; and appointed one of the commiſſioners to prepare matters to be laid before the convocation, in order to a comprehenſion of all Proteſtants, as well diſſenters as churchmen; but this attempt was fruſtrated by the zeal of thoſe members of that body, who refuſed to admit of any alteration in things confeſſedly indifferent. In 1691 Dr. Tillotſon was, notwithſtanding the warmeſt remonſtrances and intreaties on his part, conſecrated archbiſhop of Canterbury, and four days afterwards was ſworn one of the privy-council; their majeſties always repoſing an entire confidence in his prudence, moderation, and integrity. In 1694 he was ſeized with a dead palſy, of which he died in the ſixty-fifth year of his age. He was interred in the church of St. Lawrence Jewry, London, where a handſome monument is erected to his memory. This learned and pious divine, while living, was greatly inveighed againſt by the enemies of the revolution. After his death there was found a bundle of bitter libels which had been publiſhed againſt him, on which he had written with his own hand, "I forgive the authors of theſe books, and pray God th... he may alſo forgive them." It is remarkable, that wh... this truly great man was in a private ſtation, he alway... ...id aſide two-tenths of his income for charitable uſes. ...he volume in folio of Dr. Tillotſon's ſermons was publi...d in his life-time, and corrected by his own hand; theſe ... beyrac tranſlated into French. Thoſe which came ab...d after his death, from his chaplain Dr. Barker, made ...wo volumes in folio, the copy of which was ſold for 2500l. and this was the only legacy he left to his family, his extenſive charity having conſumed his yearly revenues as conſtantly as they came to his hands. However, King William gave two grants to his widow; the firſt of which was an annuity of 400l. during the term of her natural life, and the ſecond of 200l. as an addition to the former annuity. Dr. Tillotſon wrote ſome other works beſides his Sermons; and alſo pub-

lifhed Dr. Barrow's works, and Dr. Wilkins's Treatife of the Principles and Duties of Natural Religion, and a volume of that divine's Sermons.

TIMBER, wood fit for building, &c. See TREE.

TIMBERS, the ribs of a fhip, or the incurvated pieces of wood, branching outward from the keel in a vertical direction, fo as to give ftrength, figure, and folidity, to the whole fabric. See SHIP-BUILDING.

TIME, a fucceffion of phenomena in the univerfe, or a mode of duration marked by certain periods or meafures, chiefly by the motion and revolution of the fun. The general idea which time gives in every thing to which it is applied, is that of limited duration. Thus we cannot fay of the Deity, that he exifts in time; becaufe eternity, which he inhabits, is abfolutely uniform, neither admitting limitation nor fucceffion. See METAPHYSICS.

TIME, in mufic, is an affection of found, by which it is faid to be long or fhort, with regard to its continuance in the fame tone or degree of tune. Mufical time is diftinguifhed into *common* or *duple* time, and *triple* time. *Double, duple,* or *common* time, is when the notes are in a duple duration of each other, *viz.* a femibreve equal to two minims, a minim to two crotchets, a crotchet to two quavers, &c.

Common or double time is of two kinds. The firft when every bar or meafure is equal to a femibreve, or its value in any combination of notes of a lefs quantity. The fecond is where every bar is equal to a minim, or its value in lefs notes. The movements of this kind of meafure are various, but there are three common diftinctions; the firft *flow*, denoted at the beginning of the line by the mark C; the fecond *brifk*, marked thus ₵; and the third *very brifk*, thus marked Ɔ.

Triple time is when the durations of the notes are triple of each other, that is, when the femibreve is equal to three minims, the minim to three crotchets, &c. and it is marked T.

TIME-*Keepers*, or *Inftruments for meafuring Time.* See CLOCK, DIAL, WATCH, &c.

Harrifon's TIME-*Keeper.* See HARRISON and LONGITUDE.

TIMOLEON, a celebrated Corinthian general, who reftored the Syracufans to their liberty, and drove the Carthaginians out of Sicily.

TIMON the *Sceptic,* who is not to be confounded with Timon the *Mifanthrope,* was a Phliafian, a difciple of Pyrrho, and lived in the time of Ptolemy Philadelphus. He took fo little pains to invite difciples to his fchool, that it has been faid of him, that as the Scythians fhot flying, Timon gained pupils by running from them. He was fond of rural retirement; and was fo much addicted to wine, that he held a fuccefsful conteft with feveral celebrated champions in drinking. Like Lucian, he wrote with farcaftic humour againft the whole body of philofophers. The fragments of his fatirical poem *Silli,* often quoted by the ancients, have been carefully collected by Henry Stephens in his *Poefis Philofobica.* Timon lived to the age of 90 years.

TIMON, furnamed *Mifanthropos,* or the *Man-ha[illegible]* a famous Athenian, who lived about 420 B.C. He was o[illegible] day afked, why he loved the young Alcibiades while he detefted the reft of the human race? on which he replied, "It is becaufe I forefee that he will be the ruin of the Athenians." He carefully avoided all forts of company; yet went one day to an affembly of the people, and cried with a loud voice, "that he had a fig-tree on which feveral perfons had hanged themfelves; but as he intended to cut it down in order to build a houfe on the place where it ftood, he gave them notice of it, that if any of them had a mind to hang themfelves, they muft make hafte and do it fpeedily." He had an epitaph engraved on his tomb, filled with imprecations againft thofe who read it. Shakfpeare has formed a tragedy on his ftory.

TIMOR, an ifland of Afia, in the Eaft-Indian fea, to the fouth of the Moluccas, and to the eaft of the ifland of Java, being 150 miles in length, and 37 in breadth. It abounds in fandal-wood, wax, and honey; and the Dutch have a fort here. The inhabitants are Pagans, and are little better than favages; and fome pretend they had not the ufe of fire many years ago.

TIMOTHEUS, one of the moft celebrated poet-muficians of antiquity, was born at Miletus, an Ionian city of Caria, 446 years B.C. He was contemporary with Philip of Macedon and Euripides; and not only excelled in lyric and dithyrambic poetry, but in his performance upon the cithara. According to Paufanias, he perfected that inftrument by the addition of four new ftrings to the feven which it had before; though Suidas fays it had nine before, and that Timotheus only added two, the 10th and 11th, to that number. See LYRE. It appears from Suidas, that the poetical and mufical compofitions of Timotheus were very numerous, and of various kinds. He attributes to him 19 nomes, or canticles, in hexameters; 36 proems, or preludes; 18 dithyrambics; 21 hymns; the poem in praife of Diana; one panegyric; three tragedies, the Perfians, Phinidas, and Laertes; to which muft be added a fourth, mentioned by feveral ancient authors, called *Niobe,* without forgetting the poem on the birth of Bacchus. Stephen of Byzantium makes him author of 18 books of nomes, or airs, for the cithara, to 8000 verfes; and of 1000 Προοιμια, or preludes, for the nomes of the flutes.

Timotheus died in Macedonia, according to Suidas, at the age of 97; though the Marbles, much better authority, fay at 90; and Stephen of Byzantium fixes his death in the fourth year of the 105th Olympiad, two years before the birth of Alexander the Great; whence it appears, that this Timotheus was not the famous player on the flute fo much efteemed by that prince, who was animated to fuch a degree by his performance as to feize his arms; and who employed him, as Athenæus informs us, together with the other great muficians of his time, at his nuptials. However, by an inattention to dates, and by forgetting that of thefe two muficians of the fame name the one was a Milefian and the other a Theban, they have been hitherto often confounded.

TIMUR-BECK. See TAMERLANE.

TIN, one of the four imperfect metals. For an account of its metalline qualities, and the various ftates in which it is found, fee MINERALOGY. For its chemical qualities, fee the places referred to in CHEMISTRY. For the method of affaying and fmelting its ore, fee METALLURGY. See alfo CORNWALL. An advantageous commerce exifts between Cornwall and the Eaft Indies and China. In 1791 about 3000 tons of tin were raifed in Cornwall; of which 2200 tons were fold in the European market for £.72 each, and 800 tons carried to India and China at £.62 *per* ton.

TINCAL, the name by which crude or impure borax is called. See BORAX and CHYMISTRY.

TINCTURE, in pharmacy. See PHARMACY.

TINDAL (Dr. Matthew), a famous Englifh writer, was the [illegible] of the reverend Mr. John Tindal of Beer-Ferres in Devon[illegible] and was born about the year 1657. He ftudied at Lincoln [illegible]llege in Oxford, whence he removed to Exeter, and was af[illegible] elected fellow of All Souls. In 1685 he took the degr[illegible] James II. declared [illegible] doctor of law, and in the reign of renounced that religion [illegible] a Roman-catholic; but foon feveral pamphlets in favour [illegible] the revolution he publifhed [illegible]ernment, the liberty of

the prefs, &c. His "Rights of the Chriftian Church afferted," occafioned his having a violent conteft with the high-church clergy; and his treatife "Chriftianity as old as the Creation," publifhed in 1730, made much noife, and was anfwered by feveral writers, particularly by Dr. Conybeare, Mr. Fofter, and Dr. Leland. Dr. Tindal died at London in Auguft 1733. He left in manufcript a fecond volume of his "Chriftianity as old as the Creation;" the preface to which has been publifhed. Mr. Pope has fatirized Dr. Tindal in his Dunciad.

TINDALE (William). See TYNDALE.

TINNING, the covering or lining any thing with melted tin, or tin reduced to a very fine leaf. Looking-glaffes are foilated or tinned with thin plates of beaten tin, the whole bignefs of the glafs, applied or faftened thereto by means of quickfilver. See FOLIATING *of Looking Glaffes*.

TINNING *of Copper*. See COPPER.

TINNITUS AURIUM, a noife in the ears like the continued found of bells, very common in many diforders, particularly in nervous fevers.

TIPPERARY, a county of Ireland, in the province of Munfter, bounded on the north-eaft by King's County: on the eaft by Queen's County and Kilkenny; on the fouth by Waterford; and on the weft by Limerick, Clare, and Galway: fifty-two miles in length, and from twelve to thirty-one in breadth. It contains twenty-four parifhes, 30,700 houfes, and 169,000 inhabitants. This county is in fome parts mountainous, but to no great extent; and elfewhere the foil is generally good, and in fome large tracts extremely fertile, more adapted for the feeding of cattle, than for cultivation by the plough; notwithftanding which, much wheat is raifed in the fouth part, and near fifty boulting mills are counted on the different rivers, a much greater number than is found in any other county. The principal river is the Suir, befides which there are abundance of fmaller rivers and brooks. In Clonmell both the linen and woollen manufactures flourifh: near Silver-mines are mines of lead, with a mixture of filver; but the principal productions are cattle, fheep, butter and flour, the laft particularly for Dublin. The county Cafhell, Clonmell, and Fethard, each fent two members to the Irifh parliament; Clonmell is the county town.

TIPSTAFF, an officer who attends the judges with a kind of ftaff tipped with filver, and takes into his charge all prifoners who are committed or turned over at a judge's chambers.

TIPULA, the CRANE-FLY; a genus of infects belonging to the order of *diptera*. The mouth is a prolongation of the head; the upper-jaw is arched. They have two palpi, which are curved, and longer than the head. The probofcis is fhort, and bends inwards. Gmelin enumerates 123 fpecies, of which 14 are Britifh. They are divided into two families. 1. Thofe with wings difplayed. 2. Thofe with wings incumbent, and which in form refemble a gnat.

This two-winged infect is often taken for the gnat, which it refembles, but has not its mifchievous inftinct, nor its murderous probofcis. The larger tipulæ go by the name of *fempftreffes*, the fmall ones by that of *culiciform*; the latter in fine fummer evenings flutter about the water-fide in legions, through which a perfon may pafs on his way unhurt. The fhrill noife they make with their wings is not very difcernible. Tipulæ, before they become inhabitants of the air, creep under the form of grubs. Thofe which turn to larger tipulæ dwell in holes of decayed willows, in the dampeft places, where they change into chryfalids, and in that ftate have the faculty of breathing through two fmall curve horns; befides which they are endowed with progreffive motion, but not retrogreffive, being impeded by little fpines placed on every ring of the abdomen. When the fhroud is torn, the infect, prettily apparelled, efcapes from his gloomy habitation by means of his wings, which often are variegated, and takes his paftime in the fields. Its long legs, and its wings, mutually affift each other when it either walks or flies. The larvæ and chryfalids of the little tipulæ are found in water. They are various in colour, form, and carriage; fome being grey, others brown, and others red; fome, like the polypus, furnifhed with a pair of arms; feveral with cylindrical tubes that perform the office of vent-holes. Thefe fwim with nimblenefs; thofe never leave the holes they have dug for themfelves in the banks of rivulets. Laftly, others make a filken cod that receives part of their body; but all of them, after a period, renounce their reptile and aquatic life, and receive wings from the hands of nature. Their frame is then fo weak, that a touch is enough to crufh them. They are fometimes of a beautiful green, fometimes coal-black; and the moft remarkable are thofe whofe fore-legs, extraordinary long, do not touch the ground, and are moveable like antennæ. In this ftate of perfection, the tipulæ being provided with proper organs, apply themfelves to the propagation of the fpecies. Thofe fame poor infects, who in the ftate of larvæ have efcaped the voracioufnefs of fifhes, often become, in their progrefs through the air, a prey to equally mercilefs birds.

TIRE, in the fea language, is a row of cannon placed along a fhip's fide, either above upon deck, or below, diftinguifhed by the epithets of *upper* and *lower tiers*.

TIROL, or TYROL, a county of Germany, in the circle of Auftria, and part of the hereditary dominions of that houfe. It is 150 miles long and 120 broad; bounded on the north by Bavaria, on the eaft by Carinthia and the archbifhopric of Saltzburg, on the fouth by the territory of Venice, on the weft by Switzerland. Though a mountainous country, it produces as much corn and wine as the inhabitants have occafion for, and has rich mines of gold, filver, and copper. It is divided into four parts; Tirol, properly fo called, the bifhopric of Trent, the bifhopric of Brixen, and four provinces of Suabia, which are united to Tirol. Infpruck is the capital.

TITAN, in fabulous hiftory, the fon of Cœlus and Terra, and the eldeft brother of Saturn, fuffered the latter to enjoy the crown, on condition that he fhould bring up none of his male iffue, by which means the crown would at length revert to him; but Jupiter being fpared by the addrefs of Rhea, Saturn's wife, Titan and his children were fo enraged at feeing their hopes fruftrated, that they took up arms to revenge the injury; and not only defeated Saturn, but kept him and his wife prifoners till he was delivered by Jupiter, who defeated the Titans; when, from the blood of thefe Titans flain in the battle, proceeded ferpents, fcorpions, and all venomous reptiles. See SATURN.

TITHES, in ecclefiaftical law, are defined to be the tenth-part of the increafe, yearly arifing and renewing from the profits of lands, the ftock upon lands, and the perfonal induftry of the inhabitants: the firft fpecies being ufually called *predial*, as of corn, grafs, hops, and wood; the fecond *mixed*, as of wool, milk, pigs, &c. confifting of natural products, but nurtured and preferved in part by the care of man; and of thefe the tenth muft be paid in grofs; the third *perfonal*, as of manual occupations, trades, fifheries, and the like; and of thefe only the tenth-part of the clear gains and profits is due.

We fhall, in this article, confider, 1. The original of the

rights of tithes. 2. In whom that right at preſent ſubſiſts. 3. Who may be diſcharged, either totally or in part, from paying them.

1. As to their original, we will not put the title of the clergy to tithes upon any divine right; though ſuch a right certainly commenced, and we believe as certainly ceaſed, with the Jewiſh theocracy. Yet an honourable and competent maintenance for the miniſters of the goſpel is undoubtedly *jure divino*, whatever the particular mode of that maintenance may be. For, beſides the poſitive precepts of the New Teſtament, natural reaſon will tell us, that an order of men who are ſeparated from the world, and excluded from other lucrative profeſſions for the ſake of the reſt of mankind, have a right to be furniſhed with the neceſſaries, conveniences, and moderate enjoyments of life, at their expence; for whoſe benefit they forego the uſual means of providing them. Accordingly all municipal laws have provided a liberal and decent maintenance for their national prieſts or clergy; ours, in particular, have eſtabliſhed this of tithes, probably in imitation of the Jewiſh law: and perhaps, conſidering the degenerate ſtate of the world in general, it may be more beneficial to the Engliſh clergy to found their title on the law of the land, than upon any divine right whatſoever, unacknowledged and unſupported by temporal ſanctions.

We cannot preciſely aſcertain the time when tithes were firſt introduced into this country. Poſſibly they were contemporary with the planting of Chriſtianity among the Saxons by Auguſtin the monk, about the end of the ſixth century. But the firſt mention of them which we have met with in any written Engliſh law, is a conſtitutional decree, made in a ſynod held A.D. 786, wherein the payment of tithes in general is ſtrongly enjoined. This canon or decree, which at firſt bound not the laity, was effectually confirmed by two kingdoms of the heptarchy, in their parliamentary conventions of eſtates, reſpectively conſiſting of the kings of Mercia and Northumberland, the biſhops, dukes, ſenators, and people. Which was a few years later than the time that Charlemagne eſtabliſhed the payment of them in France, and made that famous diviſion of them into four parts; one to maintain the edifice of the church, the ſecond to ſupport the poor, the third the biſhop, and the fourth the parochial clergy.

The next authentic mention of them is in the *fœdus Edwardi et Guthruni*; or the laws agreed upon between King Guthrun the Dane, and Alfred and his ſon Edward the Elder, ſucceſſive kings of England, about the year 900. This was a kind of treaty between thoſe monarchs, which may be found at large in the Anglo-Saxon laws: wherein it was neceſſary, as Guthrun was a Pagan, to provide for the ſubſiſtence of the Chriſtian clergy under his dominion; and accordingly, we find the payment of tithes not only enjoined, but a penalty added upon non-obſervance: which law is ſeconded by the laws of Athelſtan, about the year 930. And this is as much as can certainly be traced out with regard to their legal original.

2. We are next to conſider the perſons to whom tithes are due. Upon their firſt introduction, though every man was obliged to pay tithes in general, yet he might give them to what prieſts he pleaſed; which were called *arbitrary conſecrations of tithes*; or he might pay them into the hands of the biſhop, who diſtributed among his dioceſian clergy the revenues of the church, which were then in common. But when dioceſes were divided into pariſhes, the tithes of each pariſh were allotted to its own particular miniſter; firſt by common conſent or the appointments of lords of manors, and afterwards by the written law of the land.

Arbitrary conſecrations of tithes took place again afterwards, and were in general uſe till the time of King John. This was probably owing to the intrigues of the regular clergy, or monks of the Benedictine and other orders, under Archbiſhop Dunſtan and his ſucceſſors; who endeavoured to wean the people from paying their dues to the ſecular or parochial clergy (a much more valuable ſet of men than themſelves), and were then in hopes to have drawn, by ſanctimonious pretences to extraordinary purity of life, all eccleſiaſtical profits to the coffers of their own ſocieties. And this will naturally enough account for the number and riches of the monaſteries and religious houſes which were founded in thoſe days, and which were frequently endowed with tithes. For a layman, who was obliged to pay his tithes ſomewhere, might think it good policy to erect an abbey, and there pay them to his own monks, or grant them to ſome abbey already erected: ſince for this donation, which really coſt the patron little or nothing, he might, according to the ſuperſtition of the times, have maſſes for ever ſung for his ſoul. But in proceſs of years, the income of the poor laborious pariſh-prieſts being ſcandalouſly reduced by theſe arbitrary conſecrations of tithes, it was remedied by Pope Innocent III. about the year 1200, in a decretal epiſtle ſent to the Archbiſhop of Canterbury, and dated from the palace of Lateran: which has occaſioned Sir Henry Hobart and others to miſtake it for a decree of the council of Lateran, held A.D. 1179, which only prohibited what was called the *infeodation of tithes*, or their being granted to mere laymen; whereas this letter of Pope Innocent to the archbiſhop enjoined the payment of tithes to the parſons of the reſpective pariſhes where every man inhabited, agreeable to what was afterwards directed by the ſame pope in other countries. This epiſtle, ſays Sir Edward Coke, bound not the lay ſubjects of this realm; but being reaſonable and juſt, it was allowed of, and ſo became *lex terræ*. This put an effectual ſtop to all the arbitrary conſecrations of tithes; except ſome footſteps which ſtill continue in thoſe portions of tithes which the parſon of one pariſh hath, though rarely, a right to claim in another; for it is now univerſally held, that tithes are due, of common right, to the parſon of the pariſh, unleſs there be a ſpecial exemption. This parſon of the pariſh may be either the actual incumbent, or elſe the appropriator of the benefice; appropriations being a method of endowing monaſteries, which ſeems to have been deviſed by the regular clergy, by way of ſubſtitution to arbitrary conſecrations of tithes.

3. We obſerved that tithes are due of common right to the parſon, unleſs by ſpecial exemption; let us therefore ſee, *thirdly*, who may be exempted from the payment of tithes, and how lands and their occupiers may be exempted or diſcharged from the payment of tithes, either in part or totally; firſt, by a real compoſition; or, ſecondly, by cuſtom or preſcription.

Firſt, a real compoſition is when an agreement is made between the owner of the lands and the parſon or vicar, with the conſent of the ordinary and the patron, that ſuch lands ſhall for the future be diſcharged from payment of tithes, by reaſon of ſome land or other real recompenſe given to the parſon in lieu and ſatisfaction thereof. This was permitted by law, becauſe it was ſuppoſed that the clergy would be no loſers by ſuch compoſition; ſince the conſent of the ordinary, whoſe duty it is to take care of the church in general, and of the patron, whoſe intereſt it is to protect that particular church, were both made neceſſary to render the compoſition effectual: and hence have riſen all ſuch compoſitions as exiſt at this day by force of the common law. But experience ſhowing that even this caution

was ineffectual, and the possessions of the church being by this and other means every day diminished, the disabling statute 13 Eliz. c. 10. was made; which prevents, among other spiritual persons, all parsons and vicars from making any conveyances of the estates of their churches, other than for three lives or 21 years. So that now, by virtue of this statute, no real composition made since the 13 Eliz. is good for any longer term than three lives or 21 years, though made by consent of the patron and ordinary: which has indeed effectually demolished this kind of traffic; such compositions being now rarely heard of, unless by authority of parliament.

Secondly, a discharge by custom or prescription, is where time out of mind such persons or such lands have been either partially or totally discharged from the payment of tithes. And this immemorial usage is binding upon all parties; as it is in its nature an evidence of univerfal consent and acquiescence, and with reason supposes a real composition to have been formerly made. This custom or prescription is either *de modo decimandi*, or *de non decimando*.

A *modus decimandi*, commonly called by the simple name of a *modus* only, is where there is by custom a particular manner of tithing allowed, different from the general law of taking tithes in kind, which are the actual tenth-part of the annual increase. This is sometimes a pecuniary compensation, as two pence an acre for the tithe of land: sometimes it is a compensation in work and labour, as that the parson shall have only the twelfth cock of hay, and not the tenth, in consideration of the owner's making it for him: sometimes, in lieu of a large quantity of crude or imperfect tithe, the parson shall have a less quantity when arrived at greater maturity, as a couple of fowls in lieu of tithe-eggs, and the like. Any means, in short, whereby the general law of tithing is altered, and a new method of taking them is introduced, is called a *modus decimandi*, or special manner of tithing.

A prescription *de non decimando* is a claim to be entirely discharged of tithes, and to pay no compensation in lieu of them. Thus the king by his prerogative is discharged from all tithes. So a vicar shall pay no tithes to the rector, nor the rector to the vicar, for *ecclesia decimas non solvit ecclesiæ*. But these personal privileges (not arising from or being annexed to the land) are personally confined to both the king and the clergy; for their tenant or lessee shall pay tithes, though in their own occupation their lands are not generally tithable. And, generally speaking, it is an established rule, that in lay hands *modus de non decimando non valet*. But spiritual persons or corporations, as monasteries, abbots, bishops, and the like, were always capable of having their lands totally discharged of tithes by various ways: as, 1. By real composition. 2. By the pope's bull of exemption. 3. By unity of possession; as when the rectory of a parish, and lands in the same parish, both belonged to a religious house, those lands were discharged of tithes by this unity of possession. 4. By prescription; having never been liable to tithes, by being always in spiritual hands. 5. By virtue of their order; as the knight-templars, Cistercians, and others, whose lands were privileged by the pope with a discharge of tithes. Though, upon the dissolution of abbeys by Henry VIII. most of these exemptions from tithes would have fallen with them, and the lands become tithable again, had they not been supported and upheld by the statute 31 Henry VIII. c. 13. which enacts, that all persons who should come to the possession of the lands of any abbey then dissolved, should hold them free and discharged of tithes, in as large and ample a manner as the abbeys themselves formerly held them. And from this original have sprung all the lands which being in lay hands, do at present claim to be tithe-free: for if a man can show his lands to have been such abbey-lands, and also immemorially discharged of tithes by any of the means before mentioned, this is now a good prescription *de non decimando*. But he must show both these requisites: for abbey-lands, without a special ground of discharge, are not discharged of course; neither will any prescription *de non decimando* avail in total discharge of tithes, unless it relates to such abbey-lands.

It is universally acknowledged that the payment of tithes in kind is a great discouragement to agriculture. They are inconvenient and vexatious to the husbandman, and operate as an impolitic tax upon industry. The clergyman, too, frequently finds them troublesome and precarious; his expences in collecting are a considerable drawback from their value, and his just rights are with difficulty secured: he is too often obliged to submit to imposition, or is embroiled with his parishioners in disputes and litigations, no less irksome to his feelings than prejudicial to his interest, and tending to prevent those good effects which his precepts should produce. It is therefore of the utmost importance to parochial tranquillity, and even to religion, that some just and reasonable standard of composition could be fixed. Land has been proposed, but in the present state of the division of property this is impossible: and as money is continually changing in its value, it would also be a very improper standard, unless some plan could be formed by which the composition could be increased as the value of money diminishes. A plan of this kind has been published in the Transactions of the Society instituted at Bath, Vol. IV. which those who are interested in this subject may consult for farther information.

TITHING (*Tithinga*, from the Sax. *Theothunge, i. e. Decuriam)*, a number or company of ten men, with their families, knit together in a kind of society, and all bound to the king, for the peaceable behaviour of each other. Anciently no man was suffered to abide in England above forty days, unless he were enrolled in some tithing.—One of the principal inhabitants of the tithing was annually appointed to preside over the rest, being called the *tithing-man*, the head-borough, and in some countries the borseholder, or borough's ealder, being supposed the discreetest man in the borough, town, or tithing. The distribution of England into tithings and hundreds is owing to King Alfred. See BORSEHOLDER.

TITIAN, or TITIANO, the most universal genius for painting of all the Lombard-school, the best colourist of all the moderns, and the most eminent for histories, landscapes, and portraits, was born at Cadore in Friuli, a province in the state of Venice, in 1477, being descended from the ancient family of the Vacelli. At ten years of age, his parents sent him to one of his uncles at Venice, who, observing in him an inclination to painting, put him to the school of Giovanni Bellino, where he improved himself more by the emulation that was between him and his fellow disciple Giorgione, than by the instruction of his master. He made three several portraits of the emperor Charles V. who honoured him with knighthood, created him count-palatine, made all his descendants gentlemen, and assigned him a considerable pension out of the chamber at Naples. He was so happy in the constitution of his body, that he had never been sick till the year 1576; and then he died of the plague, aged ninety-nine, a very uncommon age for a painter. He left behind him two sons and a brother, of whom Pomponio, the eldest, was a clergyman, and well preferred. Horatio, the youngest, painted several portraits, which might stand in competition with those of his father. He was famous also for many history pieces, which he made at Venice, in concurrence with Paul Veronese and Tintoret. But bewitched at last with chymistry, and the hopes of finding the philosopher's stone, he laid aside the pencil; and having reduced what he got by his father into smoke, he died of the plague in the same year with him. Francesco

Vacelli, Titian's brother, was trained to arms in the Italian wars; but peace being reftored, applied himfelf afterwards to painting. He became fo great a proficient to it, that Titian grew jealous of him; and fearing, left in time he fhould eclipfe his reputation, fent him upon pretended bufinefs to Ferdinand king of the Romans. Afterwards he fell into another profeffion, and made cabinets of ebony adorned with figures; which, however, did not hinder him from painting now and then a portrait for a friend.

TITLARK, in ornithology. See ALAUDA.

TITLE, an appellation of dignity or rank given to princes and perfons of diftinction. Titles were not fo common among the ancient Greeks or Romans as they are in modern times. Till the reign of Conftantine the title of *Illuftrious* was never given except to thofe who were diftinguifhed in arms or letters: but at length it became hereditary in the families of princes, and every fon of a prince was illuftrious. The title of *Highnefs* was formerly given only to kings. The kings of England before the reign of Henry VIII. were addreffed by the title of *your Grace*. That monarch firft affumed the title of *Highnefs*, and afterwards that of *Majefty*. The title of majefty was firft given him by Francis I. in their interview in 1520. Charles V. was the firft king of Spain who affumed the fame title.

Princes, nobles, and clergy, generally have one title derived from their territories and eftates, and another derived from their rank or from fome other remarkable circumftance. The Pope is called the *Bifhop of Rome*, and has the title of *Holinefs*. A cardinal has his name generally from fome church, and is faluted by the name of *Eminent*, or *moft Eminent*. An archbifhop, befides being named from his diocefe, is called *his Grace* and *moft Reverend*: a bifhop is alfo diftinguifhed by the name of his diocefe, and has the title of *his Lordfhip* and *right Reverend* Inferior clergymen are denominated *Reverend*.

The titles of crowned heads derived from their dominions it is unneceffary to notice. It will be fufficient to mention thofe by which they are addreffed. To an emperor is given the title of *Imperial Majefty*; to kings, that of *Majefty*; to the princes of Great Britain, *Royal Highnefs*; to thofe of Spain, *Infant*; to electors, *Electoral Highnefs*; to the grand duke of Tufcany, *Moft Serene Highnefs*; to the other princes of Italy and Germany, *Highnefs*; to the Doge of Venice, *Moft Serene Prince*; to the grand-mafter of Malta, *Eminence*; to nuncios and ambaffadors of crowned heads, *Excellency*; to dukes, *Grace*; to marquiffes, earls, and barons, *Lordfhip*.

The emperor of China, among his titles, takes that of *Tien Su*, "Son of Heaven." The Orientals, it is obferved, are exceedingly fond of titles: the fimple governor of Schiras, for inftance, after a pompous enumeration of qualities, lordfhips, &c. adds the titles of *Flower of Courtefy*, *Nutmeg of Confolation*, and *Rofe of Delight*.

TITLE, in law, denotes any right which a perfon has to the poffeffion of a thing, or an authentic inftrument whereby he can prove his right. See the articles RIGHT, PROPERTY, &c.

TITLE *to the Crown in the Britifh Conftitution*. See SUCCESSION.

TITMOUSE, in ornithology. See PARUS.

TITULAR, denotes a perfon invefted with a title, in virtue of which he holds an office or benefice, whether he perform the functions thereof or not.

TITUS VESPASIANUS, the Roman emperor, the fon of Vefpafian; of whom it is related, that not being able to recollect any remarkable good action he had done on a certain day, he exclaimed, "I have loft a day!" He might truly be called the *father of his people*; and though Rome laboured under various public calamities during his reign, fuch was his equitable and mild adminiftration, that he conftantly preferved his popularity. He was a great lover of learning, and compofed feveral poems. He reigned but two years; and it is thought Domitian his brother poifoned him, A.D. 81, aged forty-one.

TIVIOT HILLS, See CHEVIOT.

TIVOLI, the modern name of TIBUR.

TOAD, in zoology. See RANA.

TOAD-*Fifh*. See LOPHIUS.

TOAD-*Flax*, in botany. See ANTIRRHINUM.

TOAD *Stone*, a genus of argillaceous earths examined by Dr. Withering. He defcribes it as of a dark-brownifh grey colour; its texture granular; neither effervefcing with acids nor ftriking fire with fteel. The cavities of it are filled with cryftallized fpar, and in a ftrong heat it is fufible *per fe*. An hundred parts of toad-ftone contain from 56 to 63·5 of filiceous earth, near 15 of argillaceous earth, 7·5 of calcareous earth, and 16 of oxydated iron. Dr. Kirwan obferves, that the toad-ftone is not much different from bafaltes, only that it is fofter: it contains alfo a fmaller proportion of iron, and a larger one of filiceous earth.

TOBACCO, in botany. See NICOTIANA and SNUFF. We have been told, that tobacco, when chewed, is a prefervative againft hunger: but this is a vulgar error; for, in reality, it may more properly be faid to deftroy appetite by the profufe difcharge of faliva, which has already been confidered as a powerful, diffolving fluid, effential both to appetite and digeftion. In fmoking, the fumes of tobacco induce a kind of pleafing infenfibility not eafily defcribed. Its narcotic odour, thus adminiftered, equally infatuates the ignorant favage and the intelligent philofpher; but, by the large expence of faliva thereby occafioned, it is productive of many diforders of the head and ftomach, particularly the laft.

TOBACCO-PIPE-*Fifh*. See FISTULARIA.

TOBAGO, one of the Caribbee Iflands, in the Weft Indies, about thirty miles in length, from fouth-eaft to north-weft, and about nine in breadth. This ifland was firft difcovered by Columbus, in the year 1498; but we know of no fettlement that he or any of his countrymen made upon the ifland. When an adventurous fpirit for difcoveries prevailed in England under Queen Elizabeth, Sir Robert Dudley, fon of the famous Earl of Leicefter, in an expedition againft Trinidada, gave the Englifh governor the firft hint of peopling Tobago, which was then uninhabited by any European nation: but this propofal met with fmall encouragement. William, earl of Pembroke, in the year 1628, obtained a grant of this ifland, with that of Barbuda and St. Bernard, but his death happening in lefs than two years after, the defign came to nothing. About the year 1632, fome Zealanders having fitted out a fmall fquadron for trading to thofe iflands, made fuch a favourable report of this in particular, upon their return home, that the company of merchants to which they belonged, undertook to fettle it, and gave it the name of *New Walcheren*, from one of the iflands in Zealand. The new colony, in a fhort time, increafed to about 200, who, finding themfelves peftered by the vifits of the Caribbean Indians, began to erect a fort for their prefervation. The Indians had recourfe to the Spaniards, who readily granted them affiftance. They fent a force upon the ifland, which demolifhed the rifing fort, and exterminated the new colony. It was probably from fome Dutch merchants who travelled to Courland, that James, duke of that country, conceived the defign of fettling Tobago. Being a prince of an active difpofition, and finding there was room for fuch a fettlement, he fent over a colony of his own fubjects, who fettled upon what has fince been called *Great Courland Bay*, and erected a fmall regular fort, with a town, in the neighbourhood; and the duke's title was farther confirmed by a grant from Charles II., king of England, but difputed by the Dutch. Upon the extinction of the Kettler family, dukes of Courland, in the perfon of Ferdinand, fon of

duke James, the fief of the iſland of Tobago, reverted to the crown of England, in the year 1737, and, by the definitive treaty, concluded at Paris, in the year 1763, Tobago was ceded in full right to Great Britain. A few Indians, while it was in its ſtate of neutrality, were its only ſettled inhabitants, and they lived in huts, on the ſea-coaſt, towards the northern extremity of the iſland. Thoſe Indians are by nature far more tractable than the other Caribbeans; and though enthuſiaſtically fond of liberty, there is no doubt but that every paſſion might prevail with them to enjoy it, under a mild protection. The climate of Tobago is far more temperate than could be expected in an iſland that is but eleven degrees ſixteen minutes north from the equator; for the heat is allayed by the ſea-breezes. Tobago has another favourable circumſtance to recommend it, by its lying out of the tract of thoſe hurricanes that prove ſo fatal to the other Weſt-India iſlands. The ſurface of the iſland is unequal and agreeably diverſified; but no part of it is rugged or impaſſible, though its north-weſt extremity is mountainous. Its ſoil is of different kinds, but in general thē mould is rich and black, and proper for producing, in the greateſt plenty, whatever is raiſed in other parts of the Weſt Indies. The abundance of ſprings upon the iſland, contributes to its healthfulneſs, and its bays and creeks are ſo diſpoſed as to be very commodious for all kinds of ſhipping. It is, however, to be remarked, that its ſituation requires fortifications to render the iſland ſecure againſt the viſits of ſavages and enemies. Beſides its producing the different kinds of wood that are to be found in the other Weſt-India iſlands, the Dutch affirm, that both the true nutmeg-tree and the cinnamon-tree, with that which produces the real gum-copal, grows upon the iſland, but this aſſertion wants confirmation. Mr. Blome, who, in the year 1687, wrote the preſent ſtate of our American Iſlands, ſays, " that the ſoil of Tobago produces Indian corn, Guinea corn, peas, beans, French beans, figs, pine-apples, pomegranates, oranges, lemons, limes, plantains, bananas, grapes, guavas, tamarinds, prickly pears, papas, and a variety of other fruits, which are not to be found in Europe. The cocoa-tree grows here to ſuch perfection, that the Indians call it God's-tree, as producing both meat, drink, and clothing. Muſk-melons, water-melons, cucumbers, gourds, and pompions, are raiſed to perfection: neither is there any want of potatoes, yams, carrots, turnips, parſnips, onions, and manioc. Wild hogs abounded ſo much upon Tobago, that the people killed, at leaſt, twenty thouſand of them every year, without their being ſenſibly diminiſhed. Here are likewiſe found peccaros, reſembling ſwine, armadilloes, guanoes, Indian rabbits, and badgers. Horſes, cows, aſſes, ſheep, deer, goats, and rabbits, were probably introduced by the Dutch, and have multiplied exceedingly. The ſea is ſtored with excellent fiſh, particularly turtle of every kind, and mullets of a moſt delicious taſte, with other kinds unknown in England. In ſhort, the commodities which the country doth, or may produce, are cocoa-nut, ſugar, tobacco, indigo, ginger, ſarſaparilla, ſemper-vivum, bees-wax, venelloes, natural balſam, balm, ſilk-graſs, green tar, ſoap-earth, with many curious ſhells, ſtones, marcaſites, and minerals. Long. 16. 30. W. Greenwich. Lat. 11. 16. N.

TOBOLSK, a city of Ruſſia, and capital of a government, at the conflux of the Irtiſch and Tobol. It is the ſee of an archbiſhop, and was heretofore the capital of all Siberia. This city is divided into the Upper and Lower Town. The Upper-Town ſtands very high, on the eaſt-ſide of the Irtiſch; and the Lower Town lies on a plain, between the hill, on which the former is built, and the river. Both towns, taken together, are of a very large circumference; but the houſes are all built with wood. In the Upper Town, which is properly called the city, ſtands the fort, which was built with ſtone, by governor Gagarin. In the fort are the governor's court, as it is called, the governor's houſe, the archbiſhop's palace, the exchange, and two of the principal churches, which are all ſtone buildings. The Upper Town, which ſtands on the eaſt-ſide of the fort, and is incloſed within an earthen rampart, affords nothing remarkable, but a market for proviſions, and all kinds of ſmall ware, three wooden churches, and a convent. The Lower Town contains a market-place for all kinds of proviſions, on which ſeveral ſhops are built. The Upper Town is out of the reach of inundations from the river, by its high ſituation, which, however, is attended with this inconveniency, that the inhabitants are under a neceſſity of going down the hill for water. Beſides large maſſes of earth fall from the ſide of the hill, on which the town ſtands, towards the river, almoſt every year, which obliges the inhabitants to pull down and rebuild the houſes that ſtand near the declivity. The Lower Town, indeed, has water at hand, but is expoſed to inundations when the river overflows its banks; but ſuch floods do not happen every year. The town is very populous, and almoſt the fourth part of its inhabitants are Tartars, who are partly deſcended from thoſe that were ſettled there before the conqueſt of Siberia, and partly from the Bukharians. Theſe Tartars, in general, behave very quietly, and carry on ſome commerce; but practiſe no mechanic trades. They are very ſober, and averſe to intemperance, and all kinds of riotous living. The reſt of the inhabitants are Ruſſians, whoſe anceſtors were baniſhed hither for their crimes, or ſuch as are exiles themſelves. As every thing is ſold here ſo exceeding cheap, that a common man may live very well, at Tobolſk, for ten rubels a year; indolence and ſloth prevail to ſuch a degree, that it is a hard matter to get the leaſt utenſil, &c. made, though the town abounds with artificers, who want neither tools nor materials to carry on their reſpective trades. The commerce is in a flouriſhing condition, in this city: and the traffic which the Bukharian and Calmuck merchants carry on in Indian goods, with which they ſupply all Siberia, and part of Ruſſia, is very conſiderable. All the Chineſe caravans are obliged to paſs through this town; and all the furs furniſhed by Siberia are brought into a warehouſe in this city, and from hence are forwarded to the Siberian chancery, at Moſcow. Several of the Swediſh officers, who were taken priſoners at the battle of Pultawa, and ſent to Tobolſk, ſet up ſchools here, in the year 1713, for teaching the children of Swedes, Ruſſians, Coſaks, Tartars, &c. the German, Latin, and French languages, with geography, geometry, and drawing. Many of them alſo took in boarders. Theſe ſchools acquired great reputation; ſo that children were ſent hither for education, from a conſiderable diſtance, and the exemplary behaviour of theſe military pedagogues, was attended with uncommon ſucceſs. However, when the peace of Nyſtadt was concluded, the Swediſh officers returned into their own country; and then theſe beneficial ſeminaries of learning dropped of courſe. Some time after a German ſchool was founded here, under the auſpices of the empreſs: 1000 miles E. Muſcow, and 1172 E. Peterſburg. Long. 86. E. Ferro. Lat. 57. N.

TODDA Panna. See Cycas.

TODDY, a name given to the juice of the cocoa-nut tree. See Arak.—Toddy is alſo a name given to a mixture of ſpirits, water, and ſugar.

Toddy-*Bird*. See Loxia, ſpecies 11.

TODUS, the Tody, in ornithology; a genus belonging to the order of *picæ*. The beak is ſlender, depreſſed, broad, and the baſe beſet with briſtles. The noſtrils are ſmall and oval. The toes are placed three before and one behind; the middle are greatly connected to the outer. There are 15 ſpecies according to Dr. Latham. " Birds of this genus (ſays that

eminent ornithologift) inhabit the warmer parts of America. They vary confiderably in their bills as to breadth, but all of them have a certain flatnefs, or depreffion, which is peculiar. They have great affinity to the flycatchers; and indeed, to fpeak the truth, the two genera run much into one another: however, in one thing they differ materially; for in the tody the outer and middle toes are much connected, whereas in the flycatcher genus they are divided to their origin."

TOGA, in Roman antiquity, a wide woollen gown or mantle, which feems to have been of a femicircular form, without fleeves; differing both in richnefs and largenefs, according to the circumftances of the wearer, and ufed only upon occafion of appearing in public. Every body knows that the toga was the diftinguifhed mark of a Roman: hence, the *jus togæ*, or privilege of a Roman citizen; *i. e.* the right of wearing a Roman habit, and of taking, as they explain it, fire and water through the Roman empire.

TOKAY-Wine, derives its name from a town of Hungary, where it is produced. There are four forts of wine made from the fame grapes, diftinguifhed at Tokay by the names of *effence*, *aufpruch*, *mafslach*, and the *common wine*. The effence is made by picking out the half-dried and fhrivelled grapes, and putting them into a perforated veffel, where they remain as long as any juice runs off by the mere preffure of their own weight. This is put into fmall cafks. The aufpruch is made by pouring the expreffed juice of the grapes from which the former had been picked on thofe that yielded the effence, and treading them with the feet. The liquor thus obtained ftands for a day or two to ferment, and then is poured into fmall cafks, which are kept in the air for about a month, and afterwards put into cafks. The fame procefs is again repeated by the addition of more juice to the grapes which have already undergone the two former preffures, and they are now wrung with the hands; and thus is had the mafslach. The fourth kind is made by taking all the grapes together at firft, and fubmitting them to the greateft preffure: this is chiefly prepared by the peafants. The effence is thick, and very fweet and lufcious: it is chiefly ufed to mix with the other kinds. The aufpruch is the wine commonly exported, and which is known in foreign countries by the name of *Tokay*.

The goodnefs of it is determined by the following rules. The colour fhould neither be reddifh nor very pale, but a light filver: in trying it, the palate and tip of the tongue fhould be wetted without fwallowing it, and if it manifeft any acrimony to the tongue, it is not good; but the tafte ought to be foft and mild: when poured out, it fhould form globules in the glafs, and have an oily appearance: when genuine, the ftrongeft is always of the beft quality: when fwallowed, it fhould have an earthy aftringent tafte in the mouth, which is called the tafte of the root. All tokay wine has an aromatic tafte, which diftinguifhes it from every other fpecies of wine. It keeps to any age, and improves by time: but is never good till about three years old. It is the beft way to tranfport it in cafks; for when it is on the feas, it ferments three times every feafon, and thus refines itfelf. When in bottles, there muft be an empty fpace left between the wine and the cork, otherwife it would burft the bottle. A little oil is put upon the furface, and a piece of bladder tied over the cork. The bottles are always laid on their fides in fand. *Philofophical Tranfactions*, vol. lxiii. part ii. p. 292, &c.

TOKENS. See Tradesmens-*Tokens*.

TOISE, a French meafure containing fix of their feet, or a fathom.

TOLAND (John), a very famous writer, was born near Londonderry in Ireland, 1670, and educated in the Popifh religion; but at fixteen years of age embraced the principles of the Proteftants. He ftudied three years at the univerfity of Glafgow; was created mafter of arts in the univerfity of Edinburgh; and afterwards completed his ftudies at Leyden, where he refided two years. He then went to Oxford, where, having the advantage of the public library, he collected materials upon various fubjects, and compofed fome pieces; among which was, A Differtation to prove the received hiftory of the tragical death of Atilius Regulus, the Roman conful, to be a fable. He began likewife a work of greater confequence, in which he undertook to fhow that there are no myfteries in the Chriftian religion. He publifhed it in 1696 at London, under the title of *Chriftianity not myfterious*. This book gave great offence, and was attacked by feveral writers. He afterward wrote in favour of the Hanoverian fucceffion, and many other pieces. In 1707 he went into Germany, where he vifited feveral courts; and in 1710 he was introduced to Prince Eugene, who gave him feveral marks of his generofity. Upon his return to England he was for fome time fupported by the liberality of the Earl of Oxford lord-treafurer, and kept a country-houfe at Epfom; but foon lofing his lordfhip's favour, he publifhed feveral pamphlets againft that minifter's meafures. In the four laft years of his life he lived at Putney, but ufed to fpend moft part of the winter in London. Mr. Toland died at London in 1722. He was a man of uncommon abilities, publifhed a number of curious tracts, and was perhaps the moft learned of all the infidel writers; but his private character was far from being an amiable one; for he was extremely vain, and wanted thofe focial virtues which are the chief ornaments as well as duties of life. His pofthumous works, two volumes octavo, were publifhed in 1726, with an account of his life and writings, by Mr. Des Maizeaux.

TOLEDO, a city of Spain, in New Caftile, on the Tagus, the fee of an archbifhop, and an univerfity, founded in the year 1475. The origin of Toledo is uncertain; it is only known to have been a Roman colony, and made the depofitory of the treafury fent to Rome. From the Romans it paffed under the dominion of the Goths; Leovigild refided there and embellifhed the city, which became more confiderable under his fucceffors. The Moors took Toledo in 714, and reigned there until the year 1085, when it was taken from them by Alphonfo VI., who ftyled himfelf emperor of Toledo, whence it took, and has preferved, the title of royal and imperial. Toledo, as is well known, was formerly famous for the exquifite temper of the fword blades made there; and the genuine ones that ftill remain are fold at an exorbitant price. It is faid, that the fecret of hardening them has been again recovered, and experiments have been made with blades lately fabricated there, which feem to juftify this affertion. When one of thefe has undergone the operation of tempering, if it is in the leaft notched, by ftriking with it feveral violent blows on an iron head-piece, it is rejected: almoft all that are made here, it is faid, will ftand this proof. Two centuries ago, Toledo contained more than 200,000 inhabitants, but at prefent it fcarcely has 30,000. When a houfe falls to decay it is never rebuilt; and in twenty years more this city will be little elfe than a heap of ruins. Toledo is built upon rocks, and commanded by eminences which feem to prefent the image of fterility, yet, in the midft of thefe precipices, the traveller finds, to his furprife, feveral fertile and charming fituations, impenetrable to the burning rays of the fun. Thefe places are called *Cigarrales*: thirty-two miles SSW. Madrid. Long. 12. 28. E. Peak of Teneriffe. Lat. 39. 56.

TOLL, a tax or cuftom paid for liberty to vend goods in a market or fair, or for keeping roads in proper repair. The firft appointment of a toll on highways of which we read, took place in 1346. See Road.

TOLU, a town of South America in Terra Firma, and in the government of Carthagena; famous for the fine balfam of Tolu, brought into Europe from thence, and produced from a

tree like a pine. It is feated on a bay of the North Sea, fixty miles fouth of Carthagena. W. Long. 72. 55. N. Lat. 9. 40.

TOLUIFERA, the BALSAM OR TOLU-TREE: a genus of plans belonging to the clafs of *decandria*, and order of *monogynia*. There is only one fpecies; the *balfamum*. This tree grows to a confiderable height; it fends off numerous large branches, and is covered with rough, thick, greyifh bark: the leaves are elliptical or ovate, entire, pointed, alternate, of a light green colour, and ftand upon fhort ftrong footftalks: the flowers are numerous, and produced in lateral racemi: the calyx is bell-fhaped, divided at the brim into five teeth, which are nearly equal, but one is projected to a greater diftance than the others: the petals are inferted into the receptacle, and are five in number, of which four are equal, linear, and a little longer than the calyx; the fifth is much the largeft, inverfely heart-fhaped, and its unguis is of the length of the calyx: the ten filaments are very fhort, and furnifhed with long antheræ: the germen is oblong: there is no ftyle: the ftigma is pointed: the fruit is a round berry.

It grows in Spanifh America, in the province of Tolu, behind Carthagena, whence we are fupplied with the balfam, which is brought to us in little gourd-fhells. This balfam is obtained by making incifions in the bark of the tree, and is collected into fpoons, which are made of black wax, from which it is poured into proper veffels.

This balfam is of a reddifh yellow colour, tranfparent, in confiftence thick and tenacious: by age it grows fo hard and brittle, that it may be rubbed into a powder between the finger and thumb. Its fmell is extremely fragrant, fomewhat refembling that of lemons; its tafte is warm and fweetifh, and on being chewed it adheres to the teeth. Thrown into the fire it immediately liquifies, takes flame, and difperfes its agreeable odour. Though it does not diffolve in water, yet if boiled in it for two or three hours in a covered veffel, the water receives its odoriferous fmell: water alfo fuffers a fimilar impregnation from the balfam by diftillation. With the affiftance of mucilage it unites with water, fo as to form a milky folution. It diffolves entirely in fpirit of wine, and eafily mixes with diftilled oils, but lefs eafily with thofe of the expreffed kind. Diftilled without addition, it produces not only an empyreumatic oil, of a pale dark colour, but fometimes a fmall portion of a faline matter, fimilar to that of the flowers of benzoin.

This balfam poffeffes the fame general virtues with the balfam of Gilead, and that of Peru; it is, however, lefs heating and ftimulating, and may therefore be employed with more fafety. It has been chiefly ufed as a pectoral, and is faid to be an efficacious corroborant in gleets and feminal weakneffes. It is directed by the Pharmacopœias in the fyrupus tolutanus, tinctura tolutana, and fyrupus balfamicus.

TOMATOES. See SOLANUM.

TOMB, includes both the grave or fepulchre wherein a defunct is interred, and the monument erected to preferve his memory. The word is formed from the Greek τυμβος, *tumulus*, "fepulchre;" or, according to Menage, from the Latin *tumba*, which fignifies the fame. In many nations it has been cuftomary to burn the bodies of the dead; and to collect the afhes with pious care into an urn, which was depofited in a tomb or fepulchre. See BURNING. Among many nations it has alfo been the practice to lay the dead body in a tomb, without confuming it, after having wrapped it up decently, and fometimes placing it in a coffin. See COFFIN.

The tombs of the Jews were generally hollow places hewn out of a rock. Abraham buried Sarah in a cave. Such was the place too in which the kings of Judah and Ifrael were interred; and fuch was the place in which the body of our Saviour was depofited by Jofeph of Arimathea. But it is robable that the common people buried their dead in graves; for our Saviour compares the Pharifees to "graves which appear not, and the men that appear not are not aware of them." Over the tombs, perhaps only of people of diftinction, a ftone or monument was erected, to intimate to paffengers that they were burying places, that they might not pollute themfelves by touching them. With the fame intention, as Lightfoot informs us, they whitened them every year on the 15th of February.

The Egyptians alfo buried their dead in caves, called *catacombs*. See CATACOMB. The pyramids, as fome think, were alfo employed for the fame purpofe. Sometimes alfo, after embalming their dead, they placed them in niches in fome magnificent apartment in their houfes.

The Greeks and Romans burned their dead, and depofited their afhes in a tomb. The Greeks interred the afhes without the cities, by the fides of their highways. Sometimes indeed, by way of particular honour, they were buried in an elevated part of the town; and the Lacedemonians were allowed by Lycurgus to bury in the city and round their temples: But this was forbidden among the Romans by the law of the twelve tables, *In urbe ne fepelito, ne-ve urito;* yet Valerius Publicola, Pofthumus Tubertius, and the family of the Claudii, were buried in the Capitol. To bury by the fides of public roads was common among the Romans alfo; hence their epitaphs frequently began with *fifte viator*. Highways were made choice of probably for two reafons; 1. That the dead might not be offenfive or injure the health of the living, which they certainly would if buried in towns or populous places; and, 2dly, That they might hold out to travellers a leffon of mortality, and teach the ruftic moralift to die.

Among the northern nations it was cuftomary to bury their dead under heaps of ftones called *cairns*, or under barrows: (See the articles CAIRNS and BARROW). The inhabitants of Tibet, it is faid, neither bury nor burn their dead, but expofe them on the tops of the mountains. See TIBET.

TOMPION, a fort of bung or cork ufed to ftop the mouth of a cannon. At fea this is carefully encircled with tallow or putty, to prevent the penetration of water into the bore, whereby the powder contained in the chamber might be damaged or rendered incapable of fervice.

TON, a meafure or weight. See TUN.

TONE, or TUNE, in mufic, a property of found, whereby it comes under the relation of *grave* and *acute*; or the degree of elevation any found has, from the degree of fwiftnefs of the vibrations of the parts of the fonorous body. The variety of tones in human voices arifes partly from the dimenfions of the windpipe, which, like a flute, the longer and narrower it is, the fharper the tone it gives; but principally from the head of the larynx or knot of the throat: the tone of the voice being more or lefs grave as the rima or cleft thereof is more or lefs open. The word *tone* is taken in four different fenfes among the ancients: 1. For any found; 2. For a certain interval, as when it is faid the difference between the diapente and diateffaron is a tone; 3. For a certain locus or compafs of the voice, in which fenfe they ufed the Dorian, Phrygian, Lydian tones; 4. For tenfion, as when they fpeak of an acute, grave, or a middle tone.

TONE is more particularly ufed, in mufic, for a certain degree or interval of tune, whereby a found may be either raifed or lowered from one extreme of a concord to the other, fo as ftill to produce true melody.

TONGUE. See ANATOMY.

TONIC, in mufic, fignifies a certain degree of tenfion, or the found produced by a vocal ftring in a given degree of tenfion, or by any fonorous body when put in vibration. *Tonic*, fays Rouffeau, is likewife the name given by Ariftoxenus to one of the three kinds of chromatic mufic, whofe divifions he explains, and which was the ordinary chromatic

of the Greeks, proceeding by two femitones in fucceffion, and afterwards a third minor.

TONIC *Dominant*. See DOMINANT.

TONNAGE and POUNDAGE, an ancient duty on wine and other goods, the origin of which feems to have been this: about the 21ft of Edward III. complaint was made that merchants were robbed and murdered on the feas. The king thereupon, with the confent of the peers, levied a duty of 2s. on every ton of wine, and 12 d. in the pound on all goods imported; which was treated as illegal by the Commons. About twenty-five years after, the king, when the knights of fhires were returned home, obtained a like grant from the citizens and burgeffes, and the year after it was regularly granted in parliament. Thefe duties were diminifhed fometimes, and fometimes increafed; at length they feem to have been fixed at 3s. tonnage and 1s. poundage. They were at firft ufually granted only for a ftated term of years, as, for two years in 5 Rich. II.; but in Henry VI.'s time they were granted him for life by a ftatute in the 31ft year of his reign; and again to Edward IV. for the term of his life alfo: fince which time they were regularly granted to all his fucceffors for life, fometimes at the firft, fometimes at other fubfequent parliaments, till the reign of Charles I.; when, as the noble hiftorian expreffes it, his minifters were not fufficiently folicitous for a renewal of this legal grant. And yet thefe impofts were imprudently and unconftitutionally levied and taken, without confent of parliament, for fifteen years together; which was one of the caufes of thofe unhappy difcontents, juftifiable at firft in too many inftances, but which degenerated at laft into caufelefs rebellion and murder. For, as in every other, fo in this particular cafe, the king (previous to the commencement of hoftilities) gave the nation ample fatisfaction for the errors of his former conduct, by paffing an act, whereby he renounced all power in the crown of levying the duty of tonnage and poundage, without the exprefs confent of parliament; and alfo all power of impofition upon any merchandifes whatever. Upon the reftoration, this duty was granted to King Charles II. for life, and fo it was to his two immediate fucceffors; but now, by three feveral ftatutes, 9 Ann. c. 6. 1 Geo. I. c. 12. and 3 Geo. I. c. 7. it is made perpetual, and mortgaged for the debt of the public.

TONQUIN, a kingdom of Afia, in the Eaft Indies, beyond the Ganges; bounded on the north by the province of Yunnan in China, on the eaft by the province of Canton and the bay of Tonquin, on the fouth by Cochin China, and on the weft by the kingdom of Laos. It is about 1200 miles in length and 500 in breadth; and is one of the fineft and moft confiderable kingdoms of the eaft, as well on account of the number of inhabitants as the riches it contains and the trade it carries on. The country is thick fet with villages; and the natives in general are of a middle ftature and clean limbed, with a tawny complexion. Their faces are oval and flattifh, and their nofes and lips well proportioned. Their hair is black, long, lank, and coarfe; and they let it hang down their fhoulders. They are generally dexterous, nimble, active, and ingenious in mechanic arts. They weave a multitude of fine filks, and make curious lacquer-works, which are tranfported to other countries. There is fuch a number of people, that many want employment; for they feldom go to work but when foreign fhips arrive. The money and goods brought hither by the Englifh and Dutch put them in action; for they have not money of their own fufficient to employ themfelves; and therefore one-third at leaft muft be advanced beforehand by the merchants: and the fhips muft ftay here till the goods are finifhed, which is generally five or fix months. They are fo addicted to gaming, that when every thing elfe is loft, they will ftake their wives and children. The garments of the Tonquinefe are made either of filk or cotton; but the poor people and foldiers wear only cotton of a dark tawny colour. Their houfes are fmall and low; and the walls either of mud, or hurdles daubed over with clay. They have only a ground-floor, with two or three partitions; and each room has a fquare hole to let in the light. The villages confift of thirty or forty houfes, furrounded with trees; and in fome places there are banks to keep the water from overflowing their gardens, where they have oranges, betels, melons, and fallad-herbs. In the rainy feafon they cannot pafs from one houfe to another without wading through the water; they fometimes have boats. In the capital city called *Cacho* there are about 20,000 houfes with mud-walls, and covered with thatch; a few are built with brick, and roofed with pan-tiles. In each yard is a fmall arched building like an oven, about fix feet high, made of brick, which ferves to fecure their goods in cafe of fire. The principal ftreets are very wide, and paved with fmall ftones. The king of Tonquin has three palaces in it, fuch as they are; and near them are ftables for his horfes and elephants. The houfe of the Englifh factory is feated at the north end of the city, fronting the river, and is the beft in the city. The people in general are courteous, and civil to ftrangers; but the great men are proud, haughty, and ambitious; the foldiers infolent, and the poor thievifh. They buy all their wives, of which the great men have feveral; but the poor are ftinted for want of money. In hard times the men will fell both their wives and children to buy rice to maintain themfelves. The women offer themfelves to ftrangers as wives while they ftay, and agree with them for a certain price. Even the great men will offer their daughters to the merchants and officers who are likely to ftay fix months in the country. They are not afraid of being with child; for if they are girls they can fell them well when they are young, becaufe they are fairer than the other inhabitants. Thefe women are faid to be very faithful; and are trufted with money and goods by the Europeans during their abfence, and will make great advantage with them. The firft new moon in the year that happens after the middle of January is a great feftival; when they rejoice for ten or twelve days together, and fpend their time in all manner of fports. Their common drink is tea, but they make themfelves merry with arrack. The language is fpoken very much in the throat; and fome of the words are pronounced through the teeth, and has a great refemblance to the Chinefe. They have feveral mechanic arts or trades; fuch as fmiths, carpenters, joiners, turners, weavers, taylors, potters, painters, money-changers, paper-makers, workers in lacquer, and bell-founders. Their commodities are gold, mufk, filks, calicoes, drugs of many forts, wood for dyeing, lacquered wares, earthen wares, falt, anifeeds, and worm-feeds. The lacqured ware is not inferior to that of Japan, which is accounted the beft in the world. With all thefe merchandifes, one would expect the people to be very rich, but they are in general very poor; the chief trade being carried on by the Chinefe, Englifh, and Dutch. The goods imported befides filver, are faltpetre, fulphur, Englifh broad-cloth, pepper, fpices, and great guns.

TONSILS. See ANATOMY.

TONSURE, in ecclefiaftical hiftory, a particular manner of fhaving or clipping the hair of ecclefiaftics or monks. The ancient tonfure of the clergy was nothing more than polling the head, and cutting the hair to a moderate degree, for the fake of decency and gravity: and the fame obfervation is true with refpect to the tonfure of the ancient monks. But the Romans have carried the affair of tonfure much farther; the candidate for it kneeling before the bifhop, who cuts the hair in five different parts of the head, viz. before, behind, on each fide, and on the crown.

TONTINE, a loan given for life annuities with benefit of ſurvivorſhip; ſo called from the inventor Laurence Tonti, a Neapolitan. He propoſed his ſcheme in 1653 to reconcile the people to Cardinal Mazarine's government, by amuſing them with the hope of becoming ſuddenly rich. He obtained the conſent of the court, but the parliament would not regiſter the edict. He made attempts afterwards, but without ſucceſs.

It was not till Lewis XIV. was diſtreſſed by the league of Augſburg, and by his own immenſe expences, that he had recourſe to the plans of Tonti, which, though long laid aſide, were not forgotten. By an edict in 1689 he created a tontine royale of 1,400,000 livres annual rent, divided into fourteen claſſes. The actions were 300 livres a-piece, and the proprietors were to receive 10l. per cent. with benefit of ſurvivorſhip in every claſs. This ſcheme was executed but very imperfectly; for none of the claſſes roſe to above 25,000 livres, inſtead of 100,000, according to the original inſtitution; though the annuities were very regularly paid. A few years after, the people ſeeming in better humour for projects of this kind, another tontine was erected upon nearly the ſame terms, but this was never above half full. They both ſubſiſted in the year 1726, when the French king united the thirteenth claſs of the firſt tontine with the fourteenth of the ſecond; all the actions of which were poſſeſſed by Charlotte Bonnemay, widow of Lewis Barbier, a ſurgeon of Paris, who died at the age of ninety-ſix. This gentlewoman had ventured 300 livres in each tontine; and in the laſt year of her life ſhe had for her annuity 73,500 livres, or about 3600l. a-year, for about 30l.

The nature of the tontine is this; there is an annuity, after a certain rate of intereſt, granted to a number of people; divided into claſſes, according to their reſpective ages; ſo that annually the whole fund of each claſs is divided among the ſurvivors of that claſs; till at laſt it falls to one, and upon the extinction of that life, reverts to the power by which the tontine was erected, and which becomes thereby ſecurity for the due payment of the annuities.

TOOL, among mechanics, denotes in general any ſmall inſtrument uſed as well for making other complex inſtruments and machines, as in moſt other operations in the mechanic arts.

TOOTH, ſee Anatomy.

TOOTHACH. See Surgery and Teeth. Burning the nerve of a hollow tooth with a red-hot knitting needle, an operation the pain of which is inſtantaneous, is an effectual cure, and far better than loſing the tooth. Dr. Beddoes recommends the inſect called a *Lady-cow*, bruiſed, and put into the tooth.

Toothach-*Tree*. See Zanthoxylum.

TOOTHWORT. See Plumbago.

TOP, a ſort of platform, ſurrounding the lower maſt-head, from which it projects on all ſides like a ſcaffold. The principal intention of the top is to extend the top-maſt ſhrouds, ſo as to form a greater angle with the maſt, and thereby give additional ſupport to the latter. It is ſuſtained by certain timbers fixed acroſs the hounds or ſhoulders of the maſt, and called the *treſtle-trees* and *croſs-trees*. Beſides the uſe above mentioned, the top is otherwiſe extremely convenient to contain the materials neceſſary for extending the ſmall ſails, and for fixing or repairing the rigging and machinery with more facility and expedition. In ſhips of war it is uſed as a kind of redoubt, and is accordingly fortified for attack or defence; being furniſhed with ſwivels, muſketry, and other fire-arms, and guarded by a thick fence of corded hammocs. Finally, it is employed as a place for looking out, either in the day or night.

Top-*Maſt*, the ſecond diviſion of a maſt, or that part which ſtands between the upper and lower pieces. See the article Mast.

Top-*Sails*, certain large ſails extended acroſs the top-maſts by the topſail-yard above, and by the yard attached to the lower maſt beneath; being faſtened to the former by robands, and to the latter by means of two great blocks fixed on its extremities, through which the topſail-ſheets are inſerted, paſſing from thence to two other blocks fixed on the inner part of the yard cloſe by the maſt; and from theſe latter the ſheets lead downwards to the deck, where they may be ſlackened or extended at pleaſure. See the article Sail.

TOPAZ, in natural hiſtory, a gem called by the ancients *chryſolite*, as being of a gold colour; its texture foliaceous; its form cubic parallelopipedal, or priſmatic; its ſpecific gravity from 3,46 to 4,56; it loſes its colour only in a very ſtrong heat, and of the uſual fluxes it yields only to borax and microcoſmic ſalt. According to Bergman, 100 parts of it contain 46 of argill, 39 of ſiliceous earth, 8 of mild calcareous, and 6 of iron. Its great ſpecific gravity ſhews theſe earths to be very perfectly united. The fineſt topazes in the world are found in the Eaſt Indies; but they are very rare there of any great ſize: the Great Mogul, however, at this time, poſſeſſes one which is ſaid to weigh 157 carats, and to be worth more than 20,000l. The topazes of Peru come next after theſe in beauty and in value. The European are principally found in Sileſia and Bohemia, and are generally full of cracks and flaws, and of a browniſh yellow.

TOPE, in ichthyology, a ſpecies of Squalus.

TOPHET. See Hinnom and Moloch.

TOPHUS, in medicine, denotes a chalky or ſtony concretion in any part of the body; as the bladder, kidney, &c. but eſpecially in the joints.

TOPIC, a general head or ſubject of diſcourſe.

Topics, in oratory. See Oratory.

Topics, or *Topical Medicines*, are the ſame with external ones, or thoſe applied outwardly to ſome diſeaſed and painful part: ſuch are plaſters, cataplaſms, unguents, &c.

TOPOGRAPHY, a deſcription or draught of ſome particular place, or ſmall track of land, as that of a city or town, manor or tenement, field, garden, houſe, caſtle, or the like; ſuch as ſurveyors ſet out in their plots, or make draughts of, for the information and ſatisfaction of the proprietors.

TOPSHAM, a town in Devonſhire, in England, ſeated on the river Exmouth, five miles ſouth-eaſt of Exeter, to which place the river was formerly navigable; but in time of war was choaked up deſignedly, ſo that ſhips are now obliged to load and unload at Topſham. W. Long. 3. 26. N. Lat. 50. 39.

TORBAY, a fine bay of the Engliſh channel, on the coaſt of Devonſhire, a little to the eaſt of Dartmouth, formed by two capes, called *Bury Points*, and *Bob's Noſe*.

TORDA, or rasor-bill. See Alca, n° 4.

TORDYLIUM, Hart-wort, in botany: a genus of plants belonging to the claſs of *pentandria*, and order of *digynia*; and in the natural ſyſtem arranged under the 45th order, *Umbellatæ*. The corollets are radiated, and all hermaphrodite; the fruit is roundiſh, and crenated on the margin; the involucra long and undivided. There are ſeven ſpecies; of which two are Britiſh, the *nodoſum* and *officinale*. 1. The *nodoſum*, or knotted parſley, has ſimple ſeſſile umbels, the exterior ſeeds being rough. It grows in the borders of the cornfields, and in dry ſtony places. 2. The *officinale*, officinal hartwort, has partial involucra, as long as th- flowers; leafets oval and jagged: the ſeeds are large an- flat, and their edges notched.

TORIES, a political facti-- in Britain, oppoſed to the Whigs. The name of T- -es was given to a ſort of banditti

in Ireland, and was thence transferred to the adherents of Charles I. by his enemies, under the pretence that he favoured the rebels in Ireland. His partiſans, to be even with the republicans, gave them the name of *Whigs*, from a word which ſignifies *whey*, in deriſion of their poor fare. The Tories, or *cavaliers*, as they were alſo called, had then principally in view the political intereſts of the king, the crown, and the church of England; and the round-heads, or Whigs, propoſed chiefly the maintaining of the rights and intereſts of the people, and of Proteſtantiſm. This is the moſt popular account; and yet it is certain the names *Whig* and *Tory* were but little known till about the middle of the reign of King Charles II. M. de Cize relates, that it was in the year 1678 that the whole nation was firſt obſerved to be divided into Whigs and Tories; and that on occaſion of the famous depoſition of Titus Oates, who accuſed the Catholics of having conſpired againſt the king and the ſtate, the appellation of *Whig* was given to ſuch as believed the plot real; and *Tory* to thoſe who held it fictitious.

Theſe parties may be conſidered either with regard to the ſtate or to religion. The ſtate Tories are either violent or moderate: the firſt would have the king to be abſolute, and therefore plead for paſſive obedience, non-reſiſtance, and the hereditary right of the houſe of Stuart. The moderate Tories would not ſuffer the king to loſe any of his prerogative; but then they would not ſacrifice thoſe of the people. The ſtate Whigs are either ſtrong republicans or moderate ones. "The firſt (ſays Rapin) are the remains of the party of the long parliament, who attempted to change monarchy to a commonwealth: but theſe make ſo ſlender a figure, that they only ſerve to ſtrengthen the party of other Whigs. The Tories would perſuade the world, that all the Whigs are of this kind; as the Whigs would make us believe that all the Tories are violent. The moderate ſtate Whigs are much in the ſame ſentiments with the moderate Tories, and deſire that the government may be maintained on the ancient foundation: all the difference is, that the firſt bear a little more to the parliament and people, and the latter to that of the king. In ſhort, the old Whigs were always jealous of the encroachments of the royal prerogative, and watchful over the preſervation of the liberties and properties of the people.

TORMENTILLA, Tormentil, in botany: a genus of plants belonging to the claſs of *icoſandria*, and order of *polygynia*; and in the natural ſyſtem ranging under the 35th order, *Senticoſæ*. The calyx is octofid; the petals are four; the ſeeds round, naked, and affixed to a juiceleſs receptacle. There are two ſpecies; the *erecta* and *repens*, both indigenous. 1. The *erecta*, common tormentil, or ſeptfoil, has a ſtalk ſomewhat erect, and ſeſſile leaves. The roots conſiſt of thick tubercles, an inch or more in diameter, replete with a red juice of an aſtringent quality. They are uſed in moſt of the Weſtern Iſles, and in the Orkneys, for tanning of leather; in which intention they are proved by ſome late experiments to be ſuperior even to the oak-bark. They are firſt of all boiled in water, and the leather is afterwards ſteeped in the liquor. In the iſlands of Tirey and Col the inhabitants have deſtroyed ſo much ground by digging them up, that they have lately been prohibited the uſe of them. A decoction of theſe roots in milk is alſo frequently adminiſtered by the inhabitants of the ſame iſlands in diarrhœas and dyſenteries, with good ſucceſs; but perhaps it would be moſt proper not to give it in dyſenteries till the morbid matter be firſt evacuated. Linnæus informs us, that the Laplanders paint their leather of a red colour with the juice of the roots. 2. The *reptans*, or creeping tormentil, has reddiſh ſtalks, ſlender and creeping. The leaves are ſharply ſerrated, grow on ſhort footſtalks, and are five-lobed. The flowers are numerous and yellow, bloſſom in July, and are frequent in woods and barren paſtures.

TORNADO, a ſudden and vehement guſt of wind from all points of the compaſs, frequent on the coaſt of Guinea.

TORPEDO, the Cramp-fish. See Raja, and Electricity.

TORPOR, a numbneſs, or defect of feeling and motion. Galen ſays it is a ſort of intermediate diſorder between palſy and health.

TORREFACTION, in chemiſtry, is the roaſting or ſcorching of a body by the fire, in order to diſcharge a part either unneceſſary or hurtful in another operation. Sulphur is thus diſcharged from an ore before it can be wrought to advantage.

TORRENT, denotes a temporary ſtream of water falling ſuddenly from mountains, whereon there have been great rains, or an extraordinary thaw of ſnow.

TORRICELLI (Evangeliſte), an illuſtrious Italian mathematician and philoſopher, born at Faenza in 1608. He was trained in Latin literature by his uncle, a monk; and after cultivating mathematical knowledge for ſome time without a maſter, he ſtudied it under father Benedict Caſtelli, profeſſor of mathematics at Rome. Having read Galileo's dialogues, he compoſed a treatiſe on motion, on his principles, which brought him acquainted with Galileo, who took him home as an aſſiſtant: but Galileo died in three months after. He became profeſſor of mathematics at Florence, and greatly improved the art of making teleſcopes and microſcopes: but he is beſt known for finding out a method of aſcertaining the weight of the atmoſphere by quickſilver; the barometer being called, from him, the *Torricellian tube*. He publiſhed *Opera Geometrica*, 4to. 1644; and died in 1647.

TORRICELLIAN experiment, a famous experiment made by Torricelli, by which he demonſtrated the preſſure of the atmoſphere in oppoſition to the doctrines of ſuction, &c. finding that preſſure able to ſupport only a certain length of mercury, or any other fluid, in an inverted glaſs tube. See Barometer.

TORSK, or Tusk, in ichthyology. See Gadus.

TORTOISE, in zoology. See Testudo.

Tortoise-*ſhell*; the ſhell, or rather ſcales, of the teſtaceous animal called a *tortoiſe*; uſed in inlaying, and in various other works, as for ſnuff-boxes, combs, &c. Mr. Cateſby obſerves, that the hard ſtrong covering which incloſes all ſorts of tortoiſes, is very improperly called a *ſhell*; being of a perfect bony contexture; but covered on the outſide with ſcales, or rather plates, of a horny ſubſtance; which are what the workmen call *tortoiſe-ſhell*.

There are two general kinds of tortoiſes, *viz.* the *land* and *ſea-tortoiſe*, *teſtudo terreſtris* and *marina*. The ſea-tortoiſe, again, is of ſeveral kinds; but it is the caret, or teſtudo imbricata of Linnæus, alone which furniſhes that beautiful ſhell ſo much admired in Europe. The ſhell of the caretta, or hawkſbill tortoiſe, is thick; and conſiſts of two parts, the upper, which covers the back, and the lower the belly: the two are joined together at the ſides by ſtrong ligaments, which yet allow of a little motion. In the fore-part is an aperture for the head and fore-legs, and behind for the hind-legs and tail. It is the under ſhell alone that is uſed: to ſeparate it, they make a little fire beneath it, and as ſoon as ever it is warm, the under ſhell becomes eaſily ſeparable with the point of a knife, and is taken off in laminæ or leaves. The whole ſpoils of the caret conſiſt in 13 leaves or ſcales, eight of them flat, and five a little bent. Of the flat ones, there are four large ones, ſometimes a foot long, and ſeven inches broad. The beſt tortoiſe-ſhell is thick, clear, tranſparent, of the colour of antimony, ſprinkled with brown and white. When uſed in

marquetry, &c. the workmen give it what colour they pleaſe by means of coloured leaves, which they put underneath it.

Working and joining of Tortoise-*ſhell*.—Tortoiſe-ſhell and horn become ſoft in a moderate heat, as that of boiling water, ſo as to be preſſed, in a mould, into any form, the ſhell or horn being previouſly cut into plates of a proper ſize. Plumier informs us, in his *Art de Tourner*, that two plates are likewiſe united into one by heating and preſſing them; the edges being thoroughly cleaned, and made to fit cloſe to one another. The tortoiſe-ſhell is conveniently heated for this purpoſe by applying a hot iron above and beneath the juncture, with the interpoſition of a wet cloth to prevent the ſhell from being ſcorched by the irons: theſe irons ſhould be pretty thick, that they may not loſe their heat before the union is effected. Both tortoiſe-ſhell and horns may be ſtained of a variety of colours, by means of the colouring drugs commonly uſed in dyeing, and by certain metallic ſolutions.

TORTURE, a violent pain inflicted on perſons to force them to confeſs the crimes laid to their charge, or as a puniſhment for crimes committed. Torture was never permitted among the Romans except in the examination of ſlaves: it would therefore appear, that it was a general opinion among them, that a ſlave had ſuch a tendency to falſehood, that the truth could only be exterted from him. To the diſgrace of the profeſſors of Chriſtianity, torture was long practiſed by thoſe who called themſelves Catholics, againſt thoſe whom they termed *heretics*: that is, thoſe who differed in opinion from themſelves. Finding that they could not bring over others to adopt their ſentiments by the force of argument, they judge it proper to compel them by the force of puniſhment. This practice was very general among orthodox Chriſtians, but eſpecially among Roman Catholics. See Inquisition. By the law of England, torture was at one period employed to compel thoſe criminals who ſtood obſtinately mute when brought to trial, and refuſed either to plead guilty or not guilty; but it is now aboliſhed (ſee Arraignment, Rack). A hiſtory of the machines which have been invented to torture men, and an account of the inſtances in which theſe have been employed, would exhibit a diſmal picture of the human character.

TORUS, in architecture, a large round moulding uſed in the baſes of columns. See Architecture.

TOUCAN, in ichthyology. See Rhamphastos.

TOUCH needle, among aſſayers, refiners, &c. little bars of gold, ſilver, and copper, combined together, in all the different proportions and degrees of mixture; the uſe of which is to diſcover the degree of purity of any piece of gold or ſilver, by comparing the mark it leaves on the touchſtone with thoſe of the bars.

The metals uſually tried by the touch-ſtone are gold, ſilver, and copper, either pure, or mixed with one another in different degrees and proportions, by fuſion. In order to find out the purity or quantity of baſer metal in theſe various admixtures, when they are to be examined they are compared with theſe needles, which are mixed in a known proportion, and prepared for this uſe. The metals of theſe needles, both pure and mixed, are all made into laminæ or plates, one-twelfth of an inch broad, and of a fourth part of their breadth in thickneſs, and an inch and half long; theſe being thus prepared, you are to engrave on each a mark indicating its purity, or the nature and quantity of the admixture in it. The black rough marbles, the baſaltes, or the ſofter kinds of black pebbles, are the moſt proper for touch-ſtones.

The method of uſing the needles and ſtone is this: The piece of metal to be tried ought firſt to be wiped well with a clean towel or piece of ſoft leather, that you may the better ſee its true colour; for from this alone an experienced perſon will, in ſome degree, judge beforehand what the principal metal is, and how and with what debaſed.

Then chooſe a convenient, not over large, part of the ſurface of the metal, and rub it ſeveral times very hardly and ſtrongly againſt the touch-ſtone, that in caſe a deceitful coat or cruſt ſhould have been laid upon it, it may be worn off by that friction: this, however, is more readily done by a grindſtone or ſmall file. Then wipe a flat and very clean part of the touchſtone, and rub againſt it, over and over, the juſt mentioned part of the ſurface of the piece of metal, till you have, on the flat ſurface of the ſtone, a thin metallic cruſt, an inch long, and about an eighth of an inch broad: this done, look out the needle that ſeems moſt like to the metal under trial, wipe the lower part of this needle very clean, and then rub it againſt the touchſtone, as you did the metal, by the ſide of the other line, and in a direction parallel to it.

When this is done, if you find no difference between the colours of the two marks made by your needle and the metal under trial, you may with great probability pronounce that metal and your needle to be of the ſame alloy, which is immediately known by the mark engraved on your needle. But if you find a difference between the colour of the mark given by the metal, and that by the needle you have tried, chooſe out another needle, either of a darker or lighter colour than the former, as the difference of the tinge on the touchſtone directs; and by one or more trials of this kind you will be able to determine which of your needles the metal anſwers, and thence what alloy it is of, by the mark of the needle; or elſe you will find that the alloy is extraordinary, and not to be determined by the compariſon of your needles.

Touch-*Stone*, a black, ſmooth, gloſſy ſtone, uſed to examine the purity of metals. The ancients called it *lapis lydius*, the Lydian ſtone, from the name of the country whence it was originally brought. Any piece of pebble or black flint will anſwer the purpoſes of the beſt lapis lydius of Aſia. Even a piece of glaſs made rough with emery is uſed with ſucceſs, to diſtinguiſh true gold from ſuch as is counterfeit; both by the metallic colour and the teſt of aquafortis. The true touchſtone is of a black colour, and is met with in ſeveral parts of Sweden. See Trapp.

TOUCHWOOD. See Boletus.

TOULON, a celebrated city and ſeaport of France, in that part of the late province of Provence which is now denominated the department of the *Var*. It is a very ancient place, having been founded, according to the common opinion, by a Roman general. It is the chief town of the department, and before the great revolution in 1789 was an epiſcopal ſee. The inhabitants are computed at 80,000. It is divided into the Old Quarter and the New Quarter. The firſt, which is very ill built, has nothing remarkable in it but the *Rue aux Arbres*, the Tree Street, which is a kind of courſe or mall, and the town-houſe; the gate of this is ſurrounded by a balcony, which is ſupported by two termini, the maſterpieces of the famous Pujet. The New Quarter, which forms as it were a ſecond city, contains, beſide the magnificent works conſtructed in the reign of Louis XIV. many fine houſes (among which that of the late ſeminary merits beyond compariſon the preference), and a grand oblong ſquare, lined with trees, and ſerving as a parade.

The Merchants Haven, along which extends a noble quay, on which ſtands the townhouſe, is protected by two moles, begun by Henry IV. The New Haven was conſtructed by Louis XIV. as were the fortifications of the city. In the front of this haven is an arſenal, containing all the places neceſſary for the conſtruction and fitting out of veſſels: the firſt object that appears is a rope-walk, entirely arched, extending as far as the eye can reach, and built after the deſigns of Vauban;

here cables are made, and above is a place for the preparation of hemp. Here likewiſe is the armoury for muſkets, piſtols, halberds, &c. In the park of artillery are cannons placed in piles, bombs, grenades, mortars, and balls of various kinds, ranged in wonderful order. The long ſail-room, the foundry for cannon, the dock-yards, the baſons, &c. are all worthy of obſervation.

Both the Old and New Port have an outlet into the ſpacious outer road or harbour, which is ſurrounded by hills, and formed by nature almoſt circular. Its circuit is of very great extent, and the entrance is defended on both ſides by a fort with ſtrong batteries. In a word, the baſons, docks, and arſenal, at Toulon, warranted the remark of a foreigner that viſited them in the late reign, that "the king of France was greater there than at Verſailles." Toulon is the only mart in the Mediterranean for the re-exportation of the products of the Eaſt Indies.

This place was deſtroyed toward the end of the tenth century, and pillaged by the African pirates almoſt as ſoon as rebuilt. The conſtable of Bourbon, at the head of the Imperial troops, obtained poſſeſſion of it in 1524, as did Charles V. in 1536; but in the next century Charles Emanuel duke of Savoy could not enter it, and Prince Eugene in 1707 ineffectually laid ſiege to it. This city was ſurrendered by the inhabitants in September 1793 to the Britiſh admiral Lord Hood, as a condition and means of enabling them to effect the re-eſtabliſhment of monarchy in France, according to the conſtitution of 1789; but it afterwards became neceſſary to evacuate it after burning the ſhips and arſenals. Toulon is ſeated on a bay of the Mediterranean, 17 leagues ſouth-eaſt of Aix, 15 ſouth-eaſt of Marſeilles, and 217 ſouth-eaſt of Paris. E. Long. 5. 37. N. Lat. 43. 7.

TOULOUSE, a very ancient city of France, in the department of Upper Garonne, and late province of Languedoc, with an archbiſhop's ſee. It is the moſt conſiderable city in France next to Paris and Lyons, although its population bears no proportion to its extent. According to Mr. Neckar's calculation, it contains 56,000 inhabitants. The ſtreets are very handſome, and the walls of the city, as well as the houſes, are built with bricks. The town-houſe, a modern ſtructure, forms a perfect ſquare, 324 feet long and 66 high. The principal front occupies an entire ſide of the grand ſquare, lately called the *Place Royale*. In the great hall, called the *Hall of Illuſtrious Men*, is the ſtatue of the Chevalier Iſaure, and the buſts of all the great men to whom Toulouſe has given birth. Communicating with the ocean on one ſide by the river Garonne, and with the Mediterranean on the other by the canal of Languedoc, Toulouſe might have been a very commercial city; but the taſte of the inhabitants has been principally for the ſciences and belles-lettres. Of courſe, there are two colleges, two public libraries, and three academies. The little commerce of Toulouſe conſiſts in leather, drapery, blankets, mignionets, oil, iron, mercery, hardware, and books. The bridge over the Garonne is at leaſt equal to thoſe of Tours and Orleans: it forms the communication between the ſuburb of St. Cyprian and the city. The quays extend along the banks of the Garonne; and it has been in contemplation to line them with new and uniform houſes. Toulouſe is 37 miles eaſt of Auch, 125 ſouth-eaſt of Bourdeaux, and 350 ſouth-by-weſt of Paris. E. Long. 1. 27. N. Lat. 43. 36.

TOUR (Henry de la), Viſcount Turenne, a celebrated French general, was the ſecond ſon of Henry de la Tour duke of Bouillon, and was born at Sedan in 1611. He made his firſt campaigns in Holland, under Maurice and Frederic Henry princes of Orange; who were his uncles by his mother's ſide; and even then diſtinguiſhed himſelf by his bravery. In 1634 he marched with his regiment into Lorraine; and having contributed to the taking of La Mothe, was, though very young, made mareſchal de camp. In 1636 he took Saverne, and the year following the caſtles of Hirſon and Sole; on which occaſion he performed an action like that of Scipio's, with reſpect to a very beautiful woman whom he ſent back to her huſband. The Viſcount Turenne continued to diſtinguiſh himſelf in ſeveral ſieges and battles, and in 1644 was made marſhal of France; but had the misfortune to be defeated at the battle of Mariendal in 1645. However, he gained the battle of Nortlingen three months after; reſtored the elector of Treves to his dominions; and the following year made the famous junction of the French army with that of Sweden commanded by General Wrangel, which obliged the Duke of Bavaria to demand a peace. Afterwards that duke breaking the treaty he had concluded with France, he was defeated by the Viſcount Turenne at the battle of Zumarſhauſen, and in 1648 driven entirely out of his dominions. During the civil wars in France he ſided with the princes, and was defeated at the battle of Rhetel in 1650; but ſoon after was reſtored to the favour of the king, who in 1652 gave him the command of his army. He acquired great honour at the battles of Jergeau, Gren, and the ſuburbs of St. Anthony, and by the retreat he made before the army commanded by the princes at Ville Neuve St. George. In 1654 he made the Spaniards raiſe the ſiege of Arras: the next year he took Conde, St. Guilian, and ſeveral other places; gained the famous battle of Dunes; and made himſelf maſter of Dunkirk, Oudenarde, and almoſt all Flanders: this obliged the Spaniards to conclude the peace of the Pyrenées in 1660. Theſe important ſervices occaſioned his being made marſhal-general of the king's camps and armies. The war being renewed with Spain in 1667, Turenne commanded in Flanders; and took ſo many places, that in 1668 the Spaniards were obliged to ſue for peace. He commanded the French army in the war againſt the Dutch in 1672; took 40 towns in 22 days; purſued the elector of Brandenburg even to Berlin; gained the battles of Slintſheim, Ladenburg, Enſheim, Mulhauſen, and Turkeim; and obliged the Imperial army, which conſiſted of 70,000 men, to repaſs the Rhine. By this campaign the viſcount Turenne acquired immortal honour. He paſſed the Rhine to give battle to general Montecuculi, whom he followed as far as Saſpach; but mounting upon an eminence to diſcover the enemy's camp, he was killed by a cannon-ball in 1675. All France regretted the loſs of this great man, who by his military exploits had raiſed the admiration of Europe.

TOURAINE, a province of France, bounded on the north by Maine, on the eaſt by Orleanois, on the ſouth by Berris, and on the weſt by Anjou and Poitou. It is about 58 miles in length, and 55 in breadth where it is broadeſt. This country is watered by 17 rivers, beſides many brooks, which not only render it delightful, but keep up a communication with the neighbouring provinces. The air is temperate, and the ſoil is ſo fruitful that it is called the *garden of France*. It now forms the department of Indre and Loire, of which Tours is the capital.

TOURMALINE, in mineralogy, a ſpecies of ſiliceous earth. It has been found only in Ceylon, Brazil, and Tyrol. That of Ceylon is of a dark brown or yellowiſh colour; its ſpecific gravity 3,065, or 3,295; that of Brazil is green, blue, red, or yellow, and its ſpecific gravity 3,075 or 3,180; that of Tyrol by reflected light is of a blackiſh brown, but by refracted light yellowiſh, or in thin pieces green; its ſpecific gravity 3,050; moſtly cryſtalliſed in polygon priſms, but ſometimes amorphous. The thickeſt parts are opake: the thin more or leſs tranſparent. The proportion of their conſtituent parts has been found by Bergman,

	Tourmaline of Tyrol.	of Ceylon.	of Brazil.
Argill,	42	39	50
Silex,	40	37	34
Calcareous earth,	12	15	11
Iron,	6	9	5
	100	100	100

Electrical qualities have been found to exiſt in tourmaline.

TOURNAMENT, a martial ſport or exerciſe which the ancient cavaliers uſed to perform, to ſhow their bravery and addreſs. It is derived from the French word *tourner*, i. e. "to turn round," becauſe to be expert in theſe exerciſes, much agility both of horſe and man was requiſite, they riding round a ring in imitation of the ancient Circi. The firſt tournaments were only courſes on horſeback, wherein the cavaliers tilted at each other with canes in manner of lances; and were diſtinguiſhed from juſts, which were courſes or careers, accompanied with attacks and combats, with blunted lances and ſwords. See JUST.

The prince who publiſhed the tournament, uſed to ſend a king at arms, with a ſafe-conduct, and a ſword, to all the princes, knights, &c. ſignifying that he intended a tournament and a claſhing of ſwords, in the preſence of ladies and damſels; which was the uſual formulæ of invitation. The firſt engaged man againſt man, then troop againſt troop; and after the combat, the judges allotted the prize to the beſt cavalier, and the beſt ſtriker of ſwords; who was accordingly conducted in pomp to the lady of the tournament; where, after thanking her very reverently, he ſaluted her and likewiſe her two attendants.

Theſe tournaments made the principal diverſion of the 13th and 14th centuries. Munſter ſays, it was Henry the Fowler, duke of Saxony, and afterwards emperor, who died in 936, that firſt introduced them; but it appears from the chronicle of Tours, that the true inventor of this famous ſport, at leaſt in France, was one Geoffry, lord of Preuilli, about the year 1066.

Inſtances of them occur among the Engliſh in the reign of King Stephen, about the year 1140; but they were not much in uſe till Richard's time, towards the year 1149. After which period theſe diverſions were performed with extraordinary magnificence in the Tilt-yard near St. James's, Smithfield, and other places. The following account of a tournament, from Maitland, is curious. King Richard II. deſigning to hold a tournament at London on the Sunday after Michaelmas, ſent divers heralds to make proclamations of it in all the principal courts of Europe; and accordingly not a few princes, and great numbers of the prime nobility, reſorted hither from France, Germany, the Netherlands, &c. This ſolemnity began on Sunday afternoon, from the Tower of London, with a pompous cavalcade of 60 ladies, each leading an armed knight by a ſilver chain, being attended by their 'ſquires of honour, and, paſſing through Cheapſide, rode to Smithfield, where the juſts and tournaments continued ſeveral days with magnificent variety of entertainments; on which occaſion the king kept open houſe at the biſhop of London's palace for all perſons of diſtinction, and every night concluded with a ball.

At laſt, however, they were found to be productive of bad effects, and the occaſions of ſeveral fatal miſfortunes—as in the inſtance of Henry II. of France, and of the tilt exhibited at Chalons, which, from the numbers killed on both ſides, was called the *little war of Chalons*. Theſe and other inconveniences, reſulting from thoſe dangerous paſtimes, gave the popes occaſion to forbid them, and the princes of Europe gradually concurred in diſcouraging and ſuppreſſing them.

TOURNAY, a town of the Auſtrian Netherlands in Flanders, and capital of a diſtrict called *Tournayſis*, with a biſhop's ſee. It is divided into two parts by the river Scheld; and is large, populous, well built, and carries on a great trade in woollen ſtuffs and ſtockings. The cathedral is a very handſome ſtructure, and contains a great many chapels, with rich ornaments, and ſeveral magnificent tombs of marble and braſs. The town was taken by the allies in 1709; but was ceded to the houſe of Auſtria by the treaty of Utrecht, though the Dutch had a right to put in a garriſon. It was taken by the French in June 1745, who demoliſhed the fortifications. In 1781 the emperor Joſeph II. obliged the Dutch to withdraw their garriſon. It was taken by the French in 1791, abandoned by them in 1793, and again conquered by them in 1794. It is 14 miles ſouth-eaſt of Liſle, 30 ſouth-weſt of Ghent, and 135 north by eaſt from Paris. E. Long. 3. 28. N. Lat. 50. 33.

TOURNEFORT (Joſeph Pitton de), a famous French botaniſt, born at Aix in Provence in 1656. He had a paſſion for plants from his childhood, which overcame his father's views in putting him to ſtudy philoſophy and divinity; therefore on his death he quitted theology, and gave himſelf up entirely to phyſic, natural hiſtory, and botany. He wandered over the mountains of Dauphiny, Savoy, Catalonia, the Pyrenées, and the Alps, in ſearch of new ſpecies of plants, which he acquired with much fatigue and danger. His fame in 1683 procured him the employment of botanic profeſſor, in the king's garden; and by the king's order, he travelled into Spain, Portugal, Holland, and England, where he made prodigious collections of plants. In 1700, Mr. Tournefort, in obedience to another order, ſimpled over all the iſles of the Archipelago, upon the coaſts of the Black Sea, in Bithynia, Pontus, Cappadocia, Armenia, and Georgia; making obſervations on natural hiſtory at large, ancient and modern geography, religion, manners, and commerce. He ſpent three years in this learned voyage; and then reſuming his profeſſion, was made profeſſor of phyſic in the college-royal. He died in conſequence of an accidental cruſh of his breaſt by a cart-wheel, which brought on a ſpitting of blood and hydrothorax, that carried him off in 1708. He wrote Elements of Botany, both in French and Latin: A Relation of his Voyage into the Levant; with other pieces of leſs conſideration.

TOURNIQUET, in ſurgery, an inſtrument formed with ſcrews, for compreſſing any part with rollers, &c. for the ſtopping of hæmorrhages. See SURGERY.

TOWER, a tall building conſiſting of ſeveral ſtories, uſually of a round form, though ſome are ſquare or polygonal. Towers are built for fortreſſes, &c. as the Tower of London. See LONDON.

TOWN, a place inhabited by a conſiderable number of people, being of a middle ſize between a city and a village.

TOXICODENDRON, in botany. See RHUS.

TRAAS. See TERRAS.

TRACHEA. See ANATOMY.

TRACHINUS, the WEEVER, a genus of fiſhes belonging to the order of jugulares. There is but one ſpecies, viz. the *draco*, or common weever. The qualities of this fiſh were well known to the ancients, who take notice of them without any exaggeration: the wounds inflicted by its ſpines are exceedingly painful, attended with a violent burning and moſt pungent ſhooting, and ſometimes with an inflammation that will extend from the arm to the ſhoulder.

This fiſh buries itſelf in the ſands, leaving only its noſe out, and if trod on immediately ſtrikes with great force; and they have been ſeen directing their blows with as much judgment as fighting cocks. Notwithſtanding this noxious property of the ſpines, it is exceeding good meat.

The Engliſh name ſeems to have no meaning, being corrupted from the French *la vive*, ſo called as being capable of

living long out of the water, according to the interpretation of Belon. It grows to the length of 12 inches, but is commonly found much lefs: the irides are yellow: the under jaw is longer than the upper, and flopes very much towards the belly; the teeth are fmall: the back is ftraight, the fides are flat, the belly is prominent, the lateral line ftraight: the covers of the gills are armed with a very ftrong fpine: the firft dorfal fin confifts of five very ftrong fpines, which, as well as the intervening membranes, are tinged with black; this fin, when quiefcent, is lodged in a fmall hollow: the fecond confifts of feveral foft rays, commences juft at the end of the firft, and continues almoft to the tail: the pectoral fins are broad and angular; the ventral fins fmall: the vent is placed remarkably forward, very near the throat: the anal fin extends to a fmall diftance from the tail, is a little hollowed in the middle, but not fo much as to be called forked: the fides are marked lengthwife with two or three dirty yellow lines, and tranfverfely by numbers of fmall ones: the belly filvery.

TRACT, in geography, an extent of ground, or a portion of the earth's furface.

TRACT, in matters of literature, denotes a fmall treatife or written difcourfe upon any fubject.

TRADE, in general, denotes the fame with commerce, confifting in buying, felling, and exchanging of commodities, bills, money, &c. See COMMERCE, COIN, MONEY, COMPANY, &c.

TRADE-*Winds*, denote certain regular winds at fea, blowing either conftantly the fame way, or alternately this way and that; thus called from their ufe in navigation, and the Indian commerce. See WIND.

TRADESMEN's TOKENS, a term fynonymous among medallifts with provincial coins. This is a fubject curious enough to deferve attention, though we will not go fo far as Mr. Pinkerton does, who fays that it is a fubject in which the perpetual glory of the nation is interefted. Since the year 1789 provincial halfpence have been made and circulated in confiderable quantity. As ancient medals and coins have been frequently of ufe to hiftorians, it is to be regretted that many of thefe provincial halfpence are rendered ufelefs in this refpect by unmeaning figures and puerile devices. Utility and elegance ought to be ftudied: for this view it has been propofed by a gentleman of tafte on this fubject, that all coins fhould be diftinguifhed by one of the following five characteriftics. 1. Fac fimilies of magnificent beautiful buildings. 2. Reprefentations of great and ufeful undertakings. 3. Emblems of the induftry and commerce of the age. 4. The illuftrious men, &c. to which the nation has given birth. 5. Important hiftorical events. For thefe hints we acknowledge ourfelves indebted to the papers of an ingenious gentleman publifhed in the periodical works of the time.

TRADITION, fomething handed down from one generation to another without being written. Thus the Jews pretended, that befides their written law contained in the Old Teftament, Mofes had delivered an oral law which had been conveyed down from father to fon; and thus the Roman-catholics are faid to value particular doctrines fuppofed to have defcended from the apoftolic times by tradition.

TRAGACANTH. See ASTRAGALUS.

TRAGEDY, a dramatic poem, reprefenting fome fignal action performed by illuftrious perfons, and which has frequently a fatal iffue or end. See POETRY.

TRAGI-COMEDY, a dramatic piece, partaking both of the nature of tragedy and comedy; in which a mixture of merry and ferious events is admitted.

TRAGOPOGON, GOAT'S BEARD, in botany: a genus of plants belonging to the clafs of *fyngenefia*, and to the order of *polygamia æqualis*; and in the natural fyftem ranging under the 49th order, *Compofitæ*. The receptacle is naked, the calyx fimple, and the pappus plumofe. There are 14 fpecies; of which two are Britifh; the *pratenfe* and *porrifolium*. 1. The *pratenfe*, or yellow goat's beard, has its calyxes equal with the florets, and its leaves entire, long, narrow, feffile, and graffy. In fair weather this plant opens at fun-rifing, and fhuts between nine and ten in the morning. The roots are conical and efculent, and are fometimes boiled and ferved up at table like afparagus. It grows on meadows. 2. The *porrifolium*, or purple goat's beard, has the calyx longer than the radius of the floret; the flowers are large, purple, fingle, and terminal; and the leaves long, pointed, and bluifh. The root is long, thick, and efculent. It grows in meadows, and is cultivated in gardens under the name of *falfafy*.

TRAJAN (Marcus Ulpius), a celebrated Roman emperor, who gained many victories over the Parthians and Germans, pufhing the empire to its utmoft extent on the eaft and north fides. He died at Silinunte, a city of Cilicia, which from him was called *Trajanopolis*, in the year 117.

TRAJAN's *Column*, a famous hiftorical column erected in Rome, in honour of the emperor Trajan. It is of the Tufcan order, though fomewhat irregular: its height is eight diameters, and its pedeftal Corinthian: it was built in a large fquare called *Forum Romanum*. Its bafe confifts of 12 ftones of an enormous fize, and is raifed on a focle, or foot, of eight fteps: withinfide is a ftaircafe illuminated with 44 windows. It is 140 feet high, which is 35 feet fhort of the Antonine column, but the workmanfhip of the former is much more valued. It is adorned from top to bottom with baffo-relievos, reprefenting the great actions of the emperor againft the Dacians.

TRAIN, a line of gunpowder laid to give fire to a quantity thereof, in order to do execution by blowing up earth, works, buildings, &c.

TRAIN *of Artillery*, includes the great guns and other pieces of ordnance belonging to an army in the field.

TRAIN-*Oil*, the oil procured from the blubber of a whale by boiling.

TRALLIAN (Alexander), a Greek writer on phyfic, a native of Tralles in Lydia, who lived about the middle of the fixth century. His works are divided into 12 books; in which he treats of diftempers as they occur, from head to foot. He was the firft who opened the jugular vein, and that ufed cantharides as a blifter for the gout. Dr. Freind, in his Hiftory of Phyfic, ftyles him one of the moft valuable authors fince the time of Hippocrates. Though he appears on the whole to have been a rational phyfician, yet there are things in his writings that favour of enthufiam and fuperftition.

TRA-LOS-MONTES, a province of Portugal, called in Latin *Tranfmontana*, becaufe fituated on the eaft fide of a chain of hills that feparate it from Entre Duero-e Mintio. It is bounded on the north by Galicia; on the fouth by the provinces of Beira and Leon; by the laft of which it is bounded alfo to the eaft. Its length from north to fouth is upwards of 120 miles, and its breadth about 80. It is full of mountains, and produces little corn, but plenty of wine, fruits of feveral forts, and abundance of game.

TRANSACTIONS, a name generally given to a collection of the papers read before literary or philofophical focieties. The name of *Philofophical Tranfactions* was firft adopted by the Royal Society of London. See an account of the Royal Society, Vol. XVII. p. 582.

The Philofophical Tranfactions to the end of the year 1700 were abridged in three volumes by Mr. John Lowthorp: thofe from the year 1700 to 1720 were abridged in two volumes by Mr. Henry Jones: thofe from 1719 to 1733 were abridged in two volumes by Mr. John Eames and Mr. John Martyn; Mr. Martyn continued the abridgement of thofe from 1732 to 1744 in two volumes, and of thofe from 1743 to 1750 in two volumes.

They were for many years publifhed in numbers, and the

printing of them was always, from time to time, the single act of the respective secretaries, till the year 1752, when the society thought fit that a committee should be appointed to reconsider the papers read before them, and to select out of them such as they should judge most proper for publication in the future Transactions. They are published annually in two parts at the expence of the society, and each fellow is entitled to receive one copy *gratis* of every volume published after his admission into the society.

They were first set on foot in 1665, by Mr. Oldenburg, secretary of the society, and were continued by him till the year 1677. Upon his death, they were discontinued till January 1678, when Dr. Grew resumed the publication of them, and continued it for the months of December 1678, and January and February 1679, after which they were intermitted till January 1683. During this last interval they were supplied in some measure by Dr. Hooke's Philosophical Collections. They were also interrupted for three years, from December 1687 to January 1691, beside other smaller interruptions amounting to near one year and a half more, before October 1695, since which time the Transactions have been regularly carried on.

TRANSCENDENTAL, or Transcendent, something elevated, or raised above other things; which passes and transcends the nature of other inferior things.

TRANSCRIPT, a copy of any original writing, particularly that of an act or instrument inserted in the body of another.

TRANSFER, in commerce, an act whereby a person surrenders his right, interest, or property, in any thing moveable or immoveable to another.

TRANSFORMATION, in general, denotes a change of form, or the assuming a new form different from a former one.

TRANSFUSION, the act of pouring a liquor out of one vessel into another.

Transfusion *of Blood*, an operation by which it was some time ago imagined that the age of animals would be renewed, and immortality, or the next thing to it, conferred on those who had undergone it. In the Philosophical Transactions we have accounts of the success of various transfusions practised at London, Paris, in Italy, &c. Sir Edmund King transfused forty-nine ounces of blood out of a calf into a sheep; the sheep, after the operation, appearing as well and as strong as before.

M. Denis transfused the blood of three calves into three dogs, which all continued brisk, and eat as well as before. The same person transfused the blood of four wethers into a horse twenty-six years old, which thence received much strength, and a more than ordinary appetite. Soon after this operation was introduced at Paris, *viz.* in 1667 and 1668, M. Denis performed it on five human subjects, two of whom recovered of disorders under which they laboured, one being in perfect health suffered no inconvenience from it; and two persons who were ill, and submitted to the operation, died: in consequence of which the magistrates issued a sentence, prohibiting the transfusion on human bodies under pain of imprisonment.

Mr. John Hunter made many ingenious experiments to determine the effects of transfusing blood, some of which are sufficient to attract attention. But whether such experiments can ever be made with utility on the human body, is a point not easily determined. They might be allowed in desperate cases proceeding from a loss of blood, from accidents, &c. in which case the blood transfused should be that of a healthy man.

TRANSIT, from *transit*, "it passes over," signifies the passage of any planet over the sun, moon, or stars.

TRANSITION, the passage of any thing from one place to another.

Transition, in oratory. See Oratory.

TRANSITIVE, in grammar, an epithet applied to such verbs as signify an action which passes from the subject that does it, to or upon another subject which receives it. Under the head of verbs transitive come what we usually call *verbs active* and *passive*; other verbs, whose action does not pass out of themselves, are called *neuters*.

TRANSLATION, the act of transferring or removing a thing from one place to another; as we say, the translation of a bishop's see, a council, a seat of justice, &c.

Translation is also used for the version of a book or writing out of one language into another. The principles of translation have been clearly and accurately laid down by Dr. Campbell of Aberdeen in his invaluable Preliminary Dissertations to his excellent translations of the gospels. The fundamental rules which he establishes are three: 1. That the translation should give a complete transcript of the ideas of the original. 2. That the style and manner of the original should be preserved in the translation. 3. That the translation should have all the ease of original composition. The rules deducible from these general laws are explained and illustrated with much judgment and taste, in a late Essay on the Principles of Translation, by Mr. Tytler, judge-advocate of Scotland.

TRANSMARINE, something that comes from or belongs to the parts beyond sea.

TRANSMIGRATION, the removal or translation of a whole people into another country, by the power of a conqueror.

Transmigration is particularly used for the passage of the soul out of one body into another. See Metempsychosis.

TRANSMUTATION, the act of changing one substance into another. Nature, says Sir Isaac Newton, is delighted with transmutation; water, which is a fluid, volatile, tasteless, salt, is, by heat, transmuted into vapour, which is a kind of air; and by cold into ice, which is a cold, transparent, brittle stone, easily dissolvable; and this stone is convertible again into water by heat, as vapour is by cold.—Earth, by heat, becomes fire, and, by cold, is turned into earth again: dense bodies, by fermentation, are rarefied into various kinds of air; and that air, by fermentation also, and sometimes without it, reverts into gross bodies. All bodies, beasts, fishes, insects, plants, &c. with all their various parts, grow and increase out of water and aqueous and saline tinctures; and by putrefaction, all of them revert into water, or an aqueous liquor, again.

Transmutation, in alchemy, denotes the act of changing imperfect metals into gold or silver. This is also called the *grand operation*; and, they say, it is to be effected with the philosopher's stone. The trick of transmuting cinnabar into silver is thus: the cinnabar, being bruised grossly, is stratified in a crucible with granulated silver, and the crucible placed in a great fire; and, after due time for calcination, taken off; then the matter, being poured out, is found to be cinnabar turned into real silver, though the silver grains appear in the same number and form as when they were put into the crucible; but the mischief is, coming to handle the grains of silver, you find them nothing but light friable bladders, which will crumble to pieces between the fingers. The transmutability of water into earth seems to have been believed by Mr. Boyle; and Bishop Watson thinks that it has not yet been disproved. See his *Chemical Essays*.

TRANSOM, among builders, denotes the piece that is framed across a double-light window.

TRANSOMS, in a ſhip, certain beams or timbers extended acroſs the ſternpoſt of a ſhip, to fortify her afterpart, and give it the figure moſt ſuitable to the ſervice for which ſhe is calculated.

TRANSPARENCY, in phyſics, a quality in certain bodies, whereby they give paſſage to the rays of light; in contradiſtinction to opacity, or that quality of bodies which renders them impervious to the rays of light. It has been generally ſuppoſed by philoſophers, that tranſparent bodies have their pores diſpoſed in ſtraight lines, by which means the rays of light have an opportunity of penetrating them in all directions; but ſome experiments in electricity have made it apparent, that by the action of this fluid the moſt opaque bodies, ſuch as ſulphur, pitch, and ſealing-wax, may be rendered tranſparent as glaſs, while yet we cannot ſuppoſe the direction of their pores to be any-way altered from what it originally was (ſee ELECTRICITY). A curious inſtance of an increaſe of tranſparency we have in rubbing a piece of white paper over one that has been written upon or printed: while the white paper is at reſt, the writing or print will perhaps ſcarce appear through it; but when in motion, will be very eaſily legible, and continue ſo till the motion is diſcontinued.

TRANSPOSITION, in grammar, a diſturbing or diſlocating the words of a diſcourſe, or a changing their natural order of conſtruction, to pleaſe the ear by rendering the contexture more ſmooth, eaſy, and harmonious.

TRANSUBSTANTIATION, in theology, the converſion or change of the ſubſtance of the bread and wine, in the euchariſt, into the body and blood of Jeſus Chriſt; which the Romiſh church ſuppoſe to be wrought by the conſecration of the prieſt.

TRANSVERSALIS, in anatomy, a name given to ſeveral muſcles. See ANATOMY.

TRANSVERSE, ſomething that goes acroſs another from corner to corner: thus bends and bars in heraldry are tranſverſe pieces or bearings; the diagonals of a parallelogram or a ſquare are tranſverſe lines.

TRANSYLVANIA, a province of Europe, annexed to Hungary, and bounded on the north by Upper Hungary and Poland, on the eaſt by Moldavia and Walachia, on the ſouth by Walachia, and on the weſt by Upper and Lower Hungary. It is ſurrounded on all parts by high mountains, which, however, are not barren. The inhabitants have as much corn and wine as they want themſelves; and there are rich mines of gold, ſilver, lead, copper, quickſilver, and alum. It has undergone various revolutions; but it now belongs to the houſe of Auſtria. The inhabitants are of ſeveral ſorts of religions; as Papiſts, Lutherans, Calviniſts, Socinians, Photinians, Arians, Greeks, and Mahometans. It is about 162 miles in length, and 150 in breadth. The adminiſtration of affairs is conducted by 12 perſons; namely, three Roman-catholics, three Lutherans, three Calviniſts, and three Socinians. The militia is commanded by the governor, whoſe commiſſion is the more important, as Tranſylvania is the bulwark of Chriſtendom. It is divided into ſeveral ſmall diſtricts, called *palatinates* and *counties;* and is inhabited by three different nations, Saxons, Sicilians, and Hungarians. Hermanſtadt is the capital town.

TRAPEZIUM, in geometry, a plane figure contained under four unequal right lines.

TRAPEZIUS, a muſcle. See ANATOMY.

TRAPP (Dr. Joſeph), an Engliſh divine of excellent parts and learning, was born at Cherington in Glouceſterſhire, of which place his father was rector in 1579. He was the firſt perſon choſen to the profeſſorſhip of poetry founded at Oxford by Dr. Birkhead; and publiſhed his lectures under the title of *Prælectiones Poeticæ*, in which he laid down excellent rules for every ſpecies of poetry in very elegant Latin. He ſhowed afterwards, however, by his tranſlation of Virgil, that a man may be able to direct who cannot execute, and may have the critic's judgment without the poet's fire. In the early part of his life Dr. Trapp is ſaid to have been chaplain to the father of the famous Lord Bolingbroke: he obtained the living of Chriſt-church in Newgate-ſtreet, and St. Leonard's, Foſter-lane, London; and his very high church principles probably obſtructed his farther preferment. He publiſhed ſeveral occaſional poems, a tragedy called *Abramule,* tranſlated Milton's Paradiſe Loſt into Latin verſe, and died in 1747.

TRAPP, in mineralogy, a ſpecies of ſiliceous earth. It is deſcribed by Dr. Kirwan as nearly the ſame with baſaltes; a dark grey or black ſtone, generally inveſted with a ferruginous cruſt, and cryſtallized in opake, triangular, or polyangular columns, is called *baſaltes;* that which is amorphous, or breaks in large thick, ſquare pieces, is called *trapp.* Their conſtituent principles, and relation to acids and fluxes, are exactly the ſame. The texture of this ſtone is either coarſe, rough, and diſtinct, or fine and indiſcernible. It is often reddiſh; it is always opake, and moulders by expoſure to the air; ſome ſpecimens give fire with ſteel very difficultly, though it is always very compact; ſometimes it is ſprinkled over with a few minute ſhining particles; its ſpecific gravity is 3000. When heated red-hot, and quenched in water, it becomes by degrees of a reddiſh brown colour: it melts *per ſe* in a ſtrong heat into a compact ſlag. Borax alſo diſſolves it in fuſion, but mineral alkali not entirely. According to Mr. Bergman, 100 parts of the baſaltes contain 52 of ſiliceous earth, 15 of argil, 8 of calcareous, 2 of magneſia, and 25 of iron; and with this Mr. Meyer very nearly agrees. For a more complete account of this ſpecies of ſtone, ſee M. Faujas de St Fond on the *Nat. Hiſt of Trapp.*

TRAVELLERS-JOY. CLEMATIS.

TRAVERSE, or TRANSVERSE, in general denotes ſomething that goes athwart another; that is, croſſes and cuts it obliquely.

TRAVERSE, in navigation, implies a compound courſe, or an aſſemblage of various courſes, lying at different angles with the meridian. See NAVIGATION.

TRAVERSE *Board*, , a thin circular piece of board, marked with all the points of the compaſs, and having eight holes bored in each, and eight ſmall pegs hanging from the centre of the board. It is uſed to determine the different courſes run by a ſhip during the period of the watch, and to aſcertain the diſtance of each courſe.

TRAVESTY, a name given to an humorous tranſlation of any author. The word is derived from the French *traveſter*, "to diſguiſe."

TRAUMATIC BALSAM, a ſolution of ſtimulating gums, now called Tinctura Benzoes Compoſita. It was formerly much uſed as a dreſſing for freſh wounds, but is nevertheleſs highly improper in ſuch caſes.

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